**Field Study for Disposal of Solid Wastes
from Advanced Coal Processes -- Ohio
LIMB Site Assessment**

**Final Report
April 1986 - November 1994**

A. Weinberg
B. J. Coel
R. D. Butler

October 1994

Work Performed Under Contract No.: DE-AC21-86MC22118

For
U.S. Department of Energy
Office of Fossil Energy
Morgantown Energy Technology Center
Morgantown, West Virginia

By
Radian Corporation
Austin, Texas

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1.0 EXECUTIVE SUMMARY

1.1 Introduction

New air pollution regulations under the 1991 Clean Air Act and other legislation will require cleaner, more efficient processes for converting coal to electrical power (1). These processes produce solid byproducts or wastes that differ in important respects from conventional pulverized-coal (PC) combustion ash. Few data are presently available on the field behavior of these wastes or on appropriate methods for their management and disposal.

This assessment is a report in part of a U.S. Department of Energy funded effort to develop information on management strategy for solid byproducts produced by advanced coal technologies. In that work large scale test cells containing byproducts have been constructed at three sites and are to be extensively monitored over a minimal three year time frame. Cells have been constructed of circulating fluid bed combustion residues at a site in Colorado, bubbling fluid bed combustion residues at an Illinois site, and residues from a utility boiler utilizing lime injection multistage burner (LIMB) technology.

The LIMB technology that has been developed in part through EPA and DOE sponsored research (2,3). In this technology, lime or limestone is injected into the upper portions of the boiler where it reacts with sulfur oxides, scrubbing them from the combustion gases. The scrubber byproducts are collected with the coal ash in conventional particulate control equipment. Lime injection technology offers the advantages of being a relatively easy and inexpensive retrofit application for existing plants seeking to reduce sulfur dioxide (SO_2) emissions (4,5). Lime injection can be used in conjunction with other retrofit technologies such as multistage burner installation to reduce emissions of nitrogen oxides (NO_x) as well as SO_2 .

Lime injection residues contain lime and calcium sulfate contributed by reacted and unreacted sorbent materials mixed with fly ash material from the coal. The residues produce an alkaline leachate when wetted (6). Compared with PC ash, lime injection ash may be difficult to manage when wetted because of heat generation, pozzolanic or self-cementation, and swelling on hydration (6,7). On the other hand, the high lime content and chemical reactivity of lime injection residues may offer potential benefits in reuse as a cementitious material, treatment of acidic wastes or effluents, or as an agricultural supplement (6). Previous work with LIMB ash at Ontario Hydro (8) provided data on ash performance which were used as the basis for performance models and engineering design of the test cells examined under this project.

1.2 Objectives

This study incorporates elements of three separate test designs (9). The design elements included: 1) developing and validating numerical models of contaminant transport and dispersion, 2) developing rule-of-thumb guidelines for disposal facility design; and 3) collecting

descriptive data on waste interactions with the disposal environment in representative test cases.

This report presents the results of a three-year program of field testing at an ash disposal site constructed in northern Ohio. The field test used ash from a combined lime injection-multistage burner (LIMB) retrofit demonstrated in 1988 and 1989 at the Ohio Edison Edgewater plant. The landfill test cells were constructed with LIMB ash wetted only to control dusting in one cell (North Cell), and LIMB ash wetted to optimize compaction density in the other cell (South Cell). North Cell and South Cell initial moisture contents were 26% and 38%¹, respectively.

Data were collected to characterize the wastes, the environment in which they were disposed, and the leaching, migration, and attenuation of regulated or potentially regulated constituents. Data gathered during this study will serve as the basis for an engineering design manual to guide future disposal facility development.

1.3 Methods

To address the study objectives, a wide variety of test methods were required, covering both the landfill construction and field monitoring.

To make the results of the study more relevant to utility waste managers, the design of the test cell follows as closely as possible current disposal practices at utility waste landfills (10). The test cells, shown schematically in Figure 1-1, are scaled large enough to permit use of full-scale equipment. The cells were constructed in lifts and were compacted with earth-moving equipment. After construction, the test cells were instrumented for data collection but were left uncovered and exposed to the environment for one year to simulate typical waste management practices.

The monitoring design includes initial characterization of the wastes and soils at the site for physical properties, bulk chemistry, mineralogy, leaching characteristics, and other selected properties to define the baseline conditions. Subsequent monitoring includes on-site meteorology, *in situ* moisture and permeability measurements, and laboratory characterization of core samples for detailed chemical and physical properties. These data provide input for modeling efforts and insights into the fundamental mechanisms behind the behavior of the bulk material.

---

¹Moisture contents reported throughout this report are on a dry weight basis, i.e.,

$$\frac{\text{water}}{\text{dry solids}} \times 100 = \text{wt \% moisture}$$

Figure 1-1. Schematic Diagram of the Ohio Test Cell

Groundwater, porewater, and runoff sampling and analysis were included in the test design. Samples from all sources were successfully collected during the course of the field study using monitor wells, pressure/vacuum lysimeters, and a flume, respectively.

1.4 Summary of Results

Landfill construction with LIMB ash required no major procedural modifications. Apart from steam generated from the ash on wetting the LIMB ash behaved much the same as PC ash during construction. The two landfill test cells behaved similarly during three years of field monitoring, although some differences appear to be linked to the initial moisture content of the ash. The two test cells were designed to determine differences in engineering properties, leachate generation, and chemical weathering between test cells constructed identically except for variations in the initial water content. Initial moisture content and compaction density are generally of fundamental importance in determining the long-term behavior of cementitious materials. Both test cells had adequate load-bearing strength for landfill stability under normal design conditions but they exhibited continuing dimensional instability. The heaving and expansion observed in the cells did not affect the stability of the landfill itself but probably contributed to greater permeability to infiltrating water. Permeabilities were generally higher than anticipated and strengths were lower. The initially

wetted South Cell exhibited lower strengths, higher permeability, and greater leachate production over the course of the field monitoring. Leachate migration has occurred from the base of both test cells but the effects on downgradient groundwater are limited to an increased chloride concentration in one well. Constituents present in the ash leachate are attenuated or otherwise removed from solution as the leachate contacts underlying soils and groundwater. Because of the high porosity and permeability of the ash volumes of surface runoff water from the test cells have been small.

The compressive strength of the landfilled ash was adequate to support equipment, although many samples broke during sampling and could not be tested. The permeability of the wastes was considerably higher than had been anticipated and, by some measures, has increased during the monitoring period, especially in the South Cell. The average permeability in the South Cell increased from approximately 10^{-7} cm/sec in the first year to 10^{-4} cm/sec at the end of the third year. The high permeability of the landfilled materials has led to an increase in the average moisture content of the test cells to approximately 90% on a dry weight basis.

1.4.1 Conceptual Model of LIMB Ash Hydration

The initial wetting of LIMB ash causes rapid hydration of lime, typically producing considerable heat. Additional water promotes conversion of reacted sorbent, present as anhydrite, to gypsum, although anhydrite may react slowly if it has been "hard burned" at high temperatures (11). Gypsum generally forms as relatively large, well defined crystals in the pore spaces of the FBC material and can contribute to early strength development (12).

Further wetting produces additional reactions. The most important is the formation of the calcium-sulpho-aluminate mineral, ettringite $[\text{Ca}_6\text{Al}_2(\text{SO}_4)_3(\text{OH})_{12} \cdot 26\text{H}_2\text{O}]$. In the LIMB ash, the rate of ettringite formation is generally limited by the availability of aluminum. This typically leads to ettringite forming an encrustation of fine crystals on the surfaces of fly ash particles that are the source of aluminum. These crusts can form interlocking crystalline networks that fill pore spaces and cement the grains together.

Calcium silicate hydrate (CSH) may also form by reaction of calcium hydroxide and aluminosilicates. CSH generally forms a high-strength, non-crystalline gel. Because of its poor crystal structure CSH is difficult to detect with X-ray techniques.

Thaumasite $[\text{Ca}_6\text{Si}_2(\text{CO}_3)_2(\text{SO}_4)_2(\text{OH})_{12} \cdot 24\text{H}_2\text{O}]$, which is isostructural with ettringite, also forms during the later stages of LIMB ash hydration. Thaumasite forms as silicate and carbonate substitute for aluminum and sulfate in the ettringite structure. Formation mechanisms and stability relations of thaumasite remain controversial (13,14). A solid solution series appears to link the end member ettringite and thaumasite compositions. The amounts of silicon, aluminum, sulfate, and carbonate incorporated into the solids may be determined by equilibrium with the surrounding pore fluids.

Formation of ettringite and other secondary minerals, including calcium silicate hydrate, appears to be the basis of the cementitious properties of LIMB ash. By filling pore spaces and locking grains together, the secondary minerals can reduce waste permeability and increase compressive strength. On the other hand, ettringite and thaumasite have been linked to expansion, heaving, and failure in Portland cement mixtures, lime treated soils, and other applications (12,13,15,16,17). To date it has not been possible to predict expansion of ettringite-cemented materials. The results of this study have provided some new insights into the physical and chemical causes of expansion and may aid in predicting its occurrence.

The formation of ettringite from lime, anhydrite, reactive alumina, and water actually results in a slight decrease in molar volume (11). The expansion which commonly occurs is poorly understood and has been attributed to a number of physical/ chemical factors including: 1) some components, notably water, may not be present in stoichiometric amounts in the initial mix and are added later, after the initial set of the mixture, by infiltrating moisture; 2) crystal growth in restricted pore spaces may force particles apart, causing a volume increase; 3) variations in the amount of water contained in some ettringite lattice sites may cause a "gel swelling" (17). Other possible mechanisms include alumina incorporation into ettringite without an accompanying reduction in the volume of its parent phase. Alumina leached from glassy portions of fly ash particles during initial weathering, leaves a silicate-rich skeleton or pseudomorphic particle (11,18). The effects of the incongruent dissolution and pseudomorphism of the aluminosilicate glass need closer examination. In addition, the physical preparation of the materials may be important. Microstructural analysis suggests that over compaction during placement may be linked to later failure.

The process of cementation and weathering in LIMB materials is illustrated schematically in Figure 1-2. The leachability of the hydrated LIMB ash is reduced because the lower permeability limits access by water and because ettringite and calcium silicate hydrate are considerably less soluble than the calcium hydroxide, gypsum, and aluminous material from which they form. Fracturing occurs when initial bonding between grains is disrupted by continued growth of secondary minerals. Secondary porosity develops as movement of water through the material leaches out soluble phases, redistributing their constituent ions to the base of the landfill.

The initial composition of the LIMB ash and the stoichiometry of the hydration reactions control the quantity of hydration products that can be formed. Since the LIMB ash is initially virtually anhydrous, having been heated to 2200° F in the boiler, the hydration reactions require a large amount of water.

According to its chemical formula, ettringite formation requires 576 g water to 678 g dry solids, or approximately 85% of the weight of the oxides. Thaumasite requires 68% water per mole, on a dry basis. After three years in the disposal environment, the LIMB ash has bound up to 56% of its initial dry weight in water into these two mineral phases.

Mineralogical analysis of the weathered ash by x-ray diffraction shows that the average abundances, by weight, of the reactive phases ettringite, thaumasite, gypsum, and calcite are

Figure 1-2. Conceptual Model of LIMB Ash Hydration

**Table 1-1. Potential Hydration Product Formation in LIMB Ash
(moles per kilogram)**

Component	Amount in Initial Ash	Amount in Hydration Products	
		North Cell	South Cell
CaO	4.5	1.7	2.2
CaSO ₄	2.0	1.7	2.2
CaCO ₃	1.0	1.5	1.9
"Al ₂ O ₃ "	0.92	0.3	0.3
SiO ₂	2.8	0.32	0.56

38%, 20%, 6.5% and 8%, respectively, in the North Cell; and 38%, 35%, 9% and 7%, respectively, in the South Cell. This mineralogy appears to be approaching the maximum quantity of the hydration products that can form in the LIMB ash, since all the available sulfate is already bound up in these hydrates. Table 1-1 compares the quantities of the potentially reactive mineral components present in the initial ash with the quantities of these components present in the ettringite, thaumasite, gypsum, and calcite formed in the weathered LIMB ash on a mole per kilogram basis. In order to facilitate comparison the weathered ash compositions have been converted to an anhydrous basis.

In both cells, sulfate availability will limit further growth of hydration products since the amount of sulfate incorporated into these mineral phases, 1.7 mol/Kg in the North Cell and 2.2 mol/Kg in the South Cell, is close to the total amount (2.0 mol/Kg) present in the initial ash. Since a large excess of CaO is present, a high pH environment will be maintained and pH sensitive phases should remain stable for the immediate future.

Although additional mineralization may be limited by sulfate availability, shifts in the chemical equilibrium in the ash may cause reaction between the hydration products formed to date. Continued dissolution of alumina and silica at high pH may promote growth of CSH and ettringite replacement by thaumasite if sulfate limits additional mineralization. Ettringite replacement does not appear to be the predominant mode of thaumasite growth to date based on SEM evidence, however. Some alumina and silica originally present in the LIMB ash in the minerals mullite and quartz will not react to form ettringite or thaumasite; the reactive potential of the material is likely to be somewhat less than indicated by the bulk chemistry. The abundance of calcite in the weathered ash is significantly higher than in the initial material. The extra carbonate represents CO₂ absorbed from the atmosphere by the alkaline ash. This suggests that thaumasite formation may, in part, require an external carbonate source. In the long-term, additional sulfate is also added to the ash by the dilute sulfuric acid contained in the precipitation at the site.

The field monitoring program at the Ohio test site has gathered detailed data to help develop this conceptual model and to relate it to the actual behavior of LIMB wastes in a

field setting. In particular, it will be determined how this behavior relates to readily measured engineering, geotechnical, and geochemical properties.

1.4.2 Engineering Results

The engineering properties of the LIMB material in the landfill test cells depend on the initial waste composition, the method of placement, and the climate of the test site. The Edgewater plant LIMB ash is relatively high in lime and sulfate since the feed coal has a moderate to high sulfur content. The LIMB ash was collected during plant tests firing a bituminous coal with 2.5% sulfur and using lime for a sorbent. Operating conditions during the tests varied considerably, creating a wide range of compositional variation in the LIMB ash during test cell construction. The chemical reactivity and the variability in composition of the ash complicated efforts to optimize its disposal characteristics.

The ash in the North and South Cells was conditioned with sufficient water to prevent dusting during transport, and the South Cell ash was wetted further during construction. The moisture contents of the test cells were nominally 26% in the North Cell and 38% in the South Cell. The optimum moisture content for compaction was 38 percent. A bulldozer at the test site spread and compacted the ash across the cell in lifts four to six inches thick to make a total thickness of approximately eight feet. Evaporation during cell construction reduced the moisture content of the wastes somewhat, and compaction during construction appears to have achieved close to the Proctor density in the North Cell, and only 80% of the Proctor density in the South Cell. Subsequent measurements, following expansion, found dry densities as low as 62% of the Proctor density.

The test site climate is moist and temperate. The water content of the test cells increased steadily throughout the first year after construction from 26%-38% to 45%-50%, and continued to increase following the addition of a soil cover, reaching 90% after three years. The lower portions of the test cells were saturated for intervals starting in late 1990, since the permeability of the soils beneath the test cells is lower than that of the LIMB ash. Leaching tests of soils underlying the test cell suggest that vertical leachate migration has had no significant effect on the soils.

The average compressive strength of the landfilled materials has changed significantly over the course of the three years of monitoring. Initial strength development was greater in the South Cell than in the North Cell. Over time, the strength of the North Cell increased, then decreased, while the strength of the South Cell declined steadily. Microstructural analysis indicates that strength development appears to correlate with growth of ettringite in zones accessible to percolating moisture. In the larger samples, the variations in measured strength do not correlate with any other physical property measurements.

The permeability of the test cell is largely fracture-controlled and is two to three orders of magnitude higher than initially predicted based on Ontario Hydro results (8). The permeability was measured both on core samples and using an *in situ* permeameter. Mean core permeabilities have increased steadily over time in the South Cell, while mean permeabili-

ties in the North Cell were initially higher but subsequently decreased. At the end of three years, core permeabilities in the North Cell were almost as high as in the South Cell. *In situ* permeability measurements were more reliable. A larger volume of material is tested with this procedure, averaging out variability introduced by small fractures. *In situ* permeability measurements have remained relatively constant during the three years of field monitoring, and there is less variability in measurements made at any given time. As with the strength measurements, the predicted correlation between decreased permeability and pozzolanic activity appears to hold true at the microstructural scale but is not apparent in bulk measurements.

1.4.3 Chemistry and Geochemistry

The initial characterization of the LIMB residues found that the concentrations of regulated metals in RCRA EP leachates, shown in Table 1-2, were generally comparable to the leachates of conventional eastern bituminous coal ash. Although the pH of the LIMB ash leachate is high, it is still below the regulatory limit for corrosivity. The high pH may be important in reducing the solubility of regulated metals.

**Table 1-2. RCRA EP Characterization Results for Ohio LIMB Ashes
(mg/L) except where noted)**

Parameter	LIMB Ash		Conventional Coal
	North Cell	South Cell	Ash ¹
Arsenic	.0056	.012	.079
Barium	4.0	.77	.134
Cadmium	<.0003	<.0003	.056
Chromium	.019	.015	.048
Lead	.0072	.0087	.019
Mercury	<.0002	<.0002	.0007
Selenium	.020	.036	.020
Silver	<.010	<.010	0.001
pH (pH units)	12	12	NA

¹ Average value for eastern coal fly ash from Table C-1, EPRI EA-3236 (19)

Deionized-water leachates of cores taken from the landfill show a decline in the average pH from over 12 to about 10.5. The concentrations of several major elements and trace metals are also lower in core leachates than in the initial waste leachate, indicating that the hydration reactions increase the chemical stability of the LIMB ash through hydroxide precipitation and metal ion substitution in ettringite. However, a few elements, including potassium, arsenic, lead, and strontium, increased in solubility. The total dissolved solids content of test leachates is moderate, ranging from approximately 1000 to 2000 mg/L, with the major ion

chemistry dominated by calcium and sulfate. Concentrations of the major ions are consistent with the solubilities of the minerals gypsum and calcite. Ettringite and thaumasite solubilities are difficult to model accurately but are presumed to play a key role in reducing the solubilities of most major ions in solution.

1.4.4 Environmental Monitoring

Groundwater and porewater samples were collected from the test cell throughout the period of field monitoring. Background groundwater composition has a high variability at the test site. Chloride, which has a low background concentration in the shallow groundwater, appears to have migrated from the South Cell into the shallow groundwater downgradient of the test cell. Calcium and possibly sulfate appear to have migrated to a more limited extent. No migration of chloride or other major ions is apparent downgradient from the North Cell, and no trace elements appear to have migrated from either test cell.

Porewater compositions follow a pattern similar to the deionized-water leachate compositions over time, but show a much wider range of variation. Some analytes, including the major ions potassium and sodium, and the trace elements arsenic, molybdenum, and strontium, are present in significantly higher concentrations in the porewater samples than in the deionized-water leachates of core samples. Other analytes appear to have solubility limitations that hold them at relatively constant concentrations in both sets of samples.

Surface runoff volumes have been small. Less than 200 gallons of runoff from the North Cell were recorded over the course of a year, although some data was lost due to vandalism at the site. The runoff samples contain low concentrations of calcium, sulfate, and other common ions. Model results indicate that leachate quantities equal approximately 20% of the incident rainfall based on 20 year averages. Short-term predictions are complicated by accounting for water bound by hydration reactions.

1.4.5 Conclusions

The results of this field study suggest that LIMB ash from the combustion of moderate to high sulfur coals will perform acceptably if engineering controls are utilized to properly condition and compact the materials during construction, reduce the influx of water to the landfill, and minimize leachate production. The handling properties of the lime and sulfate rich LIMB ash did not pose any serious problems during cell construction. Steaming and heat build-up were moderate, affecting the in-place moisture content but not equipment operations. The ash did not set prematurely and handled well in the field. The compaction of the LIMB ash in the landfill did not follow the expected pattern, and in general, dry densities were much lower than anticipated. Difficulties in controlling the water content of a reactive material and the variations in the properties of residues generated during combustion testing contributed to the compaction problem.

Following construction, the ash initially set as a coherent mass, but following cooling during the first winter it expanded, heaved, and fractured, especially in the South Cell. Ettringite

formation is implicated in this delayed expansion; thaumasite's contribution to expansion and loss of strength may also be significant. Fracturing created additional channels for water to enter the test cell. The landfills reached saturation in a little over a year, and leachate drainage has occurred from the base of the cells. Leachate is characterized by a pH near 10.5, with potassium, sodium, chloride, and sulfate as the dominant ions. Porewater concentrations of arsenic and selenium exceed federal primary drinking water limits in some samples, and the chloride, sulfate, pH, and total dissolved solids concentrations of the leachate typically exceed federal secondary maximum contaminant levels for drinking water. Leachate migration in the groundwater has resulted in increased chloride concentrations in one downgradient well.

The high variability in the strength and permeability measurements of the landfill test cell suggest that increased attention to construction and engineering could be beneficial. Decreased permeability of the waste and/or cover soil could prevent the moisture build-up noted in the present test cells. This could be achieved through better control of the initial moisture content of the residues and/or additional effort in compaction of the residues and cover soils.

While the chemical model of LIMB ash hydration appears generally correct, the predictions of how these chemical reactions influence bulk properties have not been borne out. In part, this is a product of the poor construction engineering control, as noted above, but there is also a more fundamental problem with the development of cracks in the hydrated LIMB ash. Cracks substantially degrade the performance of ash in the landfill environment, and make it much more difficult to predict performance.

LIMB ash from other sources may have different lime or sulfate contents and different reactivities because of increased or decreased sorbent requirements or differences in operating conditions. The coal ash fraction of the ash will also differ, and may alter the performance of the LIMB ash in landfill conditions. Handling characteristics of other LIMB materials may differ from those noted in this study depending on a variety of physical and chemical factors. For these reasons, a program of laboratory testing should be conducted to determine the optimal construction specifications for each individual waste stream prior to landfill design. Details of such a test program and landfill engineering practices for advanced coal combustion process wastes are under development at Radian as part of this contract.

1.5 References

1. Engineering-Science, Impacts of Proposed RCRA Regulations and Other Related Federal Environmental Regulations on Fossil Fuel-Fired Facilities, U.S. DOE Report, DOE/ET/13543-2316.
2. R.V. Hendricks and P.S. Nolan. "EPA's LIMB Development and Demonstration Program," J. Air Pollut. Control Assoc., 36, 432-438, 1986.

3. T. White, C. Parrish, and A. Furr. "Environmental Monitoring for the DOE Coolside and LIMB Demonstration Extension Projects." DOE/PC/79798-T11, January, 1991.
4. Electric Power Research Institute. Feasibility of Furnace Limestone Injection for Sulfur Dioxide (SO₂) Control. EPRI TR-101071, 1992.
5. T.E. Emmel and S. R. Fernandes. Analysis of Utility Control Strategies Using LIMB Technology, Final Report. EPA 600/7-86-029, 1986.
6. R.S. Dahlin, C.L. Lishawa, C.C. Clark, P.S. Nolan, and N. Kaplan. "Disposal, Recycle, and Utilization of Modified Fly Ash from Hydrated Lime Injection into Coal-Fired Utility Boilers." EPA/600/D-87/173, May, 1987.
7. Electric Power Research Institute. Laboratory Characterization of Advanced SO₂ Control By-Products: Furnace Sorbent Injection Wastes. EPRI CS-5783.192, 1988.
8. A. Golomb, and B.R. Nott. Ontario Hydro's research and development on sorbent injection for SO₂ control. Part 2. Waste Characterization," in A. Mehta and R.B. Dooley, eds., in Electric Power Research Institute Conference on Effects of Coal Quality on Power Plants, Atlanta, GA. EPRI-Cs-5936-SR, October 13-15, 1987.
9. Radian Corporation. Test Procedures Manual for Field Testing of Disposed Solid Waste from Advanced Coal Processes. U.S. Department of Energy, Morgantown Energy Technology Center. DE-AC21-36MC22118, July 1987.
10. G.W. Dawson, A.G. Eklund, and G.D. Gumtz. Management of Solid By-Products From Advanced SO₂ Control Systems. Electric Power Research Institute Report CS-5076, April 1987.
11. E.E. Berry, R.T. Hemmings, and B.J. Cornelius. Commercialization Potential for AFBC Concrete: Part 2 Mechanistic Basis for Cementing Action. Electric Power Research Institute Report GS-7122, Vol. 2, January 1991.
12. Lea, F.M. "The Chemistry of Cement and Concrete," 3rd ed. Chemical Publishing Co., Inc., New York, N.Y., 1971.
13. D. Hunter. "Lime Induced Heave in Sulfate-Bearing Clay Soils." Journal of Geotechnical Engineering, Vol. 114, No. 2, February 1988.
14. Kollman, H., G. Strubel, and F. Trost, 1977. "Reaction Mechanisms in the Formation of Expansion Nuclei in Lime-Gypsum Plasters." Zement-Kalk-Gips, 30:224-28.
15. Collepardi, M., 1990. "Degradation and Restoration of Masonry Walls of Historical Buildings and Structures." Materials and Structures, 23, pp 81-102.

16. Metha, P.K., 1973. "Mechanism of Expansion Associated with Ettringite Formation." Cem. Concr. Res., 3 pp 1-6.
17. Metha, P.K. and F. Huy, 1978. "Further Evidence for Expansion of Ettringite by Water Adsorption." J. Am. Ceram. Soc., 61, pp 179-180.
18. Electric Power Research Institute Technical Brief, "Coal Ash and the Environment: Characteristics of Fly Ash." EPRI RP2985-8, 1989.
19. K.V. Summers, G.L. Rupp, and S.A. Gerini. Physical-Chemical Characterization of Utility Solid Wastes. Electric Power Research Institute Report EP-3236. September 1983.

2.0 INTRODUCTION

The Department of Energy/Morgantown Energy Technology Center (DOE/METC) is conducting a research project on the disposal of solid wastes from advanced coal combustion processes, such as limestone injection-multistage burner (LIMB) combustion, and fluidized-bed combustion. Radian Corporation and the North Dakota Energy and Environmental Research Center (EERC) were contracted to construct and monitor several field test cells filled with waste from advanced coal combustion processes. DOE/METC identified the LIMB demonstration program at the Ohio Edison Edgewater plant in Lorain, Ohio as a preferred location for a solid waste test cell.

The overall objective of the study is to develop, design, and implement guidelines for safe disposal of wastes from advanced coal combustion processes. The research will produce a greater understanding of the effects cementitious reactions have on the *in situ* permeability and leachability of these wastes. In addition, the demonstration phase of this research will provide data on the environmental behavior of the wastes to support the acquisition of waste disposal permits. Data from this demonstration, and from test cells constructed at two additional test sites in western Colorado and in central Illinois, will be used to produce an engineering design manual for disposal of advanced coal combustion wastes.

Two test cells were constructed in early 1989 adjacent to the Edgewater Plant utility waste landfill in Sheffield township near the plant. The test cells were instrumented during the summer of 1989 and were monitored on a nominal quarterly basis between August 1989 and August 1992.

The remainder of this report is organized into several sections describing the design and implementation of the field testing. Section 3 describes the LIMB combustion process, the test cell location, and the cell construction and instrumentation. Section 4 describes the analytical design of the project and discusses the results of quality assurance analyses for laboratory procedures. Section 5 describes the initial properties of the LIMB ash and soils at the test site. Section 6 contains environmental data describing the local climate at the test cell, and the results of field monitoring of test cell moisture content and permeability. Section 7 provides the results of analyses on quarterly and annual core samples collected from the two test cells. The analytical results for quarterly porewater samples are presented in Section 8 and the analytical results for groundwater samples are presented in Section 9.

3.0 PLANT OPERATIONS AND SITE DESCRIPTION

3.1 Plant Operations

The U.S. Environmental Protection Agency (EPA), the State of Ohio, Ohio Edison Company, and Babcock & Wilcox (B&W) conducted a demonstration of a retrofit flue gas desulfurization system at Ohio Edison's Edgewater plant in Lorain, Ohio. The technology demonstrated was a lime injection/multistage burner (LIMB) process that involves direct injection of dry sorbents into the boiler for capture of SO_2 from the flue gas. This technology is a low cost alternative for the removal and control of acid gas emissions from existing boilers.

The LIMB technology was demonstrated over a nine-month period at the 105-MW Unit 4 boiler at the Edgewater plant. The primary fuel for the demonstration was an Ohio bituminous coal having a nominal sulfur content of 2.5 percent. The solid wastes produced were fly ash from coal combustion combined with excess lime (unspent sorbent) and calcium sulfate (spent sorbent). The LIMB ash collected for this study was generated under steady-state operating conditions during the demonstration phase. The waste was collected during operation for flue-gas humidification tests between February and April 1989.

Figure 3-1 presents a simple schematic of the LIMB process as configured during the filling of the waste test cells. Lime (CaO) is injected in the boiler "nose" through six nozzles mounted on the boiler wall. The reacted lime and fly ash are collected in electrostatic precipitators with storage hoppers below to collect the precipitator ash.

Ash from the electrostatic precipitators drops to hoppers beneath the banks of precipitators. From the hoppers the ash is conveyed pneumatically, as needed, to an ash storage silo. During the period of filling the test cells, there were several occasions when lime injection was stopped. During these periods, conventional fly ash was collected and conveyed to the ash silo. To avoid "contaminating" the test cells with this non-LIMB ash, it was necessary to pay close attention to the plant operation and the level of LIMB ash in the ash silo. When lime was not injected, the level of LIMB ash in the silo was noted and only that amount of ash was sent to the test cell (making allowances for mixing and "rat-holing" of the fly ash with the LIMB ash).

Tables 3-1 and 3-2 present operating data for the plant during the filling of the North (first) and South (second) Test Cells. The Unit 4 boiler was operated at approximately 75% load or 75 MW. Coal flow was nominally 60,000 lbs/hr and sorbent (lime) flow averaged 6000 lbs/hr, representing a stoichiometry (calcium/sulfur) of about 2.85/1.

Tables 3-3 and 3-4 present analyses of the coal for the two periods representing filling of the North and South Test Cells, respectively. The coal had an ash content of slightly over 10% and a sulfur content of about 2.5% on an "as received" basis.

Figure 3-1. Schematic of LIMB Demonstration at Ohio Edison Edgewater Plant

Table 3-1. Plant Operating Data During Filling of the North Test Cell

Site: Ohio Edison
Sample Type: Edgewater Plant Operating Conditions, Unit 4

Condition	Units	Dates April 7, 1989 - April 17, 1989
Load	MW	80 (50-90)
Ca/S	mol Ca/mol S	1.96 (1.31 - 2.29)
SO ₂ Removal Efficiency	%	60 (40-80)
Sorbent Flow	lb/hr	6,000 (4,000-7,000)
Coal Flow	klb/hr	70 (40-75)
Coal Sulfur	wt %	2.5
Coal Nitrogen	wt %	1.4
SO ₂ Emissions	lb/MMBtu	NA
O ₂	vol %	8.5 (8-10)
Boiler Efficiency	%	86 (85-89)
Heat rate, plant		NA
Gas Temperature, Nose	°F	2,300 (2,200-2,400)
CO ₂ in Humidifier	vol %	NA
CO ₂ out Humidifier	vol %	NA
H ₂ O in Humidifier	vol %	NA
H ₂ O out Humidifier	vol %	NA

NA = Not available

Value given is estimated median. Values in parentheses represent range.

Table 3-2. Plant Operating Data During Filling of the South Test Cell

Site: Ohio Edison
Sample Type: Edgewater Plant Operating Conditions, Unit 4

Condition	Units	Dates
		February 24, 1989 - March 1, 1989
Load	MW	75 (45-95)
Ca/S	mole Ca/mols S	2.78 (1.59-3.97)
SO ₂ Removal Efficiency	%	45 (20-60)
Sorbent Flow	lb/hr	7,000 (4,000-10,000)
Coal Flow	klb/hr	60 (40-80)
Coal Sulfur	wt %	2.4
Coal Nitrogen	wt %	1.4
SO ₂ Emission	lb/MMBtu	2.75 (2.25-4.5)
O ₂	vol %	9 (7.5-10)
Boiler Efficiency	%	87 (86-88)
Heat rate, Plant	Btu/lb coal	10,200 (10,000-10,500)
Gas Temperature, Nose	°F	2,200 (1,800-2,300)
CO ₂ in Humidifier	vol %	10 (7.5-11)
CO ₂ out Humidifier	vol %	10 (7.5-12)
H ₂ O in Humidifier	vol %	5 (2.5-7.5)
H ₂ O out Humidifier	vol %	6 (2.5-7.5)

Value given is estimated median. Values in parentheses represent range.

Table 3-3. Coal Analyses During Filling of the North Test Cell

Analyte (as received, %)	
Volatile Matter	34.24
Fixed carbon	NA
H ₂ O	7.31
Ash	11.02
Sulfur	2.50
Heating Value (Btu/lb)	11,979
Carbon	66.50
Hydrogen	4.49
Nitrogen	1.37
Chlorine	NA
Oxygen	6.81

NA - Not available

Table 3-4. Coal Analyses During Filling of the South Test Cell

Sample No:	LIMB 1236	LIMB 1247	LIMB 1245	LIMB 1253	LIMB 1259
Date:	890223	890224	890227	890228	890302
Analyte (as received %)					
Volatile Matter	36.68	35.58	36.38	33.82	32.63
Fixed Carbon	48.67	49.59	49.39	50.89	51.21
H ₂ O	5.31	4.96	4.61	4.73	4.94
Ash	9.34	9.87	9.62	10.56	11.22
Sulfur	2.34	2.37	2.37	2.45	2.46
Heating Value (Btu/lb)	12,534	12,414	12,585	12492	12301
Carbon	69.74	69.55	69.8	69.38	68.39
Hydrogen	4.72	4.52	4.67	4.49	4.45
Nitrogen	1.46	1.51	1.45	1.38	1.43
Chlorine	NA	NA	NA	NA	NA
Oxygen	7.09	7.22	7.48	7.01	7.11

NA - Not available

3.2 Site Description

3.2.1 Cell Design

The test cell design at the Ohio-LIMB site includes two cells. The North Cell contains LIMB waste wetted to prevent dusting (approximately 26% moisture). The South Cell contains LIMB waste wetted to an optimum moisture for maximum compaction (approximately 36%). The purpose of the two test cells is to identify differences in permeability and leachability of the LIMB waste as a function of moisture content and packing density. Both cells were monitored for physical and chemical properties. The sampling and analysis plans for the two test cells are described in Section 4.

Critical design parameters for the construction of the test cells include:

- Maintaining a complete hydrologic balance of all water entering the test cells;
- Measuring physical properties in the waste over time;
- Tracking solute migration through the waste body;
- Determining solute concentrations in interstitial solutions within the waste and underlying soils;
- Determining the attenuation of solutes in soil underlying the test cells; and
- Monitoring groundwater downgradient from the test cells for solutes leached from the waste.

The landfill test cells are located adjacent to, but hydraulically isolated from the Ohio Edison landfill which receives all solid wastes from the Edgewater plant. The landfill area is a 56-acre tract located four miles south of the Edgewater Plant in Township 6 North, Range 17 West. The tract is situated in a natural depression bounded by higher elevation areas to the south and west and a railroad embankment on the east (see Figure 3-2).

Regional topography generally slopes northward toward the Black River and Lake Erie. Locally, the topography slopes from the southwest to the northeast (Figure 3-2) but has been altered by prior landfill operations. This landfilling began in the northeast corner and has progressed southeast, presently covering approximately half of the available disposal area.

A 200-foot wide buffer zone of trees is maintained along the south border of the site to separate the landfill from the residential properties (Figure 3-3). The other tree-covered portions of the landfill are unfilled areas to be used in the next 10 years of waste disposal.

Figure 3-2. Location Map

Figure 3-3. Disposal Area Topography and Test Cell Location

The location of the two cells in the landfill area is hydrologically isolated from existing land-filled areas by a natural drainage that lies approximately 150 feet east of the test cells. The test cells are approximately 10 feet apart to conserve space but still allow separate monitoring. The two test cells were constructed immediately downgradient (north) of existing well B-3, as shown in Figure 3-3.

3.2.2 Landfill Operation

Freshly produced LIMB waste is collected dry in silos at the plant, mixed with water to prevent dusting, and hauled to the disposal site. Approximately 46,000 tons per year of LIMB waste were disposed of at the landfill site, which is operated approximately 260 days per year. Conventional coal combustion waste has been disposed of at the site for 30 years and was not separated from the LIMB waste. However, the LIMB waste was planned to be primarily disposed of in areas on the southwest side of the landfill.

3.3 Site Characteristics

3.3.1 Soils and Geology

Recent subsurface exploration in the landfill areas (1) indicates the existence of an extremely variable profile with glacially deposited soils overlying Mississippian Cuyahoga shale and Berea sandstone bedrock. In most areas, the shale underlies the glacial soils but along the western border of the site the bedrock is sandstone.

The soils in the area are Pleistocene lacustrine clays, silts, and sands ranging in depth from about 1.5 to 2.8 feet. In the low lying areas, the soils are primarily clays, and in the higher elevations to the southwest they consist of beach ridge sand mixed with typically stiff to hard consistency clays. The soil section exhibits a color change of red or brown to gray at depth, possibly indicating a change in lithology or weathering. Soil permeability is slow to moderate, and available water capacity is medium. Leaching has resulted in acidic surface soils and calcareous soils below a depth of 60 to 120 cm.

3.3.2 Hydrology

Hydrologic investigations at the site (1) often revealed groundwater at the soil/bedrock interface. Approximately two weeks after wells were installed on the site, water-table depths ranged from 2 to 15 feet, averaging approximately 11 feet. In many cases, the groundwater levels were coincident with color changes in the soils, suggesting a redox boundary between oxidized surface soils and reduced sediments at greater depths.

Groundwater flow in the glacial soils does not exhibit a consistent pattern, but generally flows northeastward in the direction of the topographic slope. Hydrologic investigations at the site (1) showed a change in water-table elevations of approximately 40 feet over the 200-foot east to west length of the landfill. The authors of these investigations concluded that groundwater within the bedrock flows from west to east. Regional groundwater occurs at

greater depths and flows from higher elevations in the southwest toward the lower elevation Black River and Lake Erie beyond. Thus, regional groundwater flows in a northeasterly direction.

Estimates of the hydrologic budget were made prior to test cell construction to estimate the greatest possible hydrologic input to a waste landfill on the site. The Hydrologic Evaluation of Landfill Performance (HELP) model (2) was used to calculate outputs from the hydrologic system. A discussion of the model and results are presented in Appendix A. Results of the preliminary modeling for the test cell design showed that the majority of the precipitation would be lost to evaporation/evapotranspiration and surface runoff. Between 1 and 18% of the total precipitation on the landfill was predicted to percolate into the waste body, depending on the degree of waste compaction and cover soil vegetation. Results of modeling using actual field data are presented in Section 6 of this report.

3.3.3 Meteorology

The climate of the area is influenced by the effects of Lake Erie. Northerly winds off Lake Erie tend to lower the daily high temperature in summer and raise it in winter. The annual average daily maximum temperature is 61° F, and the minimum is 40° F. Humidity averages range from 60 to 80% annually. The average monthly precipitation is approximately 3 inches and the average monthly snowfall in winter (November to March) is approximately 8 inches. The total annual precipitation is approximately 35 inches. A 24-hour rain of 2.7 inches can be expected at least once every 25 years.

3.4 Test Cell Design and Instrumentation

A plan view and a cross-sectional view of the test cell design are depicted in Figure 3-4 and 3-5, respectively. The test cells, constructed above grade, each have horizontal dimensions of 40 by 40 feet at the top and increase to approximately 100 by 100 feet at the base. They were filled with LIMB waste (one was wetted just enough to prevent dusting, the other was wetted to optimum moisture) in lifts to a total thickness of 8 feet. The cells were constructed with a slope of 3 horizontal to 1 vertical (3.0 H:1.0 V). An earthen ramp with a slope of 8.0 H:1.0 V was constructed on one side of each test cell for equipment access. Soils beneath the cells were compacted (similar to a full-scale disposal landfill) to minimize differential settling during the life of the cells.

Wastes were placed in the test cells in lifts by the basic operations of dumping, spreading, compacting, and covering with additional waste. Each lift was spread over the bottom area of the test cell and compacted to a thickness of 4 to 6 inches. Design specification called for pneumatic-tired rollers, which are most suitable for compacting fine-grained nonplastic materials that are slightly cohesive and have mixed grain sizes ranging from 0.01 to 2.0 mm. Because of equipment availability, a D-5 Caterpillar tractor was used for both spreading and compaction. Compaction was designed to prevent localized erosion of waste during periods of high-intensity rainfall or high-velocity wind and to promote cementation. When the test

E10015

Figure 3-4. Plan View of the Test Cell Design

CROSS SECTION A-A'

OHIO EDISON SITE

Figure 3-5. Cross-Sectional View of the Test Cell Design

cells were filled with waste, a compacted, 2-foot layer of soil was placed over the sloped sides of the test cells.

Berms were constructed to approximately 1 foot above the filled test cells. The berms were designed to prevent entry of outside surface water onto the cells and to contain precipitation falling on the test cells. The berms were stabilized by establishing a protective cover of vegetation to prevent erosion by wind and water. A Parshall flume was placed in one corner of each cell to divert runoff through a flow monitoring device. The surface of the test cells has an approximate 0.5% slope toward one corner of the cell to facilitate run-off monitoring.

During the first year of operation, only the sloping sides of the test cells were covered with soil. This facilitated more aggressive leaching and simulated the typical delay between placement of waste in the landfill and placement of final soil cover. During the remaining two years of operation, the top of the test cells was overlain with a compacted 2-foot layer of vegetated cover soil. This represents the design of a completed landfill.

3.5 Soil and Waste Sampling Design

Shortly after the test cells were constructed, soil cores were extracted from the test cell area and composite samples of LIMB ash were prepared. These soil and waste samples were physically and chemically characterized by preliminary laboratory analyses described in Sections 4 and 5. The data obtained from the initial tests on the soils provided a baseline for comparison with later test cell soil cores.

3.6 Monitoring Design

Routine test-cell sampling included quarterly waste cores to be taken during the first year of monitoring and annual cores of waste and soil to be taken during the three years of test cell monitoring. Cores taken for physical property tests were divided into 2-foot increments, while cores taken for chemical property tests were divided into 1-foot increments. Physical and chemical tests were conducted on quarterly and annual cores from both test cells. The quantity and distribution of these samples is discussed in more detail in Section 4. The locations of core samples and all instrumentation installed in the test cells are shown in Figure 3-6 and 3-7.

Porous-cup lysimeters were installed at 1, 3, and 6-foot depth intervals in both test cells at two locations in the waste. They were also installed through the waste to a depth of 2 feet into the base soil. These lysimeters intercept leachate in the unsaturated zone directly beneath the test cell. Over time, as original lysimeters failed and were replaced, lysimeters were installed at a range of depths between 1 and 11 feet.

Neutron attenuation access tubes were installed at four locations in each test cell. The access tubes extend to a depth of 10 feet to allow neutron probe measurements of waste and soil moisture content.

Figure 3-6. Site Map of the North Cell

Figure 3-7. Site Map of the South Cell

During placement of the waste in the cell, thermistors were installed in each corner of each test cell. These thermistors were installed at four (vertical) intervals in the waste. The thermistors were continuously monitored to detect increased temperature as a result of hydration reactions caused by any infiltrating water.

Saturated-zone monitoring below the test cell was performed by using existing wells on the site for background groundwater quality. Three additional wells were placed immediately downgradient of each test cell to detect leachate migration into the groundwater. These wells were screened in 10-foot intervals beginning at the average water-table elevation and extending 30 feet into the saturated zone.

A surface-water monitoring system consisting of a one-inch Parshall flume with an electronic flow meter and autosampler was installed in the North Cell during construction. A pressure transducer flow meter was fitted in the flume and connected to the data logger to monitor runoff from the test cell. The surface-water flow measurements and the surface area that the drainage represents was used to estimate the runoff fraction of the overall water budget. Composite samples of runoff water were collected for chemical analyses. A simple drain pipe and bucket system was used to collect runoff samples from the South Cell.

In situ hydraulic conductivity was measured on a quarterly basis in each test cell using a Guelph permeameter (3). Permeability measurements during the first year used a double-ring permeameter (4). The Guelph permeameter offered the advantage of allowing measurements at various depths in the test cell. Permeability was also measured on core samples collected from the test cells, as described in Section 4.

Meteorological information was obtained from the Cleveland National Weather Service station and from a meteorologic station installed in the disposal area. Because of climatic variability induced by geographic effects, data from the National Weather Service station was only used to supplement data obtained on site.

The on-site meteorologic station consisted of a mounting platform, instrumentation tower, monitoring devices, and a data logger with an enclosure. These devices recorded daily humidity, temperature, precipitation, solar radiation, wind speed, and wind direction.

3.7 Test Cell Construction

Ash was trucked from the plant storage silo to the test cells. The storage silo had a flat bottom with high pressure air diffusers to fluidize the ash for loading into trucks. Beneath the silo were provisions for unloading the ash either wet (conditioned) or dry. The test cells (and adjacent landfill) were only filled with conditioned ash.

A Dravo wet mixer was used to condition the ash. The mixer consisted of a near-horizontal cylindrical mixer approximately 5 feet in diameter and 10 feet long, with a series of paddles arranged to provide mixing and to convey the ash through the mixing chamber.

Water was sprayed on the ash from points within the mixer at a rate needed to prevent dusting. A water feed rate of 120 gpm was possible, although the operators generally added water at a rate between 50 and 80 gpm. It generally took 8 to 12 minutes to load a truck with a capacity of about 15 tons or 28 cubic yards. A volume of water between 600 and 900 gallons was therefore added to each truck load of LIMB ash. Tables 3-5 and 3-6 present the measured moisture contents of the ash in the trucks as they left the plant for the North and South Cells, respectively. A fraction of the water added to the ash in the conditioners was lost to evaporation because of the heat generated during conditioning.

Three trucks were generally used to transport ash from the silo to the test cells. The same trucks are used when ash is hauled to the Edgewater landfill. The size of the trucks varied slightly but they had an average capacity of 28 cubic yards. The trucks were weighed after loading and prior to leaving the plant site. The net tonnage of conditioned ash ranged between roughly 15 and 20 tons (see Tables 3-5 and 3-6).

To estimate the bulk density of the trucked ash, the largest weighed load was used together with the average volume of the trucks. The largest load was used because the trucks were often not filled to capacity. With this method, a wet bulk density of 48 lbs/cubic foot, or dry bulk density of 37 lbs/cubic foot, was calculated (assuming an average moisture content of 29.5%). The laboratory dry bulk density (loosely packed) was calculated as 38 lbs/cubic foot. For comparison, earlier estimates by Babcock and Wilcox placed the trucked wet bulk density as 56 lbs/cubic foot. Dry bulk density measured at optimum moisture and compacted according to ASTM (American Society for Testing and Materials) D 698 (5) was 70.8 lbs/cubic foot.

Grab samples taken at random locations were collected periodically from the trucks for moisture content determinations. At least two splits of each sample were weighed and oven dried at 100-110° C from each single sample for moisture measurements. Tables 3-5 and 3-6 present the moisture contents. For example, the average moisture content for the South Cell, on a dry weight basis, was 29.5 percent. This value represents the water content measured from oven drying at the stated temperature. It does not account for some of the waters of hydration (water taken up in the hydration of calcium oxide, calcium sulfate, etc.). This value was used to estimate the amount of water to add at the South Test Cell to achieve optimum compacted density. The moisture-density relations were calculated using the same method of moisture determination.

During filling of the South Test Cell, additional samples of LIMB ash were collected twice per day from the storage silo. These samples were composited and represent the average ash used in filling the test cell. The sampling point for this dry ash was above the conditioner and just below the storage silo. Approximately four gallons of dry ash were collected in a plastic bucket with a sealable lid on each day that ash was sent to the test cell (April 7, 8, 9, 10, 11, 14, and 17, 1989).

No problems were encountered in unloading the ash at the test cell site. The ash did not stick to the trucks and there was not a dusting problem. There was considerable steam

Table 3-5. Tonnage and Moisture Content of Ash Delivered to the North Test Cell

Site: Ohio Edison
Sample Type: Ash from Trucks

Load No.	Date	Time	Net Tonnage	Measured % Moisture (Dry basis)
1	02/23/89	07:35		25.6% ^a
2	02/23/89	08:10		
3	02/23/89	08:15		
4	02/23/89	08:45		A 1-quart portion of the composite sample was analyzed for moisture content.
5	02/23/89	09:30		
6	02/23/89	09:45		
7	02/23/89	10:15	Total =	
8	02/23/89	10:50	213.44	
9	02/23/89	11:00	tons	
10	02/23/89	11:10		
11	02/23/89	12:30	(Avg. 13.34)	
12	02/23/89	12:35		
13	02/23/89	13:05		
14	02/23/89	14:00		
15	02/23/89	14:05		
16	02/23/89	14:30		
17	02/24/89	07:35		25.4 to 25.9%
18	02/24/89	07:55		
19	02/24/89	08:15		[Range - 25.4-25.9%]
20	02/24/89	08:45		
21	02/24/89	09:05		
22	02/24/89	09:30		The average moisture of the LIMB ash put in the north cell should, therefore, be in the range of 25%-26%.
23	02/24/89	09:35		
24	02/24/89	09:40		
25	02/24/89	10:15	Total =	
26	02/24/89	10:40	260.99	
27	02/24/89	10:50	tons	
28	02/24/89	11:00		
29	02/24/89	11:15	(Avg. 11.86)	
30	02/24/89	12:30		
31	02/24/89	12:35		
32	02/24/89	12:40		
33	02/24/89	12:55		
34	02/24/89	13:35		
35	02/24/89	14:10		
36	02/24/89	14:20		
37	02/24/89	14:30		
38	02/24/89	14:35		
39	02/25	07:35		25.6% ^a
40	02/25	08:10		
41	02/25	08:15		

Table 3-5. (Continued)

Load No.	Date	Time	Net Tonnage	Measured % Moisture (Dry basis)
42	02/25	08:55		A 1-quart portion of the composite sample was analyzed for moisture content.
43	02/25	09:20		
44	02/25	09:40		
45	02/25	10:15	Total =	
46	02/25	10:30	240.12	
47	02/25	10:50	tons	
48	02/25	11:00		
49	02/25	11:25	(Avg. 13.34)	
50	02/25	12:05		
51	02/25	12:30		
52	02/25	12:55		
53	02/25	13:20		
54	02/25	14:00		
55	02/25	14:05		
56	02/25	14:15		
57	02/27	07:35		25.4 to 25.9%
58	02/27	08:20		
59	02/27	08:30		
60	02/27	08:45		
61	02/27	09:25		
62	02/27	09:35	Total =	
63	02/27	09:45	188.56	
64	02/27	10:25	tons	
65	02/27	10:40		
66	02/27	11:00	(Avg. 13.47)	
67	02/27	11:20		
68	02/27	12:35		
69	02/27	12:50		
70	02/27	14:00		

^aA composite sample was formed by combining each grab sample taken from approximately each of the 70 ash trucks arriving at the test site over a 4-day period.

Table 3-6. Tonnage and Moisture Content of Ash Delivered to the South Test Cell

Site: Ohio Edison
Sample Type: Ash from Trucks

Load No.	Date	Time	Net Tonnage	Measured % Moisture (Dry Basis)		Field Estimate Rate of Applied Water Gal./Ton	Actual Gallons Water Applied
				EMRC	Field		
1	890407	0840	15	28-29	33.3	15	
2	890407	0950	16.21		30.4	15	
3	890407	1015	14.90		NA	15	
4	890407	1045	14.92		NA	15	
5	890407	1120	16.20		NA	15	
6	890407	1150	15.05		NA	15	
7	890407	1300	16.48		NA	15	
8	890407	1315	15.25		NA	15	
9	890407	1340	17.15		NA	15	
10	890407	1410	16.30		NA	15	
11	890407	1450	16.92		NA	15	
12	890407	1500	15.25	17-18	NA	15	3030
13	890407	1530	15.89		NA	15	
14	890408	0830	16.15		NA	15	
15	890408	0845	13.68		NA	15	
16	890408	0900	15.20	20-23	NA	15	930
17	890408	0930	17.81		NA	15	
18	890410	1220	16.95		21.5	15	
19	890410	1345	22.04		29	15	
20	890410	1415	15.28	20-38	29	15	930
21	890411	0800	16.56	16-19	NA	~15	
22	890411	0830	17.81	28-31	NA	~15	
23	890411	1130	20.00		NA	~15	
24	890411	1140	17.22		NA	~15	812
25	890411	1340	21.96	29-29	27.5	15	
26	890411	1355	17.22		NA	18	
27	890411	1515	16.56		24	36	
28	890411	1530	18.22		NA	29	1140
29	890414	1030	15.87	20	22.5	27	
30	890414	1045	14.54		23.5	27	
31	890414	1130	18.20		24	28	
32	890414	1200	19.33	23-24	NA	18	760
*33	890415	1215	18.02		NA	26	
*34	890415	1315	17.98		NA	26	
*35	890415	1430	19.29		13.5	50	2000
**36	890417	0800	14.92	42-43	42.5	~35	
**37	890417	0830	19.01		42.5	~35	
**38	890417	1000	18.51		NA	~35	
**39	890417	1015	19.73		NA	~35	2500
**40	890417	1100	12.69	39	39	~37	
**41	890417	1115	14.55	38	38	~37	
							1000

* Pug mill producing wide variation of moisture contents in conditioned ash.

** Measured moistures not consistent with dry appearance of ash. Additional water added in field.

generated from the warm ash, especially on colder days. The cells were filled in February through April.

The LIMB ash was unloaded on the uphill side of the test cells. A D-5 Caterpillar was used to spread the ash across the surface of each cell and compact it shortly after being unloaded. Lifts four to six inches thick were constructed until the cell was filled.

The North Cell was completed to a thickness of 8 feet. This cell contains prehydrated LIMB ash only. The South Cell was completed to a thickness of only 6 feet because of an insufficient supply of representative ash toward the end of the LIMB test at the plant. The LIMB ash in the South Cell was further wetted during lift construction. The wetting was performed by spraying each lift (stages of three to four truckloads) with Lorain city water (stored in a tank truck) until the moisture in the ash was approximately 38%, which is optimum in terms of compaction density. A specific, metered amount of water was applied uniformly across the entire lift using an adjustable spray nozzle (firehose type).

The moisture content of prehydrated ash destined for the test site was determined each day to enable the calculation and adjustment of the amount of makeup water being applied in the field. Table 3-6 shows the rates and amount of water applied to the lifts of ash in the South Test Cell to raise the moisture content (dry basis) to the 38% optimum.

The test cell construction is illustrated in the photographs included as Figures 3-8 through 3-11. The photographs show the sequence of ash unloading, spreading, and wetting; the completed downgradient end of one test cell is shown in the final image.

3.8 References

1. EDF/Triggs Consultants, Inc., 1987 Report of Hydrological Study, Ohio Edison Company, Edgewater Ash Disposal Site, 23 pp.
2. P.R. Shroeder, J.M. Morgan, T.M. Walski, and A.C. Gibson. The Hydrologic Evaluation of Landfill Performance (HELP) Model, Volume II, Documentation for Version 2. EPA/530-SW-84-010, 1984b.
3. W.D. Reynolds and D.E. Elrick. "Measurement of Field-Saturated Hydraulic Conductivity, Sorptivity and the Conductivity - Pressure Head Relationship Using the Guelph Permeameter." Proceedings, National Water Well Assoc. Conf. on Characterization and Monitoring of the Vadose (Unsaturated) Zone, Denver Co, November 1985.
4. C.A. Black (ed.). Methods of Soils Analysis: Part 1, Physical and Mineralogical Properties. American Society of Agronomy 9:210-220, 1965.

Figure 3-8. Unloading Conditioned Ash at the Start of the South Cell Construction

Figure 3-9. Conditioned Ash is Spread in Lifts Over the South Cell

Figure 3-10. The Moisture Content of Each Lift is Adjusted to the Optimum Moisture Content to Achieve Design Compaction Density

Figure 3-11. View of the Downgradient End of the South Cell After Ash Placement and Berm Construction

5. ASTM D 698-78 Method A, 1978. Standard Test Methods for Moisture-Density Relationships of Soils and Soil-Aggregate Mixtures Using 5.5 lb. Rammer and 11-inch Drop. American Society for Testing and Materials, Part 19, Philadelphia, PA.

4.0 SAMPLING AND ANALYTICAL METHODS

This section describes the design and operation of the sampling and analytical program implemented at the Ohio test site. The test design and the test methods are described first. Second, the results of quality control checks are discussed; and third, the project data management system is described.

4.1 Test Design and Test Methods

The test cells were monitored for three years to determine physical and chemical changes in the ash. The sampling program for the test cells included an initial physical, chemical, mineralogical, and micromorphological characterization of the ash and of the soils at the landfill site, as well as subsequent monitoring to determine the extent of cementitious reactions, the leaching of ash constituents, and the attenuation of leachate in the soil beneath the ash. Sample collection consisted of quarterly monitoring of wells and lysimeters for possible water samples, data retrieval from the on-site instruments, and permeability measurements of the wastes. Core samples of the ash and underlying soils were collected quarterly during the first year and annually for the second and third years.

Figure 4-1 presents a breakdown of the types of analysis performed on solids and liquids collected from the test cell. A complete description of each procedure and method references are provided in Sections 10 and 11 of the Test Procedures Manual (1). An alphabetical listing of all procedures employed in sample analysis appears in Appendix B, along with the associated quality control requirements.

4.1.1 Soils and Waste Characterization

Soils and wastes were analyzed for physical characteristics that can be related to the behavior of the waste in the test cell in terms of structural integrity, permeability, cementitious reactions, and other factors. Chemical and mineralogical characteristics were determined to evaluate the total loading of chemical constituents in the waste, the potential for leaching constituents, and the attenuative capacity of the underlying soil for leachable constituents.

4.1.2 Physical Analyses

Physical properties analyses were performed on preliminary laboratory samples of LIMB ash waste and initial test-cell soil cores. The analyses included moisture content, particle size, density, surface area, permeability, unconfined compressive strength, and other tests shown in Figure 4-2. The measurement of fabric-dependent parameters requires undisturbed soil and waste cores, as noted in the flow chart. In many cases, this criteria could not be met, since the brittle, poorly cemented waste and soil materials fractured during coring operations. Other fabric-independent physical property tests were measured on prepared cores.

3-88-30252

Figure 4-1. General Testing Flow Chart

3-88-30252

Figure 4-2. Flow Chart for Preliminary Laboratory Physical Characterization of Solids

After the waste was placed in the test cell, undisturbed core samples were collected quarterly during the first year and tested for physical properties according to the flow chart in Figure 4-3. Annual samples of "undisturbed" soil and waste cores were collected during the second and third years, and were tested for physical properties according to the flow chart in Figure 4-3.

4.1.3 Chemical Analyses

Chemical analyses performed on preliminary laboratory samples of initial test cell soil cores and LIMB ash waste are outlined in Figures 4-4 and 4-5, respectively. In addition, outlines for the analytical procedures performed on extracts from the ASTM water extraction (ASTM D 3987-81) and RCRA EP procedures¹ are presented in Figures 4-6 and 4-7, respectively. The results of these tests provide a comprehensive chemical characterization of preliminary soil and waste samples.

4.1.4 Mineralogical Analyses

Samples of soil and waste were analyzed for mineralogical properties. Crystalline forms in the ash were determined by x-ray diffraction (XRD) analysis. The samples were prepared with 10% rutile ground in with the sample. The rutile served as an internal standard. Samples were x-rayed using CuK_α radiation. The approximate concentration of each mineral phase was calculated from the measured counts/sec using relative intensity ratio comparing each mineral to the rutile standard. The relative intensity ratios which were used are: gypsum = 0.32; ettringite = 0.13; thaumasite = 0.105; anhydrite = 1.11; quartz = 1.48; and calcite = 1.12. Crystalline phases occurring in the ash include calcium sulfates, carbonates, and oxides, aluminosilicates, quartz, mullite and iron oxides.

The XRD work was performed at the Departments of Chemistry and Geosciences, North Dakota State University using an automated Phillips powder diffractometer, data reduction and display software (Materials Data, Inc.), and ICDD Powder Diffraction File and NDSU reference diffractograms.

Selected samples of soils and waste were analyzed by scanning electron microscopy (SEM) and scanning electron microscopy/energy dispersive spectroscopy (SEM/EDS) to determine their morphology and microchemistry. These analyses help identify the principal minerals that control the geochemical environment of water and waste interactions and show the textural relations of secondary hydrous minerals, ash particles, and pore spaces in the land-filled material.

The SEM work was performed at the Energy and Environmental Research Center (EERC), University of North Dakota using a fully integrated automated digital electron microscope

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¹The RCRA EP toxicity procedure has been replaced by the TCLP; however, no significant implications about the regulatory status of LIMB wastes are expected from this change.

First Year Quarterly Cores:

Annual Cores:

Figure 4-3. Flow Chart for Quarterly and Annual Physical Characterization of Solids

7-93-30252a

^a See additional flow charts for analyses.

^b Graphite furnace AAS may be substituted.

Figure 4-4. Flow Chart for Preliminary Laboratory Chemical Characterization of Soils

7-93-30252a

Figure 4-5. Flow Chart for Preliminary Laboratory Chemical Characterization of Wastes

3-88-30252

^aOnly the initial waste leachate will be analyzed for these parameters. Subsequent analyses will include only those parameters determined to be present in the waste.

^b Graphite furnace AAS may be substituted.

Figure 4-6. Flow Chart for ASTM Water Extraction Chemical Characterization

^aArsenic and selenium are analyzed by either hydride generation AAS or graphite furnace AAS.

3-88-30252

Figure 4-7. Flow Chart for RCRA EP Chemical Characterization

(Tracor Northern) with a light-elements x-ray detector and image analyzer. The SEM images were digitally processed, and the results were archived on computer disk and videotape. SEM imaging is used to document the microstructure and fabric, while the SEM's energy dispersive x-ray fluorescence (EDXRF) detector provides a quantitative elemental analysis of elements heavier than sodium on volumes as small as $2\text{-}3\text{ }\mu\text{m}^3$. The resulting EDXRF data provides information on the chemical composition from which mineral types and phases can be inferred. Because of the hydrated minerals in the ash samples, precautions (largely moisture control) in storage, handling, preparation, and analytical procedures were employed to ensure that core samples were as fresh as possible for all lab work. Samples for x-ray diffraction were stored frozen to prevent carbonation and stop further hydration reactions between the time of sampling and subsequent analysis.

4.1.5 Groundwater, Porewater, and Surface Water Characterization

Water samples were analyzed for the species listed for ASTM extract analysis (Figure 4-6), as well as field chemical parameters such as alkalinity, temperature, and oxidation/reduction potential. Groundwater samples were collected quarterly from upgradient and downgradient monitor wells. Samples were collected from pressure-vacuum lysimeters in the ash and underlying soils quarterly as well, although the sample volumes which were recoverable were not always sufficient for complete analysis. Only six surface water samples were collected at the Ohio site during the course of this program.

4.2 Quality Assurance and Quality Control Results

Calibration standards, control samples, instrument checks, and interference blanks were all prepared and analyzed prior to laboratory sample analysis. These quality control (QC) checks were used to verify instrument performance. All acceptance criteria for each of these QC checks were met before field samples were analyzed. Other QC analyses performed during sample analysis are designed to indicate analytical problems associated with individual sample matrices. Routine QC checks included method blanks, analytical duplicates, and matrix spikes.

Laboratory method blanks were used to address problems with the analytical process. They were analyzed with each batch of samples to check for systematic sample contamination. All analyte concentrations in the blanks were found to be below or less than five times the detection limit.

Duplicate analyses were used as an indicator of data precision. The analytical process was replicated for separate aliquots of a single sample using the same analyst, instrument, and calibration. For the anion analyses, duplicates had a 10% coefficient of variation (CV) acceptance criteria where CV equals 100 times the standard deviation divided by the mean. For metals analyses, matrix spikes were performed in duplicate. Repeatability of the spike recovery was expected within 20% CV acceptance criteria.

Matrix spike samples are field samples to which known amounts of analytes of interest have been added. Both unspiked and spiked samples are analyzed and the difference of the two are calculated and compared to the amount of spike added. Since actual samples are used, any matrix effects are taken into consideration. The spike recovery provides a measure of accuracy of the analysis based on the combined effect of bias and variability. The acceptance criteria for matrix spikes was 80-120 percent.

Table 4-1 summarizes the QC results from water and solids analysis. Results are grouped by date (quarter) and by the type of analysis.

There are three primary factors that caused matrix spike recoveries to be outside control limits for analyses conducted as part of this project. These factors are: 1) inappropriate spike concentrations; 2) unspiked sample concentrations close to analytical detection limits; and 3) matrix effects.

Many samples were initially spiked with inappropriate concentrations of some analytes. Ideally, the spike concentration should be within a factor of two to four of the sample concentration. In many samples, concentrations of major elements such as calcium, potassium, and sodium were more than ten times the spike concentrations. Under these circumstances, matrix spike recoveries and relative percent difference² RPD's can vary widely with only small differences in the analytical results relative to the sample concentration. For example, a sample with 200 mg/L calcium spiked with 10 mg/L calcium may have matrix spike/matrix spike duplicate (MS/MSD) results of 205 and 215 mg/L, giving recoveries of 50% and 150% and an RPD of 200% although the difference between the two results is only 5% of the sample concentration. Samples with this type of MS/MSD recovery problem were either respiked and reanalyzed, or accepted without reanalysis if all other indications suggested that the results were valid.

Poor spike recoveries for some elements are attributable to the sample concentration being close to the analytical detection limit. Analytical results for sample concentrations within five times the detection limit are considered by the laboratory to have lower precision than results at higher concentrations, which may affect spike recoveries as well as duplicate sample RPD's. In addition, the calculation of the spike percent recovery is less accurate for samples where the detection limit is an appreciable fraction of the spike concentration. Boron, for example, has a detection limit of 0.6 mg/L and was generally spiked at a concentration of 1 mg/L. Samples with a boron concentration below the detection limit are treated as having a zero boron concentration in calculating the spike recovery. If the actual boron concentration is 0.3 mg/L, rather than zero, a perfect spike analysis would detect

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$${}_2 \text{ RPD} = \left(\frac{S_1 + S_x}{S_1 - S_2} \right) \times 100$$

Table 4-1. QC Results from Water and Solids Analyses

Date	Analysis	QC Results
<u>April 1989</u> Initial Characterization of Soils and Wastes	Anions (solids and wastes)	All duplicates were within acceptance criteria.
	Metals (solids and wastes)	Duplicates were within limits except for Ca in one sample (44%).
<u>June and October 1989</u> Event 1	All analytes (solids and water)	All QC was within limits.
<u>February 1990</u> Event 2	Metals (solids and water)	All duplicates were within acceptance criteria. MS/MSDs were acceptable except for Cd (228%) and Se (198%, 213%) in one water sample. Native sample concentrations of these analytes were near or below analytical detection limits.
<u>June 1990</u> Event 3	All analytes (solids and water)	All duplicates and MS/MSDs were within acceptance criteria.
	All analytes (water)	Duplicates and RPDs were within acceptance criteria. MS/MSD were within acceptance criteria except for total phenolics MS recovery on one sample (128%). Phenolics were below analytical detection limits in all samples.
<u>August 1990</u> First Annual Charac- terization	Anions (solids)	Duplicate analyses of ASTM leachates were within specified limits except for chloride (29%, 36%, and 26%) and sulfate (31% and 27%). All MS/MSD recoveries met acceptance criteria.
	Metals (solids)	Duplicate analyses of ASTM leachates were within acceptance criteria. MS/MSD recoveries were within acceptance criteria except for one sample with low re- coveries of As (70%) and Ca (70%).
<u>August 1990</u> First Annual Charac- terization (continued)	Total Inorganic Carbon (TIC) (solids)	Duplicate analyses were within specified limits.

Table 4-1. (Continued)

Date	Analysis	QC Results
<u>November 1990</u> Event 5	Anions (water)	All QC were within acceptance criteria.
	Metals (water)	Duplicates met acceptance criteria except for one sample which had a 200% RPD for lead. MS/MSD recoveries were within acceptance criteria except for lead in one sample (73%). Lead concentrations were close to the detection limit in all samples.
<u>February 1991</u> Event 6	Anions (water)	All QC were within acceptance criteria.
	Metals (water)	Duplicate analyses were within acceptance criteria except for Ca (62%), Na (48%), and Mg (50%) in one sample. MS/MSD recoveries were within limits except for B (135% and 138%), Ca (170%), Pb (73% and 71%), Mg (150%), and Na (180%, 123%, and 140%).
<u>May 1991</u> Event 7	all analyses (water)	All duplicates were within acceptance criteria. MS/MSD recoveries were within acceptance criteria except for B (123%, 124%) and Na (123%, 140%) in one sample.
	Anions (water)	All QC were within acceptance criteria.
<u>August 1991</u> Second Annual Characterization	Metals (water)	Duplicate analysis results were within acceptance criteria. MS/MSD recoveries were within acceptance criteria except for Pb (65%) and Se (64%) in one sample.
	Anions (solids)	Duplicates were within acceptance criteria except for chloride on one sample (24%). MS/MSD recoveries were also within acceptance criteria except for chloride on two analyses (65%, 64%, and 135%).
<u>August 1991</u> Second Annual Characterization (continued)	Metals (solids)	Duplicates were within acceptance criteria except for Ca (102%) and K (42%) on one sample. MS/MSD recoveries were also acceptable except for Ca (63% and 55%), Pb (127% and 156%), and Se (54% and 56%).
	TIC (solids)	All duplicates were within acceptance criteria.

Table 4-1. (Continued)

Date	Analysis	QC Results
<u>November 1991</u> Event 9	Anions (water)	All duplicates and MS/MSD recoveries were within acceptance criteria.
	Metals (water)	Potassium (190%) and sodium (73%) were the only duplicates out of acceptance limits. MS/MSD recoveries for these elements were also out of acceptance criteria at 5% and 200% (K) and 65% and 140% (Na). Pb (57% and 60%) and Se (73%, 77%, 53%, and 57%) MS/MSD recoveries were also outside of acceptance criteria.
<u>February 1992</u> Event 10	Anions and Metals (water)	All QC were within acceptance criteria.
<u>May 1992</u> Event 11	Anions (water)	All QC were within acceptance criteria.
	Metals (water)	Duplicates were within acceptance criteria. MS/MSD recoveries were within acceptance criteria except Se (65%, 66%) and Na (135%).
<u>August 1992</u> Third Annual Characterization	Anions (water)	Duplicate and MS/MSD analyses were within acceptance criteria for all analytes.
	Metals (water)	Duplicate results were within acceptance criteria with the exception of As (51%), Fe (37%), and Pb (31%). MS/MSD recoveries were within acceptance criteria except for As (150%), Pb (6%, 9%, 23%, and 27%), Mg (73% and 79%), K (77%), and Se (40%, 40%, 42%, and 44%).
	Anions (soil)	All QC were within acceptance criteria.
	Metals (soil)	Duplicates were within acceptance criteria except for Na (27% and 1800%). MS/MSD recoveries were within acceptance limits except for As (48%, 51%, 51%, 52%, 68%, and 70%), Pb (49%, 50%, 61%, and 71%), K (45% and 66%), Se (24%, 25%, 32%, 33%, 46%, 46%, 71%, and 74%), and Na (32%, 40%, and 72%).
<u>August 1992</u> Third Annual Characterization (continued)		

1.3 mg/L boron for a 130% recovery, as with the Event 6 water samples. Spike results outside of control limits for this reason were ignored.

The third reason for spike results outside of control limits is matrix effects. Matrix effects occur when the instrument response for one element either masks or enhances the response for another element. Typically, major analytes such as sulfate or sodium interfere with the measurement of trace species such as arsenic, selenium, or lead. In cases of matrix interference, alternate analytical techniques were employed to check the results in some cases. For example, high calcium and sulfate concentrations in most samples interfered with arsenic and selenium measurement by graphite furnace atomic absorption spectroscopy (GFAA), giving poor spike results. Hydride generation atomic absorption (HGAA) was used to spot check the GFAA results for these analytes. In many cases, the sample concentrations for analytes with known matrix effects were below analytical detection limits. In these cases, further analysis was deemed inappropriate since little information was to be gained.

4.3 References

1. Radian Corporation. Test Procedures Manual for Field Testing of Disposed Solid Waste From Advanced Coal Processes. DE-AC21-36MC22118, July 1987.

5.0 INITIAL ASH AND SOIL ANALYSES

5.1 Waste Characteristics

The LIMB process reduces emissions of nitrogen and sulfur oxides (NO_x and SO_x) by 50 to 60% (1). The use of low- NO_x , multistage burners controls NO_x production, and dry sorbent injection into the boiler captures SO_2 from the combustion gases. The resultant waste is a mixture of fly ash, calcium oxide, and calcium sulfate.

The composition of the fly ash is dominated by a glassy aluminosilicates formed during combustion from clay minerals present in the coal. Trace elements present in nonrefractory phases in the coal may also be incorporated into the glass matrix. The crystalline mineralogy of the fly ash is determined by the inorganic composition of the coal but generally includes mullite ($3\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$), quartz (SiO_2), hematite (Fe_2O_3), and refractory trace minerals such as apatite and zircon. Trace elements in the ash may exist as separate mineral phases, as lattice substitutions within mineral structures, or as coatings on mineral surfaces. These phase relationships affect the dissolution of trace elements in water that percolates through the waste.

The combination of the alkali and alkaline earth materials with the aluminosiliceous fly ash results in a cementitious product in the presence of moisture. The initial water entering the waste body undergoes a vigorous reaction with the free lime in the waste, initiating a series of pozzolanic and cementitious reactions with finely divided aluminosilicates in the waste. These reactions can restrict the permeability of the waste to levels of 10^{-6} to 10^{-9} cm/sec under optimal conditions.

5.2 Initial Ash Analysis

The LIMB ash samples collected from the storage silos during the construction of the two test cells were analyzed to determine the physical, chemical, and mineralogical properties of the materials before the onset of hydration reactions in the field. Table 5-1 shows the results of physical properties tests on the LIMB wastes. Samples OHASH-1 and OHASH-3 are composites of unconditioned ash collected during filling of the North Cell and South Cell, respectively. Samples OHASH-2 and OHASH-4 are composites of the conditioned ash trucked to the sites during the filling of the North Cell and South Cell, respectively.

5.2.1 Initial Physical Properties

The North Cell and South Cell composite ash samples were analyzed to determine the optimum moisture content for maximum compaction density (Proctor density). North Cell LIMB ash had a maximum density of 70.9 lbs/ft.³ at a moisture content of 38.8 percent. The South Cell ash had a maximum density of 75.6 lbs/ft.³ at a moisture content of 35.6 percent. Test specimens prepared at optimum moisture had an unconfined compressive strength of 120 psi and a permeability measured at 5.6×10^{-6} cm/sec for OHASH-1 and 1.6×10^{-6} cm/sec for OHASH-3. The triaxial strength of specimens prepared from samples OHASH-1

Table 5-1. Physical Properties of Ohio LIMB Wastes

Parameter	Units	Sample ID: OHASH-1	OHASH-2	OHASH-3	OHASH-4
		Cell: North	North	South	South
Free Moisture Content	wt. %, dry	0	4.1	0.1	8.7
Optimum Moisture	(%)	38.8	NA	35.6	NA
Maximum Dry Density	lb/ft ³	70.9	NA	75.6	NA
Confining Stress	psi	22	NA	22	NA
Deviatoric Stress	psi	129	NA	128	NA
Internal Angle of Friction	degrees	36	NA	38	NA
Median Particle Size	μm	10.8	16.1	9.6	28
Particle Specific Gravity		2.69	NA	NA	2.20
Permeability	cm/sec	5.6 x 10 ⁻⁶	NA	1.6 x 10 ⁻⁶	NA
Surface Area	m ² /g	7.55	4.34	10.7	35.8
Unconfined Compressive Strength	psi	120	NA	NA	NA

NA = Not Analyzed

and OHASH-3 at optimum moisture after 28 days curing was 129 and 128 psi deviatoric stress, respectively at an angles of 36 and 38 degrees, with a confining stress of 22 psi.

Both ash samples had minimal free moisture as collected from the storage silos. The ash samples collected from the trucks in route to the North Cell and South Cell (OHASH-2 and OHASH-4) had 4.1 and 8.7% moisture, respectively, indicating that most of the conditioning water was bound into the structures of minerals in the LIMB waste and was not removed on heating to 105°C.

Particle specific gravity measurements of the initial ash vary between 2.2 and 2.7 g/cc. The BET specific surface area of the unconditioned LIMB ash sample from the North Cell (OHASH-1) is 7.55 m²/g and, for the South Cell (OHASH-3) 10.7 m²/g. Samples of ash conditioned with water had surface areas of 4.34 m²/g for the North Cell ash and 35.8 m²/g for the South Cell. The higher (calculated) lime content and reactivity of the South Cell ash may be responsible for the large changes in particle size following ash conditioning. The median particle size of the unconditioned ash samples averaged approximately 10 μm. The conditioned LIMB ash samples have an average median particle size of approximately 22 μm, reflecting some expansion or agglomeration of particles during the conditioning process.

5.2.2 Initial Ash Mineralogy

Table 5-2 shows the results of XRD mineralogical analysis of the initial ash samples. The initial ash contains several mineral phases that are potentially reactive in the landfill environment. The dry LIMB waste contains roughly 15% anhydrite, 10% lime, 5% calcite, and 3% portlandite. Quartz, mullite, and ferrite spinel were also detected in the XRD analysis of the LIMB ash cores. These minerals are essentially unreactive in the disposal environment. The remaining 55% of the waste is made up of poorly crystalline or amorphous, glassy material, which does not have sufficient mineral structure to produce a clear diffraction pattern. XRD patterns for all ash samples are presented in Appendix C.

The LIMB ash shows marked mineralogical changes after conditioning with water at the plant. Samples OHASH-2 and OHASH-4 contain no detectable lime and only trace amounts of anhydrite. They contain new mineral phases including approximately 8% gypsum content, and have more than doubled their measured portlandite content. Although the overall content of crystalline material in the ash drops from approximately 45% in the fresh ash to between 35-40% in the conditioned ash as anhydrous minerals react to the presence of water.

The general appearance of LIMB ash from the Ohio Edison Edgewater station prior to burial is shown in Figures 5-1 through 5-8. These SEM images show the microstructural appearance of both conditioned and unconditioned material from the north and south cells. Typical unconditioned material for the north cell (Figure 5-1, OHASH-1) consists of unconsolidated particles of LIMB ash composed of alumino-silicate grains about 10 microns in size coated with clusters of micron-size anhydrite and lime particles, and a few fly ash spheres.

Table 5-2. Mineralogical Composition of Initial Ohio Ash Samples

Sample ID	OHASH-01	OHASH-02	OHASH-03	OHASH-04
Cell	North	North	South	South
Water	No	Yes	No	Yes
Gypsum		8.1		6.8
Ettringite				9.2
Anhydrite	14.8	0.9	14	0.5
Quartz	2.8	3.8	4	3.3
Calcite	5.9	5	3.9	5
Portlandite	1.6	6.2	1.6	5.1
Mullite	5	6.6	8.1	6.1
Lime	11.5		7.7	
Fe-spinel	3.5	4.4	5.1	3.9
Sum	45.1	35	44.4	39.9

Figure 5-1. Unconditioned ash from the North Cell composite sample showing silt-sized fly ash spheres and agglomerations of calcium aluminosilicate material (grey) and anhydrite (white).

Figure 5-2. Fly ash particle from North Cell composite sample with smaller particles of aluminosilicate composition attached.

Figure 5-3. Conditioned North Cell ash composite showing aggregation of micron-sized ettringite and gypsum crystals attached to matrix materials.

Figure 5-4. Detail of sample shown in Figure 5-3. Gypsum appears as chunky, light-colored material; ettringite appears as darker, angular crystals with a high aspect ratio.

Figure 5-5. Unconditioned ash from the South Cell composite sample.

Figure 5-6. Detail of the sample shown in Figure 5-5 showing a cluster of anhydrite crystals formed on the surface of a spent sorbent particle.

Figure 5-7. Conditioned South Cell composite showing gypsum and ettringite development.

Figure 5-8. Detail of the sample shown in Figure 5-7.

Figure 5-2 (OHASH-1) shows a single ash grain with poorly crystallized aluminosilicate material with a chemical composition similar to mullite attached.

North cell material was conditioned at the Edgewater station to about 26% moisture (dry basis), transported to the field, and placed in the test cell in lifts. A composite sample of this material (Figure 5-3, OHASH-2) differs from the unconditioned ash shown in Figure 5-2 in that aggregates of micron size material are more abundant. Significant amounts of ettringite laths (stoichiometric ratios Ca 3.25, S 1.32, Al 2.39, Si 2.32), gypsum aggregates, and amorphous aluminosilicate material derived from degraded clays are attached to the matrix grains of ash. Figure 5-4 shows a closer view of the same area of the OHASH-2 sample.

Unconditioned LIMB ash supplied to the south cell resembles the north cell material in bulk composition and mineralogy. Figure 5-5 (OHASH-3) shows unconsolidated silt-sized grains with micron-sized material attached. The whitish cluster at right center is anhydrite attached to aluminosilicate grains (closeup, Figure 5-6). South cell material was conditioned in the field during lift emplacement to achieve optimum moisture (37%) and a high bulk density (80-90 pounds per cubic foot). A composite sample of the conditioned material (Figure 5-7) shows micron size gypsum aggregates (whitish) and ettringite crystals which have grown on the matrix grains following conditioning. In the closeup shown in Figure 5-8 ettringite crystals (stoichiometric ratios Ca 3.29, S 1.45, Si 2.32, Al 1.92) appear in early stages of development.

5.2.3 Initial Ash Bulk Chemistry

The results of initial analysis of the bulk chemistry and trace element chemistry of the LIMB ash are presented in Table 5-3. The major element chemistry of the ash was determined by inductively coupled plasma atomic emission spectrophotometry (ICAPES) analysis following lithium metaborate fusion of the ash. Calcium is the most abundant element in both initial ash samples, consistent with the large amounts of lime that were injected for SO₂ control. Calcium accounts for approximately 32% of the North Cell ash and 20% of the South Cell ash.

Silicon, aluminum, and iron, which are largely derived from the mineral fraction of the coal, are each present in amounts between 5 and 10 percent. The alkali elements magnesium, potassium, and sodium are each present in amounts less than 1 percent. The available lime index titration found approximately 42% available lime in the North Cell composite and 30% in the South Cell composite. Loss on ignition was between approximately 6 and 7% for both samples, consistent with total inorganic carbon analyses at a zero moisture content.

Total sulfate was measured by ion chromatography following a dilute acid digestion of the ash. The measured concentrations, as sulfur, were 6% in the North Cell composite and 5.5% in the South Cell composite, or 18% and 16.5%, respectively, as sulfate. Concentrations of water soluble chloride, fluoride, and sulfate species in the solids are also shown in Table 5-3.

Table 5-3. Initial Chemical Characterization of LIMB Ash

Parameter	Units	North Cell 4/07/89		South Cell 4/07/89	
Major Oxide Composition of Ash					
Aluminum, Al ₂ O ₃	percent	8.7		9.6	
Calcium, CaO	percent	44.4		27.8	
Iron, Fe ₂ O ₃	percent	10.3		10.2	
Magnesium, MgO	percent	3.8		2.0	
Potassium, K ₂ O	percent	1.6		1.3	
Silicon, SiO ₂	percent	18.3		23.1	
Sodium, Na ₂ O	percent	0.4		0.3	
Titanium, TiO ₂	percent	2.0		2.0	
Loss on Ignition	percent	6.8		5.7	
Sum	percent	96.2		82.0	

Parameter	Units	North Cell 4/07/89		South Cell 4/07/89	
		Result	Det. Lmt.	Result	Det. Lmt.
Trace Elements in Ash					
Elements by ICPES or AA					
Antimony	mg/kg	ND	(50)	ND	(50)
Arsenic	mg/kg	60	(7.5)	66	(7.5)
Barium	mg/kg	250	(2.5)	260	(2.5)
Boron*	mg/kg	400	(60)	NA	
Cadmium	mg/kg	.32@	(.075)	.3@	(.075)
Chromium	mg/kg	40	(2.5)	98	(2.5)
Copper	mg/kg	14@	(5)	19@	(5)
Iron	mg/kg	7600	(10)	87000	(10)
Lead	mg/kg	13	(.50)	16	(.5)
Manganese	mg/kg	1200	(2.50)	1000	(2.50)
Molybdenum	mg/kg	ND	(5)	ND	(5)
Nickel	mg/kg	54	(5)	99	(5)
Selenium	mg/kg	ND	(.50)	ND	(.50)
Silver	mg/kg	ND	(2.50)	3800	(2.5)
Strontium	mg/kg	150	(.75)	26	(.75)
Tin	mg/kg	ND	(150)	ND	(150)
Vanadium	mg/kg	ND	(40)	39.3	(40)
Zinc	mg/kg	130	(5)	160	(5)

Table 5-3. (Continued)

Parameter	Units	North Cell 4/07/89		South Cell 4/07/89	
		Result	Det. Lmt.	Result	Det. Lmt.
Other Ash Properties					
Available Lime Index	Wt. %	41.8	(1)	29.6	(1)
Heat of Hydration, Temp.	°C	69	(0)	63	(0)
Heat of Hydration, Time	minutes	3	(0)	7	(0)
Loss on Ignition	%	6.8	(.1)	5.7	(.1)
Organic Sulfur	Wt.%	.01	(.01)	.01	(.010)
Pyritic Sulfur	Wt.%	.04	(.01)	.04	(.01)
Sulfate Sulfur	Wt.%	5.51	(.01)	4.99	(.01)
Sulfur, Acid Soluble	mg/g as S	60	(.25)	55	(.25)
Total Inorganic Carbon	mg as CO ₃	60.0613	(.5898)	48.04904	(.5898)
Water Dissolution for Soluble Anions					
Water Soluble Anions					
Carbonate	mg/g	216	(2.5)	171	(2.5)
Chloride	mg/g	2.4	(.1)	2.1	(.1)
Fluoride	mg/g	.29	(.0012)	.29	(.0012)
Sulfate	mg/g as S	43	(.1)	43	(.1)

0 = Detection Limit

ND = Not Detected

NA = Not Analyzed

@ = < 5 times detection limit

* Prepared by sodium carbonate fusion

Trace elements were determined by ICAPES and atomic absorption spectrophotometry (AA) following an HF/HNO₃/HCl mixed acid digestion. Trace element concentrations were generally low for coal ash material. Manganese, boron, barium, strontium, and zinc, listed in order of decreasing concentrations, were the most abundant trace metals, with concentrations from 1200 to 130 mg/kg in the North Cell sample. Arsenic, nickel and chromium were present in amounts between approximately 50 and 100 mg/kg, while smaller amounts of cadmium, copper, and lead were measured.

5.2.4 Initial Ash Leachate Chemistry

As indicated by results of preliminary modeling using data from Ontario Hydro tests, approximately 18% of the total annual precipitation was expected to percolate through the waste body. The infiltrating moisture was expected to initiate pozzolanic reactions in the waste. As the waste hydrated and hardened, the permeability was expected to decrease with time. Reduced permeability would prevent further infiltration and leachate generation. The waste cell was predicted to become encapsulated by an impermeable layer of hardened waste that was exposed to moisture from the surface and host soils.

The expectation at the beginning of field testing was that any leachate produced by the test cell should have a composition controlled by the solubility products CaO, CaSO₄, and their hydration products, including ettringite. Hydration of the CaO produces Ca(OH)₂, which produces aqueous solutions with a pH of approximately 12. This high pH might be mitigated by carbonization of the waste as it is exposed to atmospheric CO₂, resulting in the formation of CaCO₃. Other soluble salts in the waste were expected to result in a leachate with high concentrations of sulfate. The highly alkaline pH produced by the waste was expected to mobilize anionic trace elements, such as arsenic, boron, selenium, and molybdenum according to solubility considerations, while other metals were predicted to precipitate as insoluble hydroxides.

Actual waste behavior has differed significantly from these initial predictions in several important respects. Details of the leaching behavior of the initial conditioned and unconditioned ash samples are discussed in this section, while further discussion of the long-term weathering of the LIMB ash is presented in Section 7.

The leachability of the LIMB ash was assessed using both the RCRA Extraction Procedure (EP) and the ASTM deionized-water leaching tests. The analytical results for these leachate solutions are shown in Tables 5-4 and 5-5, respectively. Concentrations of all regulated trace metals in the EP leachate were well below the regulatory limits, and in most cases they meet the drinking water standards for the trace elements. However, sulfate, chloride, pH, and total dissolved solids were well above secondary standards for drinking water quality. The initial ash EP pH was 12 for both samples, reflecting the high lime content of the ash, but below the regulatory threshold for corrosivity of pH 12.5.

The deionized-water leachate was analyzed for a much wider range of compounds than the EP leachate. The deionized-water leachate was characterized by a pH of nearly 12.5,

Table 5-4. RCRA Extraction Procedure (EP) Results for Initial LIMB Ash Samples

Parameter	Units	North Cell 4/07/89		South Cell 4/07/89	
		Result	Det. Lmt.	Result	Det. Lmt.
Elements by ICAPES or AA					
Arsenic	mg/kg	.0056@	(.005)	.012@	(.005)
Barium	mg/kg	.4@	(.1)	.77	(.1)
Cadmium	mg/kg	ND	(.0003)	ND	(.0003)
Chromium	mg/kg	.019@	(.01)	.015@	(.01)
Lead	mg/kg	.0072@	(.002)	.0087	(.002)
Mercury	mg/kg	ND	(.0002)	ND	(.0002)
Selenium	mg/kg	.02@	(.005)	.036	(.005)
Silver	mg/kg	ND	(.01)	ND	(.01)
pH	pH units	12	()	12	()

() = Detection Limit

ND = Not Detected

NA = Not Analyzed

@ = < 5 times detection limit

• Prepared by sodium carbonate fusion

Table 5-5. ASTM Deionized-Water Extracts of Initial LIMB Ash Samples

Parameter	Units	OH/North Cell 4/07/89		OH/South Cell 4/07/89	
		Result	Det. Lmt.	Result	Det. Lmt.
Anions					
Ammonia as N	mg/L	.18	(.02)	.39	(.02)
Chloride	mg/L	380	(1)	360	(1)
Cyanide	mg/L	ND	(.01)	ND	(.01)
Nitrate-Nitrite as N	mg/L	25	(.6)	27	(.6)
Sulfate	mg/L	1700	(1)	1700	(1)
Sulfide	mg/L	ND	(1)	ND	(1)
Sulfite	mg/L	27.3	(.1)	36	(.1)
Total Cyanide	mg/L	.01	(.01)	ND	(.01)
Solution Chemistry					
Total Chromatographable org.	μg/g	50	(2.5)	51	(2.5)
Conductivity	umhos/cm	10000	(5)	11000	(5)
pH	pH units	12.19	()	12.15	()
Total Alkalinity	meq/L	11.7999	(2)	9.34165	(2)
9					
Elements by ICAPES or AA					
Aluminum	mg/L	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.005)	ND	(.005)
Barium	mg/L	.6	(.01)	1	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)
Boron	mg/L	9.1	(.6)	11	(.6)
Cadmium	mg/L	.0019	(.0003)	ND	(.0003)
Calcium	mg/L	1800	(1)	1800	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)
Lead	mg/L	.003@	(.002)	.0057@	(.002)
Magnesium	mg/L	ND	(1)	ND	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)
Molybdenum	mg/L	.23@	(.05)	.45	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)
Potassium	mg/L	4.2@	(3)	13@	(3)
Selenium	mg/L	.033	(.005)	.035	(.005)
Silver	mg/L	ND	(.01)	ND	(.01)

Table 5-5. (Continued)

Parameter	Units	OH/North Cell 4/07/89		OH/South Cell 4/07/89	
		Result	Det. Lmt.	Result	Det. Lmt.
Elements by ICAPES or AA (continued)					
Sodium	mg/L	6.4	(1)	NA	(.003)
Strontium	mg/L	2	(.003)	1.5	(.6)
Tin	mg/L	ND	(.6)	ND	(.1)
Vanadium	mg/L	ND	(.1)	ND	(.02)
Zinc	mg/L	6.8	(.02)	7.2	
Radionuclides					
Ac-228	picoCuries/L	ND	(29)	ND	(18)
Bi-214	picoCuries/L	ND	(11)	ND	(11)
K-40	picoCuries/L	ND	(75)	76	()
Pb-211	picoCuries/L	ND	(204)	ND	(135)
Pb-212	picoCuries/L	ND	(14)	ND	(10)
Pb-214	picoCuries/L	20	()	ND	(12)
Ra-226	picoCuries/L	ND	(111)	ND	(81)
U-235	picoCuries/L	ND	(42)	ND	(32)

() = Detection Limit

ND = Not Detected

NA = Not Analyzed

@ = < 5 times detection limit

• Prepared by sodium carbonate fusion

consistent with the theoretical pH of 12.48 for a lime solution. Leachates had a conductivity of approximately 10,000 μ mhos/cm. The major soluble ions were calcium and sulfate, which were measured at 1800 and 1700 mg/L respectively, in samples from both the North Cell and the South Cell. Chloride was the next most abundant ion in solution at 360 to 380 mg/L. Nitrate/nitrite and sulfite were detected in amounts of 25 to 35 mg/L in leachates from both samples. All other species were soluble in concentrations of approximately 10 mg/L or less. Elements detected in the range of 1 to 10 mg/L include barium, boron, potassium, sodium, strontium, and zinc. Ammonia, cadmium, lead, molybdenum, and selenium were detected in amounts of less than 1 mg/L.

The deionized-water leachates from the LIMB ash samples were also screened for radionuclides. The only radionuclides detected were potassium-40 and lead-214, which were each detected in only one of the samples. Both detected values were close to the method detection limit values.

5.3 Discussion of Initial Waste Analysis

Data on the LIMB facility operations collected over the period during which the test cells were filled can be used to calculate a theoretical composition of the LIMB ash. Data from Tables 3-1 and 3-2 on the bulk composition of the coal, the sorbent feed rates, and the scrubber SO₂ removal efficiency, determine the predicted ash composition in terms of total ash volume and its available lime and sulfate contents. In these calculations it was assumed that contributions of calcium from the mineral material in the coal were minimal, and that all calcium in the ash was present as either calcium oxide or calcium sulfate.

Table 5-6 shows the results of these simple mass balance calculations for operations during the filling of both the North and South Cells. Plant data show the average operating conditions during the North Cell construction had a slightly higher coal feed rate, lower lime usage, and higher SO₂ removal efficiency than during the South Cell construction. The coal burned in February 1989 during the North Cell construction also had a slightly higher ash content than the coal used in April 1989. As a result, the total rate of ash production was approximately 11% higher in February than in April, while the percentage of lime remaining in the ash was lower and the sulfate content of the ash was higher for the North Cell.

In contrast, the analytical data for the North Cell and South Cell composite samples shows the opposite pattern. Analysis of the North Cell samples found a higher lime content than calculated from the plant data (41.8% measured vs. 25.5% calculated). Sulfate contents of the two composite samples were roughly comparable and were intermediate to the calculated values. The comparison of these data sets suggests some uncertainties in either or both the calculated average plant operating data and the analytical results from field samples. Since the range of plant operating conditions during cell construction was large, it seems likely that the "average" data may be skewed. The values used for these calculations were estimated means supplied by plant personnel, and were not compiled from complete hourly plant operations data.

**Table 5-6. Ohio LIMB Mass Balance Calculations From Plant
Operating Data and Initial Waste Chemical Analyses**

	North Cell	South Cell
Input Streams, lb/hr		
Coal	70,000	60,000
Lime	6,000	7,000
Total Calcium	4,290	5,000
Total Sulfur	1,750	1,440
Coal Ash	7,710	6,070
Process Conditions		
Ca/S, molar	1.96	2.78
SO ₂ removal, %	60%	45%
Calculated Output Composition, lb/hr		
Total Sulfur as CaSO ₄	4,460	2,750
Residual Lime	4,160	5,860
Total Ash	16,300	14,700
Percent Lime	25.5%	39.9%
Percent CaSO ₄	27.3%	18.7%
Measured Ash Composition		
Available Lime, %	41.8	29.6
Percent CaSO ₄	25.4	23.3
Inorganic Carbon, as CaCO ₃	22.4	18.8

Some of the initial analytical data were suspect, but were rerun in these cases to provide confirmation. The initial total inorganic carbon analysis gave results that were much higher than expected, and were inconsistent with the loss on ignition results. It was suspected that while the test solution was stirred in an open beaker the high pH fluid picked up additional CO₂ from the atmosphere. The test was rerun with sealed beakers, providing a lower value, similar to the results from the loss on ignition test.

5.4 Initial Soils Analyses

The soils surrounding the Ohio test cells are primarily silty and clayey material weathered from the underlying shale bedrock, as described Section 3. This section presents the results of analyses conducted on soil samples collected from the base of the test cell excavation (OHSS) and from borehole samples from upgradient and downgradient monitor well locations (OHMW).

5.4.1 Soil Physical Properties

The physical properties analyses of the initial soil samples are shown in Table 5-7. The analyses determined that most samples were moderately plastic, with a plasticity index of 13 percent. Two samples were found to be nonplastic. Liquid limits ranged from 27.8 to 45.2% moisture, while plastic limits ranged from 18.7 to 33.2% moisture. Field moistures of the soils ranged from a low of 4% for a sample from a 24-ft depth to 20% for a sample from the base of the test cell excavation. Field bulk densities of the soils ranged from approximately 130 to 145 lbs/ft³, and particle specific gravities ranged from 2.65 to 2.7 g/cm³. Specific surface areas ranged from 20 to 9.1 m²/g.

The laboratory measurements of the soil permeability ranged from 9.4×10^{-6} to 1.1×10^{-8} cm/sec, with an average value of 1.5×10^{-6} cm/sec.

5.4.2 Soil Mineralogy

The mineralogy of base soils in the cell area was characterized to provide background data on site conditions and to assess the potential for chemical attenuation of leachate migrating out of the base of the test cells. Baseline characterization of the site soils included complete vertical profiles of upgradient soils (OHMW7) and downgradient soils (OHMW1 for north cell and OHMW4 for south cell). In addition, soils directly underlying each of the cells were characterized prior to ash emplacement (89OHLY8-11 and 89OHLY16-7 for the north cell; 89OHSS-2 and 89OHSS-4 for the South Cell). One core of the base soils from each cell was taken quarterly during the first year and two cores were taken from each cell at the end of Years 1, 2, and 3.

Soils at the site are largely clay loams derived from the in situ weathering of the Paleozoic bedrock, which consists of shale with thin sandstone lenses. Soil excavated for the two cells is primarily yellowish-brown clay loam that grades with depth into soft, brownish-gray and gray clay loam and clay. The bedrock is hard, dark-gray shale and is encountered at a depth

Table 5-7. Physical Properties of Ohio Soil Samples

Sample ID	Cell	Quadrant	Depth (ft.)	Field Bulk Density (lb/ft ³)	Moisture Content (wt. %, dry)	Particle Size Distribution (um)	Particle Specific Gravity	Permeability cm/s	Surface Area (m ² /g)
OHMW 1-3	North	Downgradient	3-4'	NA	8.5	19.4	2.589	NA	19.53
OHMW 1-7	North	Downgradient	7-8'	NA	4.9	19.2	2.345	NA	10.29
OHMW 4-2,3	South	Downgradient	1-3'	NA	NA	33.8	2.72	NA	14.14
OHMW 4-4,5	South	Downgradient	3-5'	NA	NA	26.9	2.72	NA	14.03
OHMW 4-6,7	South	Downgradient	5-7'	NA	NA	19.9	2.68	NA	21
OHMW 4-9	South	Downgradient	8-9'	NA	9.8	15.1	2.694	NA	18.11
OHMW7-1,2	Both	Upgradient	2-4'	140.9	11.1	17.6	2.76	1.1 x 10 ⁻⁸	17.68
OHMW7-4,5	Both	Upgradient	6-8'	138.3	10.6	14.8	2.78	9.0 x 10 ⁻⁷	18.22
OHMW7-7	Both	Upgradient	10-11'	143.2	3.3	19.3	2.678	1.7 x 10 ⁻⁶	20
OHMW7-8	Both	Upgradient	11-12'	NA	13.8	NA	2.678	1.7 x 10 ⁻⁶	20
OHMW7-10	Both	Upgradient	14-15'	144.3	12	13.8	2.702	5.2 x 10 ⁻⁷	14.78
OHMW7-11	Both	Upgradient	15-16'	144.3	12	NA	2.702	5.0 x 10 ⁻⁷	14.78
OHMW7-13,14	Both	Upgradient	18-20'	142.5	NA	13.5	NA	1.3 x 10 ⁻⁸	13.46
OHMW7-17,18	Both	Upgradient	24-26'	133.9	13.6	15	2.651	9.4 x 10 ⁻⁶	15.17
OHMW7-20,21	Both	Upgradient	28-30'	131.1	16	11.4	2.702	1.7 x 10 ⁻⁸	13.96
OHMW7-23,24	Both	Upgradient	32-34'	144	4	15.5	NA	3.7 x 10 ⁻⁸	9.1
OHNT 1-9	North	SW Quadrant	8-9'	FP	1.5	34.4	2.72	NA	6.96
OHNT 2-9	North	SW Quadrant	8-9'	FP	6.7	NA	2.537	NA	NA
OHNT 4-8	North	NW Quadrant	7-8'	FP	13.2	NA	2.649	NA	20.13
OHSS 1	South	SW Quadrant	8'	FP	20	NA	NA	NA	NA
OHSS 2	South	SE Quadrant	8'	FP	15.7	17.6	2.585	NA	13.48
OHSS 3	South	NE Quadrant	8'	FP	13.7	NA	NA	NA	NA
OHSS 4	South	NW Quadrant	8'	FP	19	14.9	2.631	NA	13.88

FP = Fractured or poorly consolidated sample.

NP = Non-plastic sample.

NA = Not Analyzed.

of about 30 feet in the upgradient well and 8 feet in downgradient wells. Although most leachate/soil interactions are expected to take place in the yellowish-brown clay loams directly beneath the cells a full 8 feet of soils below each cell were analyzed for each annual event.

The results of XRD analyses of Ohio site soils are summarized in Table 5-8. The mineral phases identified in the soils include: quartz (Qz), k-feldspar (Kf), plagioclase feldspar (Pg), calcite (Cc), dolomite (Do), siderite (Sd), illite (I), kaolinite (K), smectite (S), chlorite (C), gypsum (Gp), hematite (Hm), and goethite (Gt). Quartz is by far the dominant mineral, followed by feldspars, carbonates, and clays. Minor gypsum was present in the base soils directly beneath the cell prior to ash emplacement, and in deeper clays and shales. Minor pyrite was also identified in soils using the SEM microprobe. Several other less reactive accessory phases were identified by SEM, including ankerite, monazite, and zircon.

Analyses of leachate composition (see Section 8) indicate that calcium, potassium, sodium, chloride, sulfate, and hydroxide are the dominant species leaching from the base of the test cells. Some samples with the highest total dissolved solids were calcium deficient and contained high silica and carbonate concentrations. Since the leachate from the test cell is dominated by highly soluble species the potential for soil mineralization is relatively low. On the basis of the leachate composition and the soil mineralogy, possible mineralogical reactions include ettringite formation as the leachate reacts with calcium aluminosilicates in the soil, gypsum precipitation as low-calcium leachate mixes with groundwater, and calcite precipitation as the low-carbonate leachate mixes with soil pore fluids and groundwater with a higher carbonate alkalinity. These minerals were the focus of XRD interpretation to determine if migrating leachate solutions have altered the baseline mineralogy of the soils below the test cells. Gypsum dissolution and reprecipitation is a common occurrence in the ash, but on a bulk basis the quantity of gypsum in the base soils has not changed after the 3 years. Calcite precipitation and dissolution was noted in Year 3 ash samples but on a bulk basis, the amount of calcite in the base soils is also unchanged. Likewise, no ettringite formation has been noted in the base soils during the study period.

The minerals siderite, goethite, and gypsum may be derived from weathering of pyrite in the parent sediments, as described in the leachate chemistry section, below. XRD patterns for all samples are included in Appendix C. Jarosite, another product of pyrite weathering that is commonly amorphous, was not detected by XRD. The leachate chemistry of some annual core samples provides additional evidence for pyrite oxidation in the sediments underlying portions of the test cells, as discussed in Section 5.6.4.

5.4.3 Soil Chemistry

The elemental compositions of the Ohio site soils are shown in Appendix D. Major elements were determined by ICAPES following lithium metaborate digestion. Trace elements were determined by ICAPES or AA following an HF/HNO₃/HCl mixed acid digestion. The most abundant element was silicon, which comprised between approximately 22 and 33% of the samples (47 to 70% as SiO₂). Iron was the second most abundant element.

Table 5-8. Engineering Properties of Ohio Soil Samples

Sample ID	Cell	Quadrant	Depth (ft.)	Liquid Limit (%, dry)	Plastic Limit (%, dry)	Plasticity Index
OHMW 1-3	North	Downgradient	3-4'	33.7	20.3	13.4
OHMW 1-7	North	Downgradient	7-8'	34.3	21	13.3
OHMW 4-2,3	South	Downgradient	1-3'	41	24	17
OHMW 4-4,5	South	Downgradient	3-5'	33	17	15
OHMW 4-6,7	South	Downgradient	5-7'	53	26	27
OHMW 4-9	South	Downgradient	8-9'	41.4	22.3	19.1
OHMW7-1,2	Both	Upgradient	2-4'	38	21	17
OHMW7-4,5	Both	Upgradient	6-8'	37	21	16
OHMW7-7	Both	Upgradient	10-11'	33	18.7	14.3
OHMW7-8	Both	Upgradient	11-12'	33	18.7	14.3
OHNT 2-9	North	SW Quadrant	8-9'	NP	NP	NP
OHNT 4-8	North	NW Quadrant	7-8'	45.2	33.2	12
OHSS 1	South	SW Quadrant	8'	NP	NP	NP
OHSS 2	South	SE Quadrant	8'	28.7	18.9	9.8
OHSS 4	South	NW Quadrant	8'	27.8	20.1	7.7

FP = Fractured or poorly consolidated sample.

NP = Non-plastic sample.

NA = Not Analyzed.

Iron concentrations ranged from approximately 2 to 15 percent. Aluminum, calcium, and potassium were also generally present in amounts between 1 and 5%, although calcium concentrations in a few samples were below 0.3 percent. Sodium and titanium made up less than 1% of all samples. Total recoveries of the major elements as oxides, plus loss on ignition, ranged from 89 to 102 percent.

The trace element analyses of the Ohio soils detected the elements barium and manganese in concentrations between 200 and 4000 mg/kg in most samples. Strontium concentrations were between 100 and 200 mg/kg. Arsenic, boron, chromium, cobalt, copper, lead, lithium, molybdenum, nickel, vanadium, and zinc were also detected in concentrations ranging from the detection limit values to over 100 mg/kg. Cadmium was detected in some samples at concentrations below 1 mg/kg. The elements antimony, silver, selenium, and tin were not detected in any of the soils. The trace element concentrations in the Ohio site soils were generally comparable to those measured in the LIMB ash placed in the test cells.

The Ohio soils have low organic carbon contents. All but one sample had less than 1% organic carbon. Inorganic carbon concentrations were also low in the initial soil samples. Less than 0.1% inorganic carbon was found in all initial soil samples, although some subsequent core samples had contained discrete zones of carbonate rich soil. Cation exchange capacities (CEC) were generally moderate to high, ranging from approximately 6 to 25 meq/100g. High CEC values correlate with the presence of smectite clays in the soils. The concentrations of the soluble anions chloride, fluoride, and sulfate were less than 5 mg/g in all soil samples.

5.4.4 Soil Leachate Chemistry

The soils from the Ohio site were tested using the ASTM deionized-water leaching procedure; complete results are provided in Appendix E. The ASTM deionized-water leachates generally had a near-neutral pH and a major element chemistry dominated by calcium, magnesium, sodium, and sulfate. Concentrations range up to approximately 100 mg/L calcium, 25 mg/L magnesium, 20 mg/L sodium, and 500 mg/L sulfate. A few samples (e.g., OHMW-1-10) had strongly acidic pH values as low as 3.4. The acidic leachate samples had a higher sulfate concentration than most other samples, and contained higher concentrations of most trace metals than the near-neutral samples. Visual observation of cores from these locations identified the mineral jarosite occurring as a fine grained, yellow precipitate on fracture surfaces and bedding features. Jarosite is a common product of the oxidative weathering of pyrite.

6.0 ENVIRONMENTAL AND SITE MONITORING DATA

This section presents the results of field measurements made at the Ohio test site. These measurements include local climate data, measurements of the physical properties of the landfilled materials, and runoff volume records. These measurements form the basis for constructing a water balance for the test cells. They are used as input to the HELP model, which provides a prediction of the volumes of leachate produced by the test cells.

6.1 Meteorological Data

Data from the meteorological station installed at the Ohio test site is summarized in Figures 6-1 through 6-5. Complete daily records of temperature, precipitation, relative humidity, wind speed, wind direction, and solar radiation can be found in Appendix F. There are several gaps in the data record provided by the meteorological station. The meteorological station was vandalized shortly after it was installed in the fall of 1989, and was off-line for a period of about 5 months. Several other, shorter data gaps occur in the record where equipment malfunctions interrupted data collection.

The period from October 1989 through August 1992 was significantly wetter than normal. During this period, over 139 inches of precipitation fell at the site, with over 61 inches in 1990 alone. Total precipitation during the monitoring period from February 1989 through August 1992 compared with an average of about 35 inches of precipitation per year. Wind patterns at the site are also significantly different from those measured by the National Weather Service at the Cleveland airport, about 20 miles away. Trees and other obstructions at the test site interfere with the regional wind patterns. These local climate data may have a significant effect on the water budget of the test cells.

6.2 Thermistor Data

The two landfill test cells were instrumented with two nests of thermistors per cell to detect possible temperature excursions caused by exothermic hydration reactions as precipitation infiltrated into the test cell. The temperature probes were installed at approximately two-foot intervals in a steel pipe grouted into the test cell. The temperature probes were connected to the data logger located in the meteorological station to provide a continuous temperature record. Many of the thermistors experienced electrical problems caused by corrosion as the high pH pore fluids in the test cell attacked the bimetallic sensors or unprotected electrical connections. Calibration problems also made interpreting much of the early data from the site difficult. Approximately one year after the initial thermistors were installed, a second batch of thermistors was placed in the test cells. Output from these instruments was used to recalibrate some of the original thermistors that continued to provide consistent output, but appeared to have lost their original calibration. Figures 6-6 and 6-7 show the corrected results from the operational test cell thermistors.

Figure 6-1. Daily Average Air Temperature in Degrees Celsius (top) and Daily Precipitation Totals in Inches (bottom) at the Ohio Site

Figure 6-2. Daily Average Relative Humidity at the Ohio Site

Figure 6-3. National Weather Service Data on Wind Speed/Wind Direction for Cleveland Airport. Prevailing winds are from the southwest.

Figure 6-4. Wind Speed/Wind Direction Data from the LIMB Test Site. Trees and other obstructions at the site modify the prevailing regional wind pattern.

Figure 6-5. Daily Average Solar Radiation at the Ohio Site in Micromoles of Photons/Second-Meters² (μmol/s·m²)

Figure 6-6. Thermistor Data for Ohio North Test Cell

Figure 6-7. Thermistor Data for Ohio South Test Cell

The thermistor results primarily showed the seasonal soil temperature variation at the site. Surface temperatures showed numerous short-term temperature excursions. Variability was increasingly damped out with depth. The results from the first few months after the thermistors were installed (10/89 through 12/89) showed some signs of thermal events with a time period of several days to one week that may be related to exothermic hydration reactions. After the data logger was restored to operation in May 1990, this type of event did not recur. Presumably, initial hydration of all oxide phases was complete by this time.

6.3 Moisture Content Measurements

The moisture content of the two test cells was monitored in several different ways. The fundamental method of moisture content determination was to collect core samples from the test cells and oven dry them to constant weight at 105°C according to ASTM test procedures. A temperature of 105°C was used in oven drying samples from the Ohio site rather than the 50°C temperature recommended for materials containing significant amounts of gypsum. At 105°C, gypsum, ettringite, and thaumasite lose most of their waters of hydration bound in the mineral structures, so that the measured moisture content is higher than the free water content of the material. As an approximation for this discussion, it is assumed that gypsum remains stable at 105°C and that ettringite and thaumasite lose all structural waters except those that can be assigned to a "gypsum" component in the mineral structure. The decomposition of a gypsum standard tested with other samples began at approximately 150°C.

Thermogravimetric analysis (TGA) shows cumulative weight loss as a function of time during a preprogrammed heating cycle. TGA analysis of a pure ettringite standard showed drying at 105°C (time $T = 0$ to $T = 10$ minutes in Figure 6-8) resulted in a mass loss of approximately 30%, or 377 g water per mol of ettringite. This is equivalent to the loss of 20-21 of the 26 structurally bound waters consistent with the conversion of ettringite to aluminum hydroxide, gypsum, and portlandite. Further heating up to 950°C results in two additional periods of mass loss associated with dehydroxylation of other ettringite components.

The results from moisture content measurements of the core samples (presented in Section 7 along with other core sample measurements) were used to calibrate two forms of field moisture measurements. A Troxler model 4300 neutron probe was used to measure moistures in the ash surrounding probe access tubes installed in four locations in each test cell. The neutron probe emits high energy neutrons released from beryllium surrounding an americium-241 source. The neutrons interact with hydrogen atoms in the surrounding media and are returned to the probe as low energy thermal neutrons. The neutron probe measures all hydrogen atoms in the effective radius of its detector. Therefore, the neutron probe measurements include not only free water present in the landfilled material but also any molecular waters of hydration associated with ettringite or gypsum, as well as structural hydroxides in clay minerals, ettringite, and portlandite.

Figure 6-8. Results of TGA Analysis of a Pure Ettringite Standard Showing Mass Loss vs. Time and Temperature

In this regard, the 105°C oven-dry moisture determinations are a better standard for calibrating the neutron probe than 50°C measurements would be.

The initial moisture content of the LIMB ash in the two test cells was significantly lower than the field capacity of the material, or the moisture content at which free drainage begins to occur if the chemical reactivity of the ash is accounted for. The field capacity of the hydrated ash was approximately 25 wt. %. This, together with the 44 wt. % bound water, means drainage would not occur until moisture contents reach approximately 69 wt. % (dry basis).

Since the LIMB ash has a higher permeability than the underlying soils, there were periods when leachate ponded at the base of the test cells. During the periods when the lower portions of the test cells were saturated, the bottom few feet of the neutron probe access tubes were filled with water, preventing moisture content measurements at these depths. The moisture content under saturated conditions was estimated on the basis of the total porosity of the ash (65%) plus the fraction of chemically bound water lost (37%) as approximately 100% (dry basis). Drying at 105°C should measure this water content as approximately 95%, based on the TGA results for ettringite dehydration. This is close to the maximum values actually measured in the test cells.

The results of the neutron probe moisture measurements are presented in Figures 6-9 and 6-10. Measurements were made on a quarterly basis through the unsaturated portion of the test cells. The neutron probe data show very little change in moisture distribution over time in most locations. Saturated conditions appear to have occurred in some areas during the third and fourth measurement periods, and moisture values were generally slightly higher at the base of the test cell than at the surface. Soil cap moisture values were significantly lower than the LIMB ash moistures, at least in part because of the absence of chemically bound water.

The moisture content of the wastes was also monitored using gypsum blocks buried in the test cells at depths of 1, 3, 5, and 7 ft. in the North Cell. The moisture tension of the waste is related to the moisture content of the materials, and is used to determine a moisture tension/moisture content curve, which indicates the wilting point and the field capacity of the material. These determinations were required for modelling the leachate production from the test cells. In practice, the moisture blocks only determined a small portion of the moisture tension/moisture content curve because the materials in the test cell were very damp by the time the gypsum blocks were installed. Wilting point and field capacity values for model input were determined independently using laboratory methods.

6.4 Field Permeability Measurements

The permeability of the materials in the test cells was monitored using both *in situ* methods and laboratory measurements on undisturbed core samples. The results of the *in situ* tests are described in this section, while the laboratory measurements are

Figure 6-9. Neutron Probe Moisture Profiles in the Ohio North Test Cell

Figure 6-10. Neutron Probe Moisture Profiles in the Ohio South Test Cell

described in Section 7. Permeability was measured in the field using a variety of techniques to determine the method best suited to the project objectives. Initially, measurements were made with a double ring infiltrometer. This method is restricted to measurement of the permeability of the top surface of the test cells, however, and the project team felt that it was important to monitor the permeability throughout the vertical profile in the test cells.

The test method selected to allow such measurements was a modified Guelph permeameter. Measurements with this instrument started in November, 1990. The Guelph permeameter measures the rate of infiltration at constant head through the bottom of a borehole into the test cells. The permeameter was modified to allow measurements at depths of up to 8 feet. The theoretical limit for the depth of measurements with the Guelph permeameter is approximately 26 ft., which is the maximum height over which a column of water can be held under tension.

The *in situ* permeability measurements made with the Guelph permeameter have an effective radius for measurement of approximately one cubic foot. Therefore, the measurements average out much of the small scale variability in the ash properties caused by microfractures or inhomogeneities in the ash placement and compaction. These small scale variations in ash properties caused the laboratory permeability measurements to have a high variability, while the *in situ* measurements were more consistent.

The results of the *in situ* permeability measurements are shown in Table 6-1. Figure 6-11 shows the trends in permeability over time when values from all depths in the landfill are considered and the trends in permeability with depth for samples from all sampling events. The results show that the permeability of the LIMB ash in both test cells decreases with depth, and that the South Cell is generally more permeable than the North Cell at a given depth or time. The field permeability does not change significantly over time.

6.5 Surface Runoff

Both test cells at the Ohio site were constructed with a slight slope to the open surface portion of the test cells. The low corner of the North Cell was equipped with a 1-inch Parshall flume. The flume measured the volume of runoff water leaving the test cell and collected samples of runoff water into two sealed pails. Water in one pail represented water from the latest runoff event, while water in the second pail represented a composite of runoff water generated during the interval between sample collection. Runoff water samples were collected during the first year after test cell construction, before the cover soil was placed on top of the test cells. The flume was removed from the site when the cover soil was placed, and no further surface water samples were collected at the site. No flume was installed in the South Cell, although the drain pipe and collection buckets were placed to allow collection of water samples.

Table 6-1. Field Permeability for the Ohio LIMB North and South Test Cells

Cell	Quadrant	Date	Mos Since Const.	Test ID	Interval(Permeability ft.)	(cm/s)	Comments
N	SE	01-Jun-90	16	OHBP-1N	2.2-3.1	1.2e-04	unwetted
N	SW	01-Jun-90	16	OHBP-5N	2.5-3.3	1.3e-04	unwetted
N	NW	01-Jun-90	16	OHBP-6N	2.7-3.5	5.6e-05	unwetted
N	NW	07-Aug-90	18	OHBP-7N	2.4-3.1	9.4e-05	unwetted
N	NW	07-Aug-90	18	OHBP-7bN	2.2-3.5	4.3e-04	wetted
N	NW	07-Aug-90	18	OHBP-7cN	2.7-3.5	9.1e-05	wetted
N	SE	07-Aug-90	18	OHBP-8N	2.6-3.3	1.4e-04	unwetted
N	SE	07-Aug-90	18	OHBP-8bN	2.8-3.3	5.6e-05	wetted
N	Center	31-Aug-91	30	OHBP-10N	8.0-10.5	1.5e-05	unwetted
N	Center	31-Aug-91	30	OHBP-11N	6.0-8.0	1.8e-05	unwetted
N	Center	31-Aug-91	30	OHBP-12N	4.0-6.0	3.3e-05	unwetted
N	Center	31-Aug-91	30	OHBP-12bN	4.3-6.0	1.2e-04	wetted
N	Center	31-Aug-91	30	OHBP-13N	1.0-2.4	3.9e-04	unwetted
N	Center	31-Aug-91	30	OHBP-9N	2.0-4.0	1.1e-04	unwetted
N	NE	19-Nov-91	33	OHBP-14N	2.0-4.0	8.2e-05	unwetted
N	NE	19-Nov-91	33	OHBP-15N	4.0-6.0	2.8e-05	unwetted
N	NE	19-Nov-91	33	OHBP-16N	7.5-9.0	5.3e-05	unwetted
N	NW	26-Feb-92	36	OHBP-17N	0.5-1.3	9.5e-05	unwetted
N	NW	26-Feb-92	36	OHBP-18N	2.0-4.2	4.0e-05	unwetted
N	NW	26-Feb-92	36	OHBP-19N	6.0-8.2	4.0e-05	unwetted
N	NW	26-Feb-92	36	OHBP-20N	7.8-10.3	9.8e-05	unwetted
N	NW	24-May-92	39	OHBP-21N	0.8-1.0	5.8e-02	unwetted
N	SW	24-May-92	39	OHBP-22N	2.2-4.2	1.6e-03	fracture zone
N	SW	24-May-92	39	OHBP-23N	4.3-6.0	1.6e-03	unwetted
N	SW	24-May-92	39	OHBP-24N	5.6-8.0	2.2e-05	unwetted
N	SE	26-Aug-92	42	OHBP-25N	0.7-2.0	1.9e-04	unwetted
N	SE	26-Aug-92	42	OHBP-26N	2.0-4.4	5.0e-05	unwetted
N	SE	26-Aug-92	42	OHBP-27N	4.2-6.4	4.2e-05	unwetted
N	SE	26-Aug-92	42	OHBP-28N	6.5-8.4	4.1e-05	unwetted
N	SE	26-Aug-92	42	OHBP-29N	8.3-10.4	5.1e-04	unwetted
S	SE	05-Jun-90	14	OHBP-2S	2.1-3.1	4.8e-04	unwetted
S	SE	05-Jun-90	14	OHBP-2bS	2.2-3.1	9.4e-04	wetted
S	SW	05-Jun-90	14	OHBP-3S	2.6-3.3	9.2e-04	unwetted
S	SW	05-Jun-90	14	OHBP-3bS	2.6-3.3	8.0e-04	wetted
S	NW	05-Jun-90	14	OHBP-4S	2.9-3.7	1.5e-03	unwetted

Table 6-1. (Continued)

Cell	Quadrant	Date	Mos Since Const.	Test ID	Interval(ft.)	Permeability (cm/s)	Comments
S	NW	05-Jun-90	14	OHBP-4bS	2.9-3.7	6.3e-04	wetted
S	NE	07-Aug-90	16	OHBP-10S	0.8-1.5	3.7e-04	unwetted
S	NE	07-Aug-90	16	OHBP-10bS	1.3-1.5	1.2e-03	unwetted
S	SW	07-Aug-90	16	OHBP-9S	0.4-1.3	1.1e-03	unwetted
S	SW	07-Aug-90	16	OHBP-9bS	0.7-1.3	8.6e-04	wetted
S	Center	31-Aug-91	28	OHBP-11S	2.0-4.0	3.5e-04	unwetted
S	Center	31-Aug-91	28	OHBP-12S	8.0-10.0	1.0e-05	unwetted
S	Center	31-Aug-91	28	OHBP-13S	6.0-8.0	2.0e-05	unwetted
S	Center	31-Aug-91	28	OHBP-14S	1.3-1.8	3.4e-03	unwetted
S	NE	22-Nov-91	31	OHBP-15S	1.2-1.8	3.2e-04	unwetted
S	NE	22-Nov-91	31	OHBP-16S	3.6-4.3	1.1e-04	unwetted
S	NE	22-Nov-91	31	OHBP-17S	5.3-7.3	6.8e-05	unwetted
S	SE	28-Feb-92	34	OHBP-18S	0.8-1.0	3.6e-03	unwetted
S	SE	28-Feb-92	34	OHBP-19S	3.3-3.6	3.4e-04	unwetted
S	SE	28-Feb-92	34	OHBP-20S	3.6-5.6	8.6e-05	unwetted
S	SE	28-Feb-92	34	OHBP-21S	5.5-8.0	2.6e-05	unwetted
S	SW	23-May-92	37	OHBP-22S	0.2-0.6	2.8e-02	fracture zone
S	SW	23-May-92	37	OHBP-23S	2.0-3.5	3.3e-04	unwetted
S	SW	23-May-92	37	OHBP-24S	0.2-0.5	9.1e-04	unwetted
S	SW	23-May-92	37	OHBP-25S	3.7-4.0	2.7e-02	fracture zone
S	SW	23-May-92	37	OHBP-26S	5.2-6.0	4.1e-03	fracture zone
S	SW	23-May-92	37	OHBP-27S	5.7-8.2	4.3e-05	unwetted
S	SW	23-May-92	37	OHBP-28S	9.8-12.0	2.5e-04	unwetted
S	NE	28-Aug-92	40	OHBP-29S	1.5-2.0	9.8e-04	unwetted
S	NE	28-Aug-92	40	OHBP-30S	3.0-5.0	1.7e-04	unwetted
S	NE	28-Aug-92	40	OHBP-31S	5.0-7.0	4.9e-05	unwetted
S	NE	28-Aug-92	40	OHBP-32S	6.8-9.0	3.6e-05	unwetted

Figure 6-11. Variations in Field Permeability Measurements with Depth and Over Time

The results of chemical analyses of the surface runoff samples from the North Cell and South Cell are shown in Appendix G along with analyses of other water samples from the site. Figure 6-12 compares the chemistry of samples from the two test cells over time. The results indicate that the concentrations of most major ions in the runoff water decrease over time. The most soluble fractions of the landfill surface appeared to be either rapidly leached out of the test cell or converted to less mobile forms by physical or chemical processes. These processes will be discussed in greater detail in Sections 7 and 8, below.

6.6 Leachate Production Modelling

The Hydrologic Evaluation of Landfill Performance (HELP) model was utilized to estimate leachate production at the Ohio site. HELP is a quasi-two-dimensional hydrologic model of daily water movement into, through, and out of landfill systems. HELP is capable of simulating the presence of covers, liners, and leachate collection systems. As part of the solution, HELP calculates a hydrologic water budget of the system that includes estimates of surface runoff, evapotranspiration, lateral drainage to collection systems, percolation through liners, changes in soil moisture storage, and average depth of saturation on the surface of liners (1).

The HELP model computes runoff by the Soil Conservation Service (SCS) runoff curve number method. Evaporation is evaluated by the modified Penman method. Flow through soil and any waste layers is assumed to be Darcian, and it does not account for potential flow through preferential flow pathways such as cracks or fractures (1).

Input requirements for the HELP model include daily climatological data, soil characteristics, and design characteristics. Daily precipitation data may be user specified, selected from a historical database that the model contains, or generated stochastically. Daily temperature and solar radiation data are generated stochastically from either default or user specified mean monthly temperature and solar radiation data. Input values for the leaf area index and evaporative zone depth are also required. Among the soil properties that the model requires are the porosity, field capacity, wilting point, hydraulic conductivity, and initial moisture content.

Two different basic modeling scenarios were considered to evaluate the hydrologic budget at the LIMB ash test site. The first scenario, which was used to evaluate potential percolation during the year of 1990, considered an 8-foot-deep test cell with horizontal dimensions of 40 by 40 feet. The cell was assumed to be completely filled with LIMB ash. No top soil cover was simulated, as this cover was not placed on the test cell until August 1990 and the model simulations only run on a yearly basis from January 1 to December 31. The LIMB ash was discretized vertically into eight 1-foot-thick model layers.

Figure 6-12. Chemistry of Surface Runoff Samples From the North and South Cells

Input parameters for this modeling scenario were based on actual measurements whenever possible. A list of model input parameters and their values is presented in Table 6-2. The porosity shown in Table 6-2 corresponds to an average value calculated based on available bulk density and particle specific gravity data of the ash at the test cell. The saturated hydraulic conductivity represents the geometric mean of *in situ* hydraulic conductivity tests conducted at the test cell. Two samples of LIMB ash were analyzed to determine the wilting point (moisture content at 15 bars) and field capacity (moisture content at 1/3 bar). The value presented on Table 6-2 for the wilting point corresponds to the average of the two laboratory measurements.

Enough field data were available to assign different initial moisture contents at different depths throughout the model profile. These values, corresponding to February 1990 moisture contents, were used as input for the model on January 1, 1990 because no earlier data were available. These moisture values were corrected at each annual time step modeled to account for loss of free water associated with the formation of hydrous minerals, in particular gypsum, ettringite, and thaumasite. Average weight fractions of gypsum, ettringite, and thaumasite in annual core samples were employed to estimate the moisture content correction factor.

No acceptable site-specific information regarding the potential runoff fraction was available for the Ohio test cells because the data logger was vandalized and it took several months for it to be replaced. Therefore, the runoff fraction was assumed to be comparable to that measured at the Colorado Nucla site (0.007) because the cell construction, design slope, and type of material are similar at the two locations. The design slope of 0.5% was input for the surface slope together with a drainage distance of 40 feet in the direction of maximum slope.

Other miscellaneous and climatological input parameters include the leaf area index, which corresponds to a nonvegetated cover for 1990, and the evaporative zone depth, a model-supplied default value for bare soil at Cleveland, Ohio, for 1990. Actual measured rainfall values for the site and mean monthly temperatures for 1990 were also input into the model. Default values for solar radiation data were implemented and evaporation coefficients were calculated internally by the model. An SCS curve number of 82 was selected to calculate runoff, which is consistent with bare ground (2).

The HELP modeling results associated with the above scenario are presented in Table 6-3. This table indicates that, of the 61.55 inches of precipitation measured at the test cell during 1990, the greatest loss was through evapotranspiration (51.6%). Percolation through the bottom of the test cell accounted for 43.4% of the hydrologic budget for the year. The volume of water stored within the test cell was predicted to have changed by 4.5%. No appreciable runoff was predicted by the model.

The measured rainfall for 1990 was over 70% higher than the annual average precipitation at the site, which is only 35 inches. The large amount of rainfall during 1990 resulted in above average amounts of percolation and recharge to the shallow aquifer.

Table 6-2. Model Input Parameters for 1990 Hydrologic Budget Simulation

Model Parameter	Value
Number of Layers	8
Thickness per Layer	12 in.
Ash Characteristics:	
Porosity	0.6475 vol/vol
Wilting Point	0.1358 vol/vol
Field Capacity	0.2382 vol/vol
Saturated Hydraulic Conductivity	2.97×10^{-3} cm/s
Initial Moisture Profile:	
0' to -1' depth	0.3867 vol/vol
-1' to -2' depth	0.3867 vol/vol
-2' to -3' depth	0.3721 vol/vol
-3' to -4' depth	0.3421 vol/vol
-4' to -5' depth	0.3818 vol/vol
-5' to -6' depth	0.4105 vol/vol
-6' to -7' depth	0.4726 vol/vol
-7' to -8' depth	0.4726 vol/vol
Miscellaneous/Climatological Variables:	
Rainfall	1990 site data
Temperature	1990 site monthly avg.
Leaf Area Index	0
Evaporative Zone Depth	8 in.
SCS Curve Number	82
Design Parameters:	
Surface Slope	0.5%
Surface Drainage Length	40 ft.

Table 6-3. Hydrologic Budget Simulation Results for 1990

Parameter	Inches of Water	Percent
Precipitation	61.55	100.00
Runoff	0.003	0.00
Evapotranspiration	31.78	51.64
Percolation	26.74	43.44
Change in Water Storage	3.03	4.92

The predicted volumetric moisture content in each of the eight model layers at the end of 1990 is presented in Table 6-4 together with actual neutron probe measurements obtained at comparable depths during the month of December 1990. The same type of correction factor discussed previously in association with the input moisture values was applied to both sets of data to account for the formation of additional hydrous minerals within the LIMB ash during 1990. A comparison of the model results with the initial moisture contents (Table 6-2) indicated that the model predicted a significant decrease in the measured moisture content throughout the section. Better agreement between modeled and measured values was found in the lower three feet of the section, where both sets of values differ by less than 20 percent.

The second modeling scenario considered the presence of a two-foot-thick soil layer on top of the eight-foot ash section. This modeling scenario was used to evaluate the hydrologic budget of the test cell and the potential for percolation for 1991. The input parameters for this scenario are summarized on Table 6-5. The porosity, wilting point, and field capacity of the ash was left unchanged from the first modeling scenario (Table 6-2). The moisture content profile was initialized to correspond with corrected moisture values measured in February 1991.

No laboratory determinations were available for the soil cover's wilting point and field capacity, so default model values associated with a silt of low plasticity (ML) were employed. The porosity of the soil was again selected to be a model default value since not enough data were available to calculate this parameter directly. The hydraulic conductivity was calculated as the geometric mean of *in situ* hydraulic conductivity determinations for the soil cover. The initial moisture content for the soil cover was calculated as the average of moisture contents dated August 1991 because no earlier data were available.

For the 1991 simulation, actual daily precipitation data were used in the model, as well as mean monthly temperatures. The leaf area index and the evaporative zone depth were adjusted to model-assigned values corresponding to a vegetated cover with fair grass at Cleveland, Ohio. An SCS curve number of 58 was selected to calculate runoff, which is consistent with a meadow (2).

Table 6-6 presents the results obtained for the 1991 HELP simulation. These results indicate again that the majority of the precipitation was expected to have been lost to evapotranspiration (81.1%). No surface runoff and negligible percolation at the bottom of the test cell (0.25%) were expected to have taken place. The water storage in the system was predicted to have changed by 19.4%. The moisture content profile predicted by the model underestimated corresponding measured moisture content values (Table 6-7).

Moisture content values measured throughout the profile in February 1992 were utilized as input for a long-term (20 year) simulation (Table 6-8). For this simulation, 20 years of rainfall data were synthetically generated with the HELP model based on a default

Table 6-4. Simulated and Measured Moisture Contents at the End of 1990

Depth (ft.)	Simulated Ash Moisture Content at End of 1990 (vol/vol) ^a	Measured Ash Moisture Content at End of 1990 (vol/vol) ^{a,b}
0 to -1	0.1709	0.2077
-1 to -2	0.2491	0.1952
-2 to -3	0.2589	0.1334
-3 to -4	0.2593	0.1837
-4 to -5	0.2335	0.2091
-5 to -6	0.2226	0.2091
-6 to -7	0.2214	0.2679
-7 to -8	0.2213	0.2679

^aMeasured and modeled moisture contents have been corrected to account for formation of hydrous minerals.

^bMoisture content measured in February 1991.

Table 6-5. Model Input Parameters for 1991 Hydrologic Budget Simulation

Model Parameter	Value
Number of Layers	2 ft. (soil cover) 8 ft. (ash)
Thickness per Layer	12 inches
Soil Cover Characteristics:	
Porosity	0.5010 vol/vol
Wilting Point	0.1350 vol/vol
Field Capacity	0.2840 vol/vol
Saturated Hydraulic Conductivity	1.21 E ⁻³ cm/s
Ash Characteristics:	
Porosity	0.6475 vol/vol
Wilting Point	0.1358 vol/vol
Field Capacity	0.2382 vol/vol
Saturated Hydraulic Conductivity	2.97E ⁻³ cm/s
Initial Moisture Content:	
2' to 1' depth (soil cover)	0.2756 vol/vol
1' to 0' depth (soil cover)	0.2756 vol/vol
-0' to -1' depth (ash)	0.2077 vol/vol
-1' to -2' depth (ash)	0.1952 vol/vol
-2' to -3' depth (ash)	0.1334 vol/vol
-3' to -4' depth (ash)	0.1837 vol/vol
-4' to -5' depth (ash)	0.2091 vol/vol
-5' to -6' depth (ash)	0.2091 vol/vol
-6' to -7' depth (ash)	0.2679 vol/vol
-7' to -8' depth (ash)	0.2679 vol/vol
Miscellaneous/Climatological Variables:	
Rainfall	1991 site data
Temperature	Site monthly avg.
Leaf Area Index	2
Evaporative Zone Depth	20 in.
SCS Curve Number	58
Design Parameters:	
Surface Slope	0.5%
Surface Drainage Length	40 ft.

Table 6-6. Hydrologic Budget Simulation Results for 1991

Parameter	Inches of Water	Percent
Precipitation	36.96	100.00
Runoff	0.00	0.00
Evapotranspiration	29.97	81.10
Percolation	0.092	0.25
Change in Water Storage	6.89	18.65

Table 6-7. Simulated and Measured Moisture Contents at the End of 1991

Depth (ft.)	Simulated Ash Moisture Content at End of 1991 (vol/vol) ^a	Measured Ash Moisture Content at End of 1991 (vol/vol) ^{a,b}
2 to 1 (cover)		0.3764
1 to 0 (cover)	0.2210	0.3731
0 to -1 (ash)	0.1809	0.0608
-1 to -2 (ash)	0.1831	0.1145
-2 to -3 (ash)	0.1679	0.1478
-3 to -4 (ash)	0.0595	0.1241
-4 to -5 (ash)	0.0472	0.1549
-5 to -6 (ash)	0.0473	0.1960
-6 to -7 (ash)	0.0927	0.2064
-7 to -8 (ash)	0.0972	0.1524

^aMeasured and modeled moisture contents have been corrected to account for potential formation of hydrous minerals.

^bMoisture content measured in February 1992.

Table 6-8. Model Input Parameters for Long-Term (20-Year) Hydrologic Budget Simulation

Model Parameter	Value
Number of Layers	2 ft. (soil cover) 8 ft. (ash)
Thickness per Layer	12 in.
Soil Cover Characteristics:	
Porosity	0.5010 vol/vol
Wilting Point	0.1350 vol/vol
Field Capacity	0.2840 vol/vol
Saturated Hydraulic Conductivity	1.21 E-3 cm/s
Ash Characteristics:	
Porosity	0.6475 vol/vol
Wilting Point	0.1358 vol/vol
Field Capacity	0.2382 vol/vol
Saturated Hydraulic Conductivity	2.97E-3 cm/s
Initial Moisture Content:	
2' to 1' depth (soil cover)	0.2594 vol/vol
1' to 0' depth (soil cover)	0.2594 vol/vol
-0' to -1' depth (ash)	0.0609 vol/vol
-1' to -2' depth (ash)	0.1145 vol/vol
-2' to -3' depth (ash)	0.1478 vol/vol
-3' to -4' depth (ash)	0.1241 vol/vol
-4' to -5' depth (ash)	0.1549 vol/vol
-5' to -6' depth (ash)	0.1961 vol/vol
-6' to -7' depth (ash)	0.2064 vol/vol
-7' to -8' depth (ash)	0.1525 vol/vol
Miscellaneous/Climatological Variables:	
Rainfall	Stochastically generated
Temperature	Site average values
Leaf Area Index	2
Evaporative Zone Depth	20 in.
SCS Curve Number	58
Design Parameters:	
Surface Slope	0.5%
Surface Drainage Length	40 ft.

5-year internal rainfall database for Cleveland, Ohio and on available average temperatures. The average results of this simulation are shown in Table 6-9. The 20-year simulation indicated that percolation at the bottom of the test cell is expected to average approximately 18% of the hydrologic budget over the 20-year period. The predicted vertical moisture distribution is presented in Table 6-10. These moisture values have not been corrected to account for the potential formation of hydrous minerals, because it is believed that the bulk of these reactions take place in the first two to three years of the test cells' lives.

Overall, there is marginal agreement between the measured and model-predicted moisture distribution profiles for the years of 1990 and 1991. One of the primary reasons for this discrepancy is likely to be the fact that the HELP model does not explicitly account for the complex chemical reactions that occur in the ash and affect the volume of free water in the system. However, the reactions through which hydrous minerals are formed are expected to have a limited life span (2 to 3 years), after which the ash section is expected to become more chemically stable and therefore more "inert" with respect to the contact with water. For this reason, the long-term (20 year) HELP model results may be more accurate than the short-term results.

Although the accuracy of the short-term results is questionable, the HELP model estimates of the rate of percolation at the bottom of the test cells are conservative. Since the model does not account for the removal of free water in solids, a greater volume of free water is perceived to be available by the model for potential leachate production so that modeled percolation is maximized. An additional problem is that the correction values applied to the measured moisture contents are based on site-wide average weight fractions of ettringite, gypsum, and thaumasite, rather than on discrete, interval-specific values. Finally, the fractured materials in the test cells violate the basic assumption of Darcian flow on which HELP model calculations are based. Under these circumstances, model results must be viewed as rough approximations, especially for short-term simulations.

6.7 References

1. P.R. Shroeder, J.M. Morgan, T.M. Walski, and A.C. Gibson. The Hydrologic Evaluation of Landfill Performance (HELP) Model, Volume II, Documentation for Version 2. EPA/530-SW-84-010, 1984b.
2. Viessman et al. Introduction to Hydrology, 2nd ed. Harper and Row, New York, 1977.

Table 6-9. Hydrologic Budget Simulation Results for Long-Term (20-Year) Simulation, Average Values

Parameter	Inches of Water	Percent
Precipitation	34.37	100.00
Runoff	0.00	0.00
Evapotranspiration	27.08	78.80
Percolation	6.21	18.09
Change in Water Storage	1.068	3.11

Table 6-10. Simulated Moisture Contents at the End of Long-Term (20-Year) Simulation

Depth (ft.)	Simulated Moisture Content (vol/vol)
2 to 1 (cover)	0.2834
1 to 0 (cover)	0.3055
0 to -1 (ash)	0.3875
-1 to -2 (ash)	0.3886
-1 to -3 (ash)	0.3815
-3 to -4 (ash)	0.3444
-4 to -5 (ash)	0.3272
-5 to -6 (ash)	0.3287
-6 to -7 (ash)	0.3318
-7 to -8 (ash)	0.3346

7.0 QUARTERLY AND ANNUAL CORE SAMPLES

Core samples of the materials in the two test cells were collected on a quarterly basis for the first year after cell construction, between August 1989 and August 1990. Core sampling continued on an annual basis for the final two years of the field testing program, as described in Section 4. Samples were initially collected from the two test cells using a diamond-tip core drill, which was designed for use in consolidated sediments or rock. Core recoveries using this device were generally poor since the LIMB ash in the test cells was not uniformly solidified.

After the first year of sampling, core collection methods were re-examined. Subsequent sampling was conducted using a continuous core sampler. This device is designed for use with a hollow stem auger drill rig in unconsolidated sediments. The core barrel advances just in front of the carbide-tipped lead bit of the drill string. The core barrel is attached to a non-rotating center string of drill pipe, while the lead bit rotates and cuts down through the material being sampled. As the drill string advances, an undisturbed profile is forced up into the core barrel. After advancing five feet, the core barrel is pulled back to the surface and split open so that the sample can be retrieved. No liner tubes were used with the core barrel, and in most cases samples could be removed and packaged for shipment without disrupting their fabric. The locations of each set of cores are shown on the site maps (Figures 3-6 and 3-7) along with the locations of all instrumentation installed in the cells. A brief geological description of most of the core samples collected during the field program is provided in Appendix H. Some descriptions are missing for samples used for chemical analysis. These samples are generally similar to the physical properties cores collected at the same times and depths.

The core samples were analyzed according to the test procedures described in Section 4. The results of physical properties tests are given in Appendix I. The results are grouped according to the date the samples were collected, which test cell they were collected from, and their depth in the test cell. For some tests, such as the unconfined compressive strength and permeability determination, many samples were fractured or broken when received by the laboratory and could not be analyzed by these techniques. Since numerical results are only presented for intact, unfractured samples these results reflect a bias towards relatively strong, impermeable samples that are less likely to break during handling. Although some of the fracturing was caused by the core collection, preparation, and shipping, other fractures were already present in the landfill material. It is not possible to quantify the sampling bias in the reported values.

7.1 Physical Properties of Ash Core Samples

7.1.1 Moisture Content

The measured moisture content of the test cell core samples consistently increased over the course of the monitoring period as the LIMB ash saturated, unlike the results of the neutron probe measurements, which showed virtually no change over time. The core sample moist-

ures indicate the average measured moisture in the South Cell was significantly lower than in the North Cell for the first three sets of measurements shown in Figure 7-1. This result is difficult to explain since water was added to the South Cell during construction. The addition of a soil cover over the top of the LIMB ash after the first year of sampling was predicted to reduce infiltration slightly, but the cover was not designed as an impermeable barrier layer. The moisture contents measured in core samples from both test cells continued to increase during the monitoring period. The final average core moisture was near 90% (dry basis) in both test cells, close to the calculated value for fully saturated ash.

7.1.2 Compressive Strength

The measured unconfined compressive strengths of core samples from the Ohio test cells varied from 40 to 2760 psi in the South Cell, and from 22 to 1748 psi in the North Cell. Many other core samples were fractured on recovery, either because of stresses induced during sampling operations, or as a result of expansive reactions in the waste. These samples had essentially zero unconfined compressive strength and were not tested, as described above.

Average unconfined compressive strengths of North Cell and South Cell cores are shown in the bottom two graphs in Figure 7-1. The unconfined compressive strengths are essentially a mirror image of the permeability data. The strengths of North Cell samples were initially less than 500 psi. At 16 months after construction, the average strength of the North Cell samples increased to almost 1000 psi, and then gradually declined over the next two years of monitoring to a value close to its initial strength. The average strength of South Cell samples generally declined over time, except for the samples from 28 months after construction. The average strength of the South Cell samples falls from nearly 1500 psi in the first set of cores to less than 200 psi in the final cores. These results indicate that even well cemented, unfractured materials lose significant strength after three years exposure.

The large-scale heaving and fracturing which disrupted the test cells in the first year after construction is shown in the photographs included as Figures 7-2 through 7-4. The surface of the test cells, particularly the South Cell, was extensively broken by fractures several feet in length and more than one inch wide. Other areas experienced heaving of up to six inches along linear trends over ten feet long.

7.1.3 Permeability

The average permeabilities of core samples collected from the LIMB test cells are also shown in Figure 7-1. The permeabilities of the North Cell samples average approximately 8×10^{-5} cm/s in the first quarterly samples. The permeability in the North Cell cores dropped over the next six months to a low of approximately 2×10^{-6} cm/s. The annual samples, collected 30 and 42 months after test cell construction, had average permeabilities of almost 1×10^{-3} and 7×10^{-5} cm/s, respectively. The South Cell core permeabilities were initially lower than those for the North Cell, averaging just over 1×10^{-7} cm/s in the

Figure 7-1. Average Values of Moisture Content, Permeability, and Unconfined Compressive Strength for Cores from the Ohio Test Cell. Bars represent one standard deviation except for the permeability results, where the bars represent high and low measurements.

Figure 7-2. Heaved area of the South Cell one year after construction. The 2-inch PVC pipe in the background provides scale.

Figure 7-3. Detail of a Heaved Area in the South Cell

Figure 7-4. Cracking in the Surface of the North Cell One Year After Construction

samples collected 10 months after cell construction. The South Cell core permeabilities increased steadily throughout the monitoring period, and averaged approximately 1×10^{-4} cm/s in the final set of samples.

Figure 7-5 shows the individual core permeabilities plotted against depth and time. Unlike the field permeabilities, which were correlated primarily with depth in the test cell, the core permeabilities were randomly distributed with depth. The highest measured core permeabilities were lower than the highest measured field permeabilities. Again, this is primarily because the most permeable cores were fractured and broken and could not be tested.

7.1.4 Density

The average bulk density of the core samples retrieved from the test cells was considerably lower than the Proctor density. In fact, the average dry density of LIMB ash is less than 1 g/cm^3 (62.4 lb/ft^3). The extremely low density of the LIMB ash is a product of: 1) less than optimal compaction; 2) expansion following hydration; 3) the low density of the highly hydrated minerals contained in the weathered ash; and 4) the high porosity of the ash. Dissolution and material transport out of the test cell will also affect density measurements in the long-term. In the initial three years exposure, this effect is probably minor. Figure 7-6 shows the average dry density of the North and South Cell samples as a function of time.

7.1.5 Soil Properties

The physical properties of the soils beneath the LIMB test cells do not appear to have changed significantly over the course of the monitoring period. The soil permeability remains low, suggesting that the structure of the clay minerals has not been disrupted by the alkaline leachate from the LIMB ash. Moisture contents in some areas of the soils beneath the test cells increased during the monitoring period as leachate migrated out of the test cells.

7.2 Mineralogy of Core Samples

The mineralogical study of the LIMB ash test cells focuses on characterization of the mineral phases present and their transformations over the 3 year study period. Analyses of mineral morphology and mineral composition by SEM/EDS on the microscale and x-ray diffraction of bulk samples provide the primary data on LIMB ash mineralogy. Other data, including the moisture content and physical properties of the samples, are related to the mineralogical data where possible. The mineralogical changes are directly related to the development of microstructural fabric; the connections between the microstructure and the physical properties of the bulk samples are a primary concern of this study. The changes in ash mineralogy also affect the leachate composition and are discussed in Section 8.

Sample collection, handling, and analysis procedures were designed to minimize moisture loss in the core samples and preserve dehydration of hydrated mineral phases as described in Section 4.

Figure 7-5. Variations in Core Permeability with Depth and Over Time

Dry density, lbs/cu. ft.

Dry density, lbs/cu. ft.

Figure 7-6. Average dry densities of LIMB site core samples from the first year of sampling. Most samples are below the target dry density of 70 - 75 lbs/cu. ft. determine by Proctor compaction testing. Stars represent +/- one standard deviation from the mean.

7.2.1 Basic Mineralogy of LIMB Ash

The residues of the LIMB process contain: 1) lime, CaO, which is unused sorbent; 2) portlandite, Ca(OH)₂, which is hydrated lime formed upon contact of lime with moisture; 3) anhydrite, CaSO₄, which forms from reaction of CaO, SO₂, and O₂; 4) calcite, CaCO₃, which forms from the reaction of portlandite with CO₂ in the ambient air; 5) quartz which is largely relict detrital material from the mineral matter in the coal; and 6) hematite, and/or Fe spinel, which forms from the oxidation of pyrite in the coal.

Water added to condition the LIMB material produces several key hydration reactions in the ash including:

- Hydration of lime to form portlandite
 $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2$
(calcite can form when portlandite is exposed to air);
- Hydration of anhydrite to form gypsum
 $\text{CaSO}_4 + 2\text{H}_2\text{O} \rightarrow \text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
- Hydration to form ettringite (nominal)
 $6\text{Ca}^{2+} + 2\text{Al(OH)}_4^- + 3\text{SO}_4^{2-} + 4\text{OH}^- + 26\text{H}_2\text{O} \rightarrow$
 $\text{Ca}_6\text{Al}_2(\text{SO}_4)_3(\text{OH})_{12} \cdot 26\text{H}_2\text{O}$ high pH
- Hydration and/or alteration of ettringite to form thaumasite (nominal)
 $\text{Ca}_6\text{Si}_2(\text{SO}_4)_2(\text{CO}_3)(\text{OH})_{12} \cdot 24\text{H}_2\text{O}$

The conventional formula for ettringite is compositionally and structurally flexible. Various oxyanions (i.e., SeO₄²⁻, B(OH)₄⁻, CrO₄²⁻, CO₃²⁻) can substitute for the sulfate, and Fe³⁺ and Si⁴⁺ are known to substitute for Al³⁺ (1). The ability of ettringite to accommodate a variety of substitutions may be important in limiting trace element solubility (1).

Some authors have suggested that a solid solution series exists between ettringite and thaumasite which allows crystals with a composition intermediate between the two end-members to form (2,3). SEM/EDS analyses of the Ohio LIMB ash indicate that end-member compositions are rare; varying amounts of silicon are present in both the phases labeled ettringite and thaumasite on the basis of their x-ray diffraction patterns. Although there is considerable compositional flexibility in ettringite and thaumasite this study found two distinct crystal habits distinguishing "ettringite" with an aluminum to silicon ration of greater than approximately 0.75 from "thaumasite" with a lower aluminum to silicon ratio. This finding suggests that there may be a gap in the solid solution series at the aluminum deficient end although it is difficult to exclude the possibility that dispersed amorphous silicates may be contributing to the SEM/EDS response on "ettringite" areas. Further study of this mineral system is required. Because of the variability in composition of ettringite and thaumasite, crystals of intermediate ettringite/ thaumasite composition are referred to generally as "ettringite-phase" materials in the following discussion.

To form ettringite, soluble Ca, SO_4 , and Al, Si must be available in a high pH aqueous environment. These conditions were largely maintained over a three year period in the LIMB test cells. Calcium is available from reacted and unreacted sorbent materials including lime, portlandite, anhydrite and gypsum. Aluminum and silicon are derived from the glassy phases of the coal ash and from dehydrated clay minerals. They are brought into solution, presumably as $\text{Al}(\text{OH})_4^-$ through reaction with highly alkaline pore solutions. Sulfate is derived from anhydrite and gypsum present in the reacted sorbent.

To form thaumasite, silicon substitutes for aluminum, and carbonate (CO_3), substitutes for some of the sulfate in the same general mineral structure as ettringite. The mechanism of thaumasite formation remains unclear. Previous studies have suggested that thaumasite develops as a replacement for ettringite (3) although results from this study indicate only minor decline in ettringite abundance accompanying thaumasite formation. Other studies have suggested that thaumasite formation only occurs at near-freezing temperatures (2,3); again, as a replacement for ettringite.

Thaumasite formation did not occur in any quantity until early in the second year of this study. Possible reasons for the delay in thaumasite formation include: 1) lack of soluble carbonate during the first year (infiltration through the vegetated soil cap may have increased dissolved CO_2); 2) lowered availability of soluble Al as the pH of pore fluids decreased through leaching and increased use of permeable fractures to transmit water through the bulk material; and 3) time required to cool the test cells below the threshold temperature required for thaumasite.

In addition to the crystalline minerals produced following LIMB ash hydration, the high pH environment can also yield an x-ray amorphous calcium-silicate-hydrate phase that forms in reactions between calcium hydroxide and the glassy component of the coal ash. Calcium-silicate-hydrate gels (CSH), provides much of the structural strength of Portland cement products. Because CSH is typically non-crystalline it is not detected by XRD techniques and it is difficult to identify by SEM/EDS in the matrix of ettringite and thaumasite.

Calcium silicate-hydrate may provide a sink for soluble silica before thaumasite formation is initiated and may provide some of the strength developed during early phases of hydration. Quantification of CSH in hydrated LIMB ash will be essential in completing the picture of this material's behavior following disposal.

At the end of one year, up to 46% ettringite and 35% thaumasite formed in the LIMB ash. After 2 years ettringite averages nearly 40% at all levels throughout both cells, while thaumasite ranges from 9 to as high as 58 percent. After 3 years ettringite averages nearly 40% throughout both cells, with a maximum of 53 percent. Thaumasite was present in 13 of 17 core samples, ranging from 0% to 50%, with an average of 35% in the South Cell and 22% in the North Cell.

The LIMB ash consists of silt size grains in the range of 10 to 30 microns in diameter, with specific surface areas of 8 to 11 square meters per gram. The specific surface area of LIMB

ash after a year of secondary mineralization can reach 60 square meters per gram, largely due to the growing abundance of micron size crystals of gypsum, calcite, ettringite and thaumasite formed during hydration. Because of the high surface areas and the relatively soluble nature of many of the mineral phases, there is a high potential for mineral transformations to occur as long as moisture is available. Growth of new minerals predominated during the early portions of the test period, although leaching, dissolution and reprecipitation of soluble phases occurred in the upper portions of the test cells. New ettringite formation stabilized sometime during the second year of testing, and gypsum/ calcite dissolution and reprecipitation along microfractures became more apparent after this point. Thaumasite crystallization appears to have increased during Year 3, making it the second most abundant mineral in the test cells.

7.2.2 Detailed Mineralogy of LIMB Ash

The results of mineralogical analyses of core samples from the two LIMB test cells are summarized in this section. A more detailed discussion of the results, keyed to a set of 64 SEM photographs, is included in Appendix C.

The bulk mineralogy of the LIMB ash samples was determined by XRD analysis. The results of this analysis are shown in Table 7-1 and XRD patterns are provided in Appendix C. Since XRD primarily identifies crystalline minerals, the sum of the detected minerals is less than 100 percent. A considerable portion of the LIMB ash was initially present as a glassy or poorly crystallized material, which diffract x-rays poorly. The growth of secondary minerals in the LIMB ash resulted in an increase in the percentage of detected minerals in the ash over time, from less than 40% in the initial core samples to over 80% in many of the final core samples.

The initial LIMB ash placed in the North Cell consisted of the crystalline phases anhydrite, 15.4%; lime, 11.6%; calcite, 6.3%; and portlandite, 2.2 percent. Minor phases include quartz, Fe-spinel, mullite, and several noncrystalline, x-ray amorphous phases of alumino-silicates and calcium alumino-silicates formed from feldspars and dehydroxylated clays during combustion. The South Cell ash is very similar in mineralogical composition. Upon conditioning, the amounts of certain reactive phases change dramatically: anhydrite is reduced to almost 0%, and lime is totally removed; portlandite increases to about 7% while calcite remains at about 5 percent. Two new phases are formed upon initial conditioning: gypsum (8%) and ettringite (6%). Within one year's time the silicon/aluminum ratio in the ettringite structure phase increased enough to allow the separate identification of thaumasite, although SEM/EDS analyses continue to show widely varying amounts of silicon and aluminum in areas which appeared to consist entirely of ettringite.

The bulk of the new mineral phases resulted from the growth of ettringite and thaumasite, as shown in Figure 7-7. Ettringite formation was apparent in the first cores collected after cell construction, and has continued throughout the monitoring period. Thaumasite formation began approximately a year after cell construction and has been extensive, especially in the South Cell. Periods of maximum thaumasite growth appear to correlate with declines

Table 7-1. X-Ray Diffraction Analysis of Ohio LIMB Ash

	Sample ID	Event	Mos Since Const	Site	Cell	Quadrant	Depth, ft	Gypsum	Ettringite	Anhydrite	Quartz	Calcite	Portlandite	Mullite	Thaumasite	Lime	Fe-spinel	Sum	Comments
	OHASH-01	0	0	OH						14.8	2.8	5.9	1.6	5		11.5	3.5	45.1	silos ash
	OHASH-02	0	0	OH				8.1		0.9	3.8	5	6.2	6.6			4.4	35	silos ash
	OHASH-03	0	0	OH						14	4	3.9	1.6	8.1		7.7	5.1	44.4	silos ash
	OHASH-04	0	0	OH				6.8	9.2	0.5	3.3	5	5.1	6.1			3.9	39.9	silos ash
	OHLY08-01	1	0	OH	N	SW	0 - 1	5.4	17.3	0.3	4.9	4.6		7.4			5.8	45.7	
	OHNT01-02	1	0	OH	N	SW	2	8.2	16.5	0.9	7.3	7		4.9			3.6	48.4	
	OHNT01-03	1	0	OH	N	SW	2 - 3	6.5	12.5	0.9	4.4	9.3		6.2			3.5	43.3	
	OHLY08-04	1	0	OH	N	SW	3 - 4	7.6	17.8	0.4	3.7	7.7		5.6			3.6	46.4	
	OHNT01-05	1	0	OH	N	SW	4 - 5	10.5	20.9	0.8	3.6	12.2		5			3.6	56.6	
	OHLY08-07	1	0	OH	N	SW	6 - 7	4.9	19.1	0.8	3.4	7		4.6			4.1	43.9	
	OHLY08-09	1	0	OH	N	SW	8 - 9	7.3	27.9	0.9	2.9	7.6		2.8			2.4	51.8	
	90FEBOH02-02	2	12	OH	N	NW	1 - 2	8.4	21.3	0.4	3.2	6.3		5			3.4	48	
	90FEBOH02-04	2	12	OH	N	NW	4	9.5	28.2	0.5	3.9	6.9		3.4			4.4	56.8	
	90FEBOH02-06	2	12	OH	N	NW	5 - 6	4.4	22.5	0.8	3	8.7		6.9			3.9	50.2	
	90FEBOH02-08	2	12	OH	N	NW	7 - 8	7.2	26.7	0.6	3.9	7		4.7			2.4	52.5	
	90MAYOH01-01	3	15	OH	N	SE	0 - 1	7	27	1	6	5.1		6.2			5.2	57.5	
	90MAYOH01-03	3	15	OH	N	SE	2 - 3	6	37.9	0	3	6.1		4			3.4	60.4	
	90MAYOH01-05	3	15	OH	N	SE	4 - 5	6.5	32.7	0.3	3.2	8.3		3.6			2.8	57.4	
	90MAYOH01-07	3	15	OH	N	SE	6 - 7	6.7	34.2	0.3	3.6	8.1		4.6			4	61.5	
	90AUGOH01-02	4	18	OH	N	NE	1 - 2	5.3	39.1		3.1	5.9		4.6			3.6	61.6	
	90AUGOH03-02	4	18	OH	N	NE	1 - 2	3.9	36.9	0	3.8	4.1		5.4			3.8	57.9	
	90AUGOH01-04	4	18	OH	N	NE	3 - 4	2.6	30.7		3.1	12.8		5.3			2.9	57.4	
	90AUGOH03-04	4	18	OH	N	NE	3 - 4	4.1	30.3	0.8	3.7	6.4		3.8			4.3	53.4	
	90AUGOH01-06	4	18	OH	N	NE	5 - 6		47.3		2.6	6.3		4.3			3.9	64.4	
	90AUGOH03-06	4	18	OH	N	NE	6	3.3	29.2	0.7	3.1	8.5		4.6			3.4	52.8	
	90AUGOH01-08	4	18	OH	N	NE	7 - 8		35		3.2	7.5		5.2			4.4	55.3	
	90AUGOH03-08	4	18	OH	N	NE	7 - 8	4.2	36.7	0.5	3.3	6.7		5.6			3.6	60.6	
	90AUGOH03-10	4	18	OH	N	NE	9 - 10	2	37.4	0.1	3.8	5.3		4.7			3.5	56.8	
	91AUGOH08-03	8	30	OH	N	SE	3	9	28		6.1	5.6						48.7	

Table 7-1. (Continued)

Sample ID	Event	Mos Since Const	Site	Cell	Quadrant	Depth, ft	Gypsum	Ettringite	Anhydrite	Quartz	Calcite	Portlandite	Mullite	Thaumasite	Lime	Fe-spinel	Sum	Comments
91AUGOH08-05	8	30	OH	N	SE	5	7	37		3.1	5.7			16			68.8	
91AUGOH06-06	8	30	OH	N	NE	6	9	35		3.2	8.6						55.8	
91AUGOH08-07	8	30	OH	N	SE	7	7	34		3.1	7.8			9			60.9	
91AUGOH06-08	8	30	OH	N	NE	8	5	42		2.9	7.8						57.7	
91AUGOH08-09	8	30	OH	N	SE	9		34		3	4.9			29			70.9	
91AUGOH06-11	8	30	OH	N	NE	11	4	38		3.1	6.4			20			71.5	
OHLY16-01	1	0	OH	S	NW	0 - 1	5.7	29.6	0.6	3.9	7.4		6.1			4.1	57.4	
OHNT08-01	1	0	OH	S	NW	0 - 1	6	26.8	0.5	2.7	8.1		4.5			3.4	52	
OHNT08-03	1	0	OH	S	NW	2 - 3	10	22.3	2.2	3.7	10.5		5.9			3.8	58.4	
OHLY16-04	1	0	OH	S	NW	3 - 4	4.3	23.4	1.8	3.1	6.7		4.4			3.6	47.3	
OHNT08-05	1	0	OH	S	NW	4 - 5	10	29.9	0.5	4	12.6		5.3			3.3	65.6	
OHLY16-06	1	0	OH	S	NW	5 - 6	3.9	20.7	0.2	3.1	8.1		3.8			3	42.8	
90FEBOH03-02	2	10	OH	S	NE	1 - 2	6.7	26.4	0.6	4.4	6.4		6.3			5	55.8	
90FEBOH03-04	2	10	OH	S	NE	4	4.7	30.1	0.4	4.4	6.9		4.6			1.8	52.9	
90FEBOH03-06	2	10	OH	S	NE	6	7	34.9	0.6	3.6	6.1		4			2.6	58.8	
90MAYOH04-02	3	13	OH	S	SE	1 - 2	5.5	35.7	0.4	3.6	7.9		4.8			3.4	61.3	
90MAYOH04-04	3	13	OH	S	SE	3 - 4	6.8	24.9	0.7	3.3	5.8		4.2			3.2	48.9	
90MAYOH04-06	3	13	OH	S	SE	5 - 6	4	32.7	0.5	3.7	7		4.3			2.9	55.1	
90AUGOH05-01	4	16	OH	S	SW	1	4.4	42.8		2.3	10.2		10.7			5.9	76.3	
90AUGOH06-01	4	16	OH	S	SW	0 - 1	3.4	55.4		3.1	7.5		3.4			2.6	75.4	
90AUGOH05-02	4	16	OH	S	SW	1 - 2	2.5	50.8		2.9	9.6		4.8			4.1	74.7	
90AUGOH06-02	4	16	OH	S	SW	2	7.7	25.3		3.4	12.8		7.1			4.3	60.6	
90AUGOH05-03	4	16	OH	S	SW	3	8.3	32		3.3	11.7		5.2			3.2	63.7	
90AUGOH06-03	4	16	OH	S	SW	2 - 3	6.3	12.4		3.8	8.6		10.9			4.8	46.8	
90AUGOH05-04	4	16	OH	S	SW	3 - 4	6.3	31		3.2	10.2		5.8			4.1	60.6	
90AUGOH06-04	4	16	OH	S	SW	4	11.2	23		2.9	12.2		5.5			4.3	59.1	
90AUGOH05-05	4	16	OH	S	SW	5	10.1	17.1		3.8	12.7		6.8			4.2	54.7	
90AUGOH06-05	4	16	OH	S	SW	4 - 5	2.8	41.4		2.7	6.3		5			4.2	62.4	
90AUGOH05-06	4	16	OH	S	SW	5 - 6	7.3	9.6		3.2	10		9.7			3.9	43.7	

Table 7-1. (Continued)

Sample ID	Event	Mos Since Const	Site	Cell	Quadrant	Depth, ft	Gypsum	Ettringite	Anhydrite	Quartz	Calcite	Portlandite	Mullite	Thaumasite	Lime	Fe-spinel	Sum	Comments
90AUGOH05-07	4	16	OH	S	SW	7	5	36.2		3.2	13.3		4.3			3.6	65.6	
90AUGOH05-08	4	16	OH	S	SW	7 - 8	2.7	38.5		3.1	10.9		5.2			3.8	64.2	
91AUGOH02-02	8	28	OH	S	SE	2		30		3.2	5.6			58			96.8	
91AUGOH04-03	8	28	OH	S	NW	3		47		3.1	7.8			36			93.9	
91AUGOH02-04	8	28	OH	S	SE	4	12	39		3.3	6.5			4			64.8	
91AUGOH04-04	8	28	OH	S	NW	4	10	36		3.6	6.5						56.1	
91AUGOH02-06	8	28	OH	S	SE	6	8	43		2.8	6.9			11			71.7	
91AUGOH04-06	8	28	OH	S	NW	6	6	37		3.6	6.4			9			62	
91AUGOH02-08	8	28	OH	S	SE	8	9	39		3.3	7.2			19			77.5	
91AUGOH04-08	8	28	OH	S	NW	8		46		3.7	7.8			26			83.5	
91AUGOH06-04	8	30	OH	S	NE	4		36		2.5	4.1			29			71.6	

North Cell

South Cell

Figure 7-7. Semiquantitative X-Ray Diffraction Analyses of Core Samples from the Ohio Test Cell. Analytical results for all the quarterly samples are averaged for clarity. Only selected potentially reactive phases are shown.

in ettringite abundance, as predicted by the chemical model for LIMB ash hydration (Figure 1-2) although overall ettringite has continued to increase despite thaumasite growth. Other elements of the chemical model, including the secondary formation of gypsum and the consumption of calcite during thaumasite formation also may have occurred, but the decrease in calcite concentrations were within the range of analytical uncertainty for the semiquantitative XRD analysis.

The vertical distribution of hydrated mineral phases in the LIMB ash show few clear patterns. Ettringite and gypsum are fairly uniformly distributed with depth in early cores; cores from the second and third years indicate some gypsum depletion at depth in the test cell. Thaumasite distribution with depth is highly variable, although in some instances it is strongly enriched in the upper portions of the test cell immediately underlying the soil cap. Further work is needed to separate the effects of temperature and carbonate availability on thaumasite formation. Appendix C contains a series of plots showing the distribution of mineral phases with depth in each core collected from the test cell during the three years of monitoring.

The micro-scale patterns of crystal growth can be related to the observed bulk behavior of the LIMB ash. Samples with dense, interlocking ettringite crystal growth, such as the sample shown in Figure 7-8 generally have the highest strength and lowest permeabilities. This sample, 90FEBOH3-2, has an unconfined compressive strength of 1937 psi and a permeability of 2.44×10^{-7} cm/sec. Micro-fractures and larger cracks can affect the bulk behavior of these materials, however. The pressure exerted by ettringite crystals growing in restricted areas of pore throats is great enough to produce deformed crystals, as shown in Figure 7-9; these pressures are expressed at a larger scale in the fracturing and heaving which disrupted the South Cell shortly after construction.

Over time, the leaching of soluble materials and the continued growth of ettringite and thaumasite alter the appearance of the LIMB ash. At a millimeter scale, the material shown in Figure 7-10 appears highly porous, although no fractures are apparent in this view. At the microstructural level, the appearance of the LIMB ash changes from the radiating clusters of sharp-edged ettringite crystals to more matted ettringite/thaumasite aggregates (Figure 7-11 ettringite appears in the lower portion, thaumasite appears in the upper half) with large, gypsum-lined secondary pores and fractures (Figure 7-12). In other areas, gypsum dissolution and thaumasite precipitation appears to predominate, as shown in Figure 7-13. In general, samples exhibiting these changes in microstructure have lower strength and higher permeability in the bulk samples.

The SEM/EDS spectra show a range of elemental compositions for ettringite and thaumasite phases in the LIMB ash. Early formed ettringite contains up to three times as much aluminum as silicon, with a near end-member stoichiometry of Ca 5.66, S 2.32, Al 1.12 and Si 0.48 in the crystals shown in Figure 7-8. Later-formed ettringite is increasingly silicon-rich, and at stoichiometric ratios of aluminum to silicon of less than approximately 0.75 it is labelled as thaumasite based on the crystal morphology. After one year of exposure in the test cells aluminum and silicon are present in roughly equal amounts in the ettringite-

Figure 7-8. Radiating ettringite crystals formed on the LIMB ash matrix during the first year after test cell construction. South Cell, 2 feet depth.

Figure 7-9. Pressures caused by early ettringite crystal growth in restricted pore spaces deformed the shape of the ettringite laths shown at center. South Cell, 5 feet depth.

Figure 7-10. Three Years After Test Cell Construction Many Samples of LIMB Ash had a Weathered, Porous Appearance as Seen in This Sample from a Depth of 5 Feet in the North Cell

Figure 7-11. Extensive Ettringite (bottom) and Thaumasite (top) Mineralization Illustrates the Contrasting Crystal Habits and Fabrics Developed by These Two Minerals After 3 Years in this Sample from a Depth of 5 Feet in the North Cell

Figure 7-12. Secondary Dissolution Created Large, Gypsum Lined Pores in the LIMB Ash After 3 Years Exposure, as Shown in this Sample from a Depth of 3.5 Feet in the South Cell

Figure 7-13. Gypsum Dissolution is Common in Other Areas of the Test Cells, as Shown in this Photo where Thaumasite Mineralization is Accompanied by Dissolution of the Large Gypsum Crystals at the Top of the Image

phase material, with compositions in the range of Ca 4.82-4.94, S 1.91-2.45, Si 0.50-1.34, and Al 1.06-1.39. EDS spectra do not show a clear compositional distinction between crystals with the acicular, radiating habit typical of ettringite and the more prismatic, matted crystals typical of thaumasite at this time. After three years there is a clearer distinction between crystals of ettringite which contain subequal amounts of aluminum and silicon and aluminum-deficient areas of thaumasite with compositions in the range of Ca 5.52-5.58, S 1.99-2.12, Si 1.75-1.89, and Al 0.27-0.34. Since determinations of oxygen and carbon with the SEM/EDS detector is only semi-quantitative carbonate is not included in the ettringite phase stoichiometries given here, although the nominal end-member formula for thaumasite includes this species.

The wide range of compositions for ettringite-phase materials and the distinct crystal morphologies of end-member compositions indicate continued equilibrium formation of ettringite-phase minerals, rather than the ettringite formation/thaumasite replacement mechanism proposed by Hunter (3). The mechanisms controlling the composition of the ettringite-phase material precipitated at a given time are not clear. The gradual decrease in the pH of pore fluids over time may affect the Al/Si ratio, although the highest concentrations of dissolved silica were present in the pore fluids during the first year of monitoring when no distinct thaumasite phase was observed. A second possibility is that carbonate availability limited thaumasite growth during the first year; vegetation on the soil cap placed approximately one year following cell construction may have increased the available concentration of dissolved carbonate. Carbonate concentrations in the porewater are highly variable with the highest carbonate concentrations occurring at the base of the test cell, rather than directly beneath the cap. Finally, a third explanation is that initially silica was taken up by a poorly crystallized, x-ray amorphous calcium-silicate-hydrate phase which was later broken down and replaced by thaumasite in response to changes in solution pH and the concentrations of calcium, sulfate, carbonate, and other constituents. The loss of calcium-silicate-hydrate may also be partly responsible for the general decrease in load-bearing strength seen over time. The available data does not point decisively to any one factor, and it is likely that all of these processes played a role in the complex chemical equilibrium controlling mineralization of the LIMB ash.

7.2.3 Summary of Mineralogical Results

Mineralogical analysis has proven to be an essential element in monitoring, diagenesis, or weathering and transformation of LIMB ash in the disposal environment. Diagenetic changes in the LIMB material have been dramatic and have affected the material properties at all scales. SEM/EDS and x-ray diffraction are extremely useful techniques for monitoring mineral transformations and exploring the relationships between the mineralogy and the physical properties of the bulk material. The microstructural fabric also provides important insights into the movement of solutions through the ash, and the sequence of geochemical reactions along their flowpath. The texture, shape, and relationships between crystalline and noncrystalline phases continues to change as weathering and climate impact the test cells. In the long term, precipitation percolating through the landfill will continue to dissolve and redistribute soluble constituents. Phases stable only at elevated pH, such as ettringite and

thaumasite, will eventually be destabilized as pH continues to drop. Decomposition of these minerals will eventually yield more typical, pH neutral soil minerals including calcite, gypsum, and aluminosilicates.

Important findings from the three years of monitoring include:

- The initial crystalline mineralogy of the LIMB ash is dominated by anhydrite, lime, and calcite. Noncrystalline material is largely aluminosilicate glass.
- Initial conditioning of LIMB ash produces hydration reactions that form gypsum and portlandite at the expense of lime and anhydrite; where pH is high and sufficient water is available to react with the residues, soluble Ca, Al, and Si are generated and react to form ettringite.
- After less than 3 months (and about 18 inches of precipitation), the major crystalline phase in the LIMB ash is ettringite, forming 16-38% of the bulk material. Clusters of micron-size ettringite crystals cover silt-size ash particles, and begin to close off pore space, reducing permeability and increasing strength. Ettringite crystals are typically 2:1 or 1:1 Al to Si.
- Approximately nine months after emplacement LIMB ash in both cells is highly mineralized with ettringite (20-36%), and gypsum; minor thaumasite is present in the upper few feet of each cell. Gypsum mineralization along microfractures is common.
- After 1 year, all parts of both cells are thoroughly wetted, and ettringite mineralization is extensive, producing a material that varies from very hard to soft and friable. Ash in the South Cell expanded and heaved, yielding a highly fractured material with variable strength and permeability. Thaumasite crystals are present as matted, felted fabric, but are difficult to distinguish with the SEM.
- After 2 years and 117 inches of precipitation, ettringite formation in both test cells is nearly complete. Combined, ettringite and thaumasite form up to 87% of the core samples. Gypsum is relatively abundant and mobile, dissolving and reprecipitating along network of microfractures. Material strength and permeability continues to be highly variable due to zones of hard and soft layers. Thaumasite is locally very abundant and easily recognizable with its felted fabric, stubby crystals, and aluminum deficient composition.
- After 3 years, new mineralization in both cells appears limited to some additional thaumasite crystallization, and dissolution and reprecipitation of gypsum and calcite in cavities and fractures. Thaumasite appears as crystals of distinct habit and texture, and increasingly deficient in aluminum content (almost zero in a few cases). Permeability appears to be less variable in E-6 cm/sec range,

and compressive strength has been significantly reduced for most material to less than 100 psi. SEM images of the LIMB material show it to be extensively fractured on a microscale, and many areas show grains and crystals that appear corroded and degraded.

7.3 Core Sample Chemistry

Core samples from quarterly and annual sampling events were leached with deionized-water according to ASTM method D-3987-81 at a 4-to-1 water-to-solids ratio on a shaker table for a period of 48 hours. Core samples were not crushed prior to leaching, but in nearly all cases the core samples completely disintegrated during the agitation. The resulting solutions were pressure filtered and analyzed for dissolved species according to the flow charts presented in Section 4. A number of analytes that were tentatively included on the original list were not detected in analysis of the initial wastes, and were excluded from further consideration. The cores were also analyzed for total inorganic carbon content to track any absorption of atmospheric carbon dioxide by the alkaline LIMB ash.

Complete analytical results for all chemical analyses of quarterly and annual core samples are presented in Appendix E, Tables E-1 through E-6. Figures 7-14 and 7-15 show the average concentrations of selected major analytes in deionized-water leachates of core samples from each sampling event and in the initial composite ash samples from the North Cell and South Cell respectively. Each bar represents the average leachate concentration for samples collected at all depths in the ash for that event. Leachable concentrations of calcium, chloride, and sulfate drop by as much as 75% between the initial ash composition and the first core sample analyses. The concentrations of calcium and sulfate decline further over the course of the monitoring period, especially in the South Cell. Average chloride concentrations remain stable throughout the monitoring period. Potassium concentrations increase from less than 15 mg/L in the initial ash leachates to 300 to 400 mg/L in subsequent core sample leachates.

The concentrations of selected major analytes in the core sample deionized-water leachates versus depth in the test cell are shown in Figures 7-16 through 7-18. Each figure shows the results from one set of annual cores. Each graph shows the leachate concentrations from samples collected from both of the two cores collected in each test cell. Where two samples were collected from the same depth interval in adjacent holes the chemical results were averaged for plotting on these figures.

Over the three years of sampling, leachable calcium and sulfate concentrations dropped from approximately 600 mg/L and 1200 mg/L, respectively, to 300 mg/L in the South Cell and 400 mg/L North Cell for calcium, and 600 mg/L in the South Cell and 800 mg/L in the North Cell for sulfate. Maximum chloride concentrations dropped from approximately 350 mg/L to 200 mg/L in the South Cell, but were fairly steady in the North Cell. A surface zone depleted in highly soluble constituents such as chloride appears to have developed quite rapidly, within the 16- to 18-month period between cell construction and the first

Figure 7-14. Average Concentrations of Selected Analytes in ASTM Deionized-Water Leachates of the Initial Ash Composite and Quarterly and Annual Core Samples from the Ohio North Cell

Figure 7-15. Average Concentrations of Selected Analytes in ASTM Deionized-Water Leachates of the Initial Ash Composite and Quarterly and Annual Core Samples from the Ohio South Cell

South Cell

North Cell

Figure 7-16. Deionized-Water Leachates of August 1992 Core Samples from the South Cell (left) and North Cell (right)

South Cell

North Cell

Figure 7-17. Deionized-Water Leachates of August 1991 Core Samples from the South Cell (left) and North Cell (right)

South Cell

North Cell

Figure 7-18 Deionized-Water Leachates of August 1990 Core Samples from the South Cell (left) and North Cell (right)

annual sampling in August 1990. The depth of the leached zone appeared to slowly increase over time.

Leachable chloride concentrations in the soils more than 5 feet beneath both the test cells remained at background levels through 1992, suggesting that vertical migration of leachate from the test cells has not been extensive. The 1991 and 1992 leachates of soils from up to 4 feet beneath the North Cell ash have chloride concentrations between approximately 100 and 200 mg/L, suggesting some limited infiltration of leachate from the test cell in these locations. Calcium and sulfate have higher background concentrations in the soils beneath the test cells and are not as useful as chloride in tracing migration of ash derived constituents.

Selected trace element concentrations in the deionized-water leachates of core samples from the North Cell and South Cell over time are shown in Figures 7-19 and 7-20, respectively. The elements depicted -- arsenic, barium, boron, lead, molybdenum, selenium, strontium, and zinc -- are the elements that were detected in a significant number of leachate samples or were detected in the initial ash composite leachates. The values shown represent average concentrations from all ash samples collected during each sampling event. Concentrations less than the analytical detection limit were set equal to one-half the detection limit value for purposes of calculation.

The trace elements fall into two groups. One group, consisting of the elements arsenic, lead, molybdenum, and strontium, had a core leachate concentration equal to or greater than that of the initial ash leachate. Concentrations of these elements peaked from 12 to 24 months following cell construction and then generally declined over the remainder of the monitoring period. The second group, consisting of the elements barium, boron, selenium, and zinc, showed a marked decline in concentration between the initial ash leachate and leachates of subsequent core samples. The leachable concentrations of the second group of trace elements show no appreciable changes over time following landfill construction.

Elements in the second group, which are stabilized in the hydrated LIMB ash, may be immobilized through a variety of mechanisms. Zinc is most likely stabilized as a hydroxide, although it is unclear why such a high concentration of leachable zinc remained in the initial waste, which was also highly alkaline. Boron and selenium, which can act as oxyanions, may be stabilized by the formation of ettringite, which incorporates a number of oxyanions by substitution for sulfate. Barium may be stabilized as barium sulfate, although, as with zinc, it is not clear why this mechanism does not limit the barium solubility in the initial ash leachate.

Figure 7-19. Average Trace Element Concentrations in Deionized-Water Leachates of North Cell Initial Ash and Subsequent Core Samples. For purposes of calculation, all results less than the analytical detection limit were set equal to one-half of the detection limit.

Figure 7-20. Average Trace Element Concentrations in Deionized-Water Leachates of South Cell Initial Ash and Subsequent Core Samples. For purposes of calculation, all results less than the analytical detection limit were set equal to one-half of the detection limit.

7.4 References

1. Kumarathasan, P., e. a., 1990. "Oxyanion Substituted Ettringites: Synthesis and Characterization and Their Potential Role in Immobilization of As, B, Se, and V." Mat. Res. Soc. Symp. Proce. Vol 178. R.L. Day and F.P. Glasser, eds., pp. 83-104.
2. Kollman H., G. Strubel, and F. Trost, 1977. "Reaction Mechanisms in the Formation of Expansion Nuclei in Lime-Gyp[sum Plaster." Zement-Kalk-Gips, 30:24-228.
3. Hunter, D., 1988. "Lime Inducted Heave in Sulfate-Bearing Clay Soils." J. Geotech. Engr. 114, No. 2.

8.0 POREWATER CHEMISTRY

The progress of geochemical reactions taking place in the LIMB ash is reflected in the composition of the porewaters present in the test cells. The ceramic cup pressure-vacuum lysimeters placed in the test cell provided a means for regular collection of porewater samples from the unsaturated zone in the test cells. While some lysimeters consistently produced enough sample for analysis, many, especially in the North Cell, were consistently dry, or only produced enough sample for partial analysis. During the first year of monitoring, few of the lysimeters produced samples on a regular basis. As the LIMB ash in the test cells became progressively wetter, more of the lysimeters began to produce, although sample recoveries from the North Cell remained spotty. At times, the lysimeters in the base of the test cells appeared to be under saturated conditions based on the presence of standing water in the neutron probe access tubes.

When lysimeters no longer maintained a vacuum, indicating cracking or poor hydraulic connection with the surrounding materials, they were replaced. The record of samples from any given lysimeter thus may span only a fraction of the interval during which the test cell was monitored.

8.1 Porewater Samples

This section summarizes the results of chemical analyses on porewater samples. Complete analytical results are provided in Appendix G, Tables G-1 through G-12, along with the results of groundwater and surface water analyses.

8.1.1 Major Element Chemistry of Porewaters

The chemistry of the porewater samples change significantly over the monitoring period, especially in the near-surface portions of the South Cell. Initially, geochemical reactions of the LIMB ash and water brought relatively high concentrations of soluble species including potassium, chloride, and sulfate into solution. Continued movement of water through the test cells reduced the concentrations of these soluble species, especially in the upper portions of the landfills. Figure 8-1 shows the decreases in concentrations of selected major analytes over time in the near surface samples.

Soluble constituents that were leached from the upper portions of the test cells by percolating porewater were concentrated in the lower portions of the test cells. Figures 8-2 and 8-3 illustrate changes in the porewater chemistry along vertical profiles through the North Cell and the South Cell, respectively, between the first and third years of monitoring. Because samples were not available from each depth interval during each sampling event, these figures show average values for all samples from a given depth interval over a specific time period. While this averaging results in some loss of detail, it allows the general trends to be viewed more easily.

OHLY-12, 1 foot below surface
Concentration, mg/L

OHLY-11, 3 feet below surface
Concentration, mg/L

Figure 8-1. Major Ion Concentrations in Near-Surface Lysimeters in the South Cell

S Cell Events 4-6

S Cell Events 10-12

Figure 8-2. Porewater Chemistry of Samples from the South Cell. Where more than one sample was analyzed for a given depth for the time period shown, the results were averaged. In some cases, the values shown represent a single analysis.

Figure 8-3. Porewater Chemistry of Samples from the North Cell. Where more than one sample was analyzed for a given depth for the time period shown, the results were averaged. In some cases, the values shown represent a single analysis.

The porewater composition of the North Cell, shown in Figure 8-2, is very consistent with depth after the first year of monitoring, as shown on the left in Figure 8-2. Samples collected during the third year of monitoring, shown on the right, had markedly lower concentrations of all the major ions at a depth of 4 feet, reflecting the leaching processes discussed above. At a depth of 8 feet, concentrations of all major species, except calcium, were much higher than in the earlier samples, although there were no data from exactly the same depth at the earlier time, and the year three data were based on a single sample collected in August 1992. This pattern appears to indicate that material dissolved in the upper portions of the test cells was largely retained in the base of the cells. There was no evidence, based on the porewater data, for significant vertical migration of solutes or leachate out of the base of the test cells. Major ion concentrations in porewaters from beneath the test cells at depths of 9.5 to 11 feet appeared to decrease between events 4 to 6 and 9 to 12.

Since saturated conditions were present in the lower portions of the test cells during a portion of this time, flow may not have been purely vertical out of the base of the test cells. Lateral movement of leachate out of the test cells will be discussed further in Section 8.3 on the groundwater chemistry downgradient from the test site.

The geochemistry of the porewater samples indicated some degree of heterogeneity in the LIMB ash as it weathered. The porewater chemistry as determined by many samples was incompatible with the presence of several of the minerals known to be present. The solubility index of ettringite and thaumasite cannot be accurately calculated since they are not purely stoichiometric phases, and because their solubilities are very sensitive to the solution pH. Generally, these minerals are stable only at pHs above about 10.5. At lower pH values, these minerals tend to break down into gypsum, calcite and aluminum or silicon hydroxide gel. Many lysimeter samples had pH values substantially below 9, yet mineralogical analyses showed continued growth of ettringite and thaumasite during the course of the monitoring period. The macroscopic secondary pores and fractures developed in the LIMB ash apparently provided conduits for water movement through the ash and into some lysimeters without substantial contact with the bulk of the material in the test cell.

8.1.2 Trace Element Composition of Porewaters

The average concentrations of selected trace elements in porewaters from the North Cell and South Cell are shown in Figures 8-4 and 8-5, respectively. Values shown represent the averages of all results from each sampling event from each test cell; results less than the analytical detection limits were treated as equal to one-half the detection limit value. Lysimeters that were installed in the soil just beneath the ash were also included in the averages. As a result of sample dilutions, the detection limits for some analytes varied among samples by as much as a factor of 100. Much of the variability in concentration shown in Figure 8-4 and 8-5 for lead and selenium was a result of the variation in detection limits. Selenium data from May 1991 (Event 7) was omitted from the graphs because the detection limit for selenium in this set of analyses was a factor of 10 higher than on any other occasion.

Figure 8-4. Comparison of average trace element concentrations in ASTM leachates of North Cell samples and average lysimeter concentrations for each sampling event. For purposes of calculation, all results less than the analytical detection limit were set equal to one-half the detection limit.

Figure 8-5. Comparison of average trace element concentrations in ASTM leachates of South Cell samples and average South Cell lysimeter concentrations for each sampling event. For purposes of calculation, all results less than the analytical detection limit were set equal to one-half the detection limit.

The average porewater concentrations of the elements arsenic, molybdenum and strontium showed an initial rise, peaking at 20 to 24 months following construction. Barium, boron, and zinc generally maintained stable concentrations throughout the monitoring period, which were low relative to the initial ash leachate composition. Boron concentrations of porewaters from the North Cell increased during the last few sampling events. The highest individual boron concentrations of 6.3 and 11.1 mg/L were for samples from lysimeters OHLY-1 and OHLY-21 respectively, from the August 1992 event. Lead and selenium concentrations varied widely for reasons discussed above, and no trends were observed in these data.

The maximum concentrations of several elements were significantly different between the North and South Cells. The peak average arsenic concentrations in the North Cell were greater than 0.08 mg/L, while in the South Cell they were less than 0.04 mg/L. Individual maximum concentrations were 0.078 mg/L in the South Cell compared to 0.18 mg/L in the North Cell. Boron concentrations, as mentioned above, were as high as 11 mg/L in the North Cell, whereas the highest boron concentration found in the South Cell porewaters was 0.52 mg/L. Selenium concentrations as high as 0.15 mg/L were detected in the North Cell porewaters, while the highest concentration detected in the South Cell was only 0.068 mg/L.

8.2 Comparison of Porewater to ASTM Leachate Chemistry

The chemistry of porewater samples from the two LIMB ash test cells was significantly different from the chemistry of the deionized-water leachates prepared from test cell core samples. Figure 8-6 shows the average concentrations of several major analytes and solution pH for the ASTM deionized-water leachates and the lysimeter porewater samples. The lysimeter samples and leachate samples had similar concentrations of calcium, but concentrations of all other major species were much higher in the porewaters. The average porewater pH was more than a full pH unit lower than the average leachate pH. In addition, the porewater samples showed a much wider range of compositions than the deionized-water leachates.

Some of the difference in composition between these two sets of samples may be caused by simple dilution of porewater present in the core samples when deionized water is added for the ASTM leaching procedure using a 4:1 water to solids ratio, by weight. In addition, dissolution of soluble minerals including calcium hydroxide and gypsum during the leaching tests will affect the measured leachate composition. The ratios of the leachate concentrations to the porewater concentration were different for each analyte, however. The factors were 0.9 for calcium, 3.6 for sulfate, 5.3 for potassium, 6.5 for chloride, 8.8 for sodium, and 25 for silicon. There appeared to be a complex set of reactions controlling solution compositions in each set of samples rather than a simple dilution effect that links the two.

The data presented in Section 7 under the core leachate chemistry discussion are included in Figures 8-4 and 8-5 with the data from the lysimeter porewater samples, so that the results from these two types of leachate can be compared. In the cases of barium and zinc, the porewater concentrations are equal to or lower than in the deionized water leachates. The porewater concentrations of boron, lead, selenium, and strontium were sometimes

Figure 8-6. Comparison of average concentrations of major analytes and pH in samples from lysimeters and annual deionized-water leachates from both test cells. Lysimeter samples have a similar calcium content but a much higher concentration of most other major species and a lower pH than the leachates.

higher and sometimes lower than in the test leachates. Boron and strontium were each higher than the test leachates in one test cell, and essentially equal to test leachate concentrations in the other test cell. Both boron and strontium showed a trend towards increasing concentration in the porewater at the end of the monitoring period, while the deionized-water leachate concentrations were stable or declining. Arsenic and molybdenum concentrations in the porewater samples were generally higher than in the laboratory leachates.

Differences in the fabric of the cemented waste matrix may be responsible for variations between test leachates and lysimeter porewaters. Porewater samples were extracted from intact cemented ash. The individual pore spaces and fracture surfaces holding the water were probably coated with products of hydration reactions, which shield the unreacted cores of grains from contact with water. The slow movement of water out of the test cells encouraged the buildup of soluble sodium and potassium chlorides and sulfates in solution, while limiting dissolution of moderately soluble species such as gypsum and calcium hydroxide. The leaching test destroyed the cement fabric and exposed fresh surfaces to water, which allowed additional dissolution reactions to take place. Silicon concentrations are generally strongly pH dependent, with significant solution concentrations of silica present only at high pH. Although the average values shown indicated higher silicon concentrations in the lower pH lysimeter samples, the silicon results were strongly skewed by a few very high values measured in lysimeter samples, and actually followed the predicted pH dependence.

9.0 GROUNDWATER HYDROLOGY AND CHEMISTRY

Groundwater was sampled for chemical analysis on a quarterly basis, as described in Section 4. Water was collected from each of the eight wells at the test site every quarter.

This section describes the results of the groundwater monitoring at the test site. The groundwater monitoring at the LIMB test site was designed to provide data on the shallow groundwater upgradient and downgradient of the test site so that any effects from leachate migration into groundwater could be detected. Monitoring wells at the site included two upgradient wells and three monitoring wells located downgradient of each test cell. The monitoring wells were installed in clusters. Each well was screened at a different depth so that vertical hydraulic gradients and trends in chemical composition with depth could be addressed. Monitoring wells were sampled on a quarterly basis.

9.1 Groundwater Hydrology

The potentiometric surface elevations at the LIMB test site varied considerably over time and indicated shifting patterns of groundwater flow. The results of quarterly water level measurements from each of the eight wells are shown in Figure 9-1. All three well clusters showed fluctuations in the water levels, especially in the deeper wells. The timing of major increases in the potentiometric surface elevation in these wells appeared to be consistent. The water levels in wells OHMW-7, OHMW-4, and OHMW-1 all fluctuated by 15 to 20 feet during each of the measurements at 12 to 16 months, 33 months, and 39 months following construction. Water levels in the shallower wells were generally more consistent throughout the monitoring period, but also had period of high variability, especially downgradient from the South Cell.

Figure 9-2 shows the average direction of groundwater flow at the test site, based on the potentiometric surface elevations for the shallow, unconfined wells. Based on the limited groundwater data from the site, the average flow direction of the near-surface groundwater was towards the southeast. Initial water level measurements indicated a difference in water table elevation of only 2 to 3 feet between upgradient well OHMW-8 and well OHMW-3 downgradient of the North Cell, while OHMW-6, downgradient of the South Cell, was almost 10 feet lower than the upgradient location. An increase in the water level of OHMW-6 near the end of the monitoring period brought it close to the elevation in OHMW-3, creating a more easterly gradient. Because the wells "downgradient" of the North Cell were not precisely downgradient according to the flow field calculations it is possible that some leachate from the North Cell bypassed these wells. The small distance between the test cell and the wells minimizes this possibility.

The groundwater flow-field in the vicinity of the LIMB test cells was also complicated by mounded water occasionally present in the cells themselves. Since the saturated zone was originally only a few feet beneath the base of the test cells, it seem likely that standing water in the base of the test cells created a dome in the surrounding water table, which caused

Figure 9-1. Quarterly Water Level Measurements from the LIMB Site Monitor Wells

Local Groundwater Flow Directions

Figure 9-2. The slope of the potentiometric surface at the top of the saturated zone has changed during the course of the field monitoring. Arrows indicate the approximate flow direction at three different times.

some radial outflow from the cells. This phenomenon may be responsible for some of the abrupt changes in water level noted in the monitoring wells at the site.

The water levels in the South Cell downgradient wells indicated that the vertical hydraulic gradient reversed periodically in this location. The other well clusters maintained a higher potentiometric surface elevation in wells screened near the surface than in wells screened at greater depths, indicating that the vertical component of groundwater flow was downwards. Sixteen months following construction, the potentiometric surface elevation in OHMW-4 (34 feet deep) was higher than in OHMW-6 (16.3 feet deep) indicating that local pressure gradients created an upward flow component downgradient from the South Cell. The potentiometric surface in well OHMW-5, 25 feet deep, was consistently above that in OHMW-6 during the first 30 months following construction.

No aquifer testing was performed on the monitoring wells installed at the test site to determine saturated hydraulic conductivity or to calculate groundwater flow velocities. However, groundwater movement at the site appeared to be very slow on the basis of well recovery times recorded by pressure transducers in the upgradient well (OHMW-8) and downgradient of the North Cell (OHMW-3) as shown in Figures 9-3 and 9-4, respectively. The program AQTESOLV™ (1) was used to estimate the saturated hydraulic conductivity from the water level recovery curves by treating the data as the recovery portion of an unconfined slug test. Values of 3.3×10^{-8} and 7.4×10^{-6} cm were obtained for wells OHMW-8 and OHMW-3, respectively. Input parameters used in the model and model results are shown in Table 9-1. The permeabilities measured on core samples of the soils beneath the test cells also indicated that water movement in the soils beneath the test cell was slow. In a low-flow environment such as that found at the LIMB test site, relatively large changes in the potentiometric gradient may be caused by relatively small changes in the water balance.

9.2 Groundwater Chemistry

9.2.1 Upgradient Water

Two upgradient wells were monitored. Well OHMW-8 was screened at the top of the saturated zone from a depth of 16 to 26 feet. Well OHMW-7 was screened deeper in the aquifer from a depth of 32 to 42 feet.

Upgradient water quality at the Ohio site varies considerably over the three-year monitoring period and also differs with depth. The shallow upgradient groundwater from OHMW-8, screened at 16 to 26 feet, contained approximately 950 mg/L total dissolved solids and had a pH near 8. The pH of the deeper groundwater was higher than the pH of the shallower upgradient groundwater and had a lower dissolved-solids content. Major analyte concentrations in the shallow groundwater are shown in Figures 9-5 and 9-6, and the average concentrations in both upgradient wells of all species detected in more than one event's samples are shown in Table 9-2.

Figure 9-3. Depth to water in upgradient well OHMW-8 following purging and sampling in May 1991. The reason for the sharp water level increase immediately before sampling is not clear. Recovery of the water level takes approximately 30 days.

Water elevation, feet above mean sea level

Figure 9-4. Water elevation in OHMW-3 following sampling in February 1992. Recovery following sampling occurs over approximately 12 hours.

Table 9-1. AQTESOLV Model Results Bouwer and Rice Unconfined Aquifer Slug Test

	OHMW-8	OHMW-3
Knowns and Constants		
No. of data points	41	10
Radius of well casing, ft.	0.1667	0.1667
Radius of well, ft.	0.5	0.5
Aquifer saturated thickness, ft.	12.5	24.5
Well screen length, ft.	10	10
Static height of water in well, ft.	6.8	8.0
Ln (Re/Rw)	1.755	1.776
Results from Statistical Curve Matching		
K saturated hydraulic conductivity	$3.37 \times 10^{-8} \pm 7.26 \times 10^{-10}$	$7.41 \times 10^{-6} \pm 5.02 \times 10^{-7}$
Yo drawdown axis intercept	$8.22 \pm 6.45 \times 10^{-2}$	$0.67 \pm 2.48 \times 10^{-2}$
Weighted Residual* Statistics		
Residual mean	0.003007	-0.004554
Residual st. dev.	0.1767	0.0282
Residual variance	0.03123	0.0007951

* Residual = calculated - observed

Ln (Re/Rw) = empirical "shape factor" determined from tables provided in Bouwer and Rice (1976) (2) where
 Re = equivalent radius over which head loss occurs and Rw = radius of well (including filter pack).

Figure 9-5. Concentration trends for major cations in the shallow groundwater at the Ohio site. Results from upgradient and downgradient monitoring wells are shown for all quarterly sampling events.

Figure 9-6. Concentration trends for major anions in the shallow groundwater at the Ohio site. Results from upgradient and downgradient monitoring wells are shown for all quarterly sampling events. Upgradient chloride concentrations, which are less than 5 mg/L, plot along the x-axis of the graph.

**Table 9-2. Average Concentrations of Analytes Detected in Upgradient Groundwater
(in mg/L except as noted)**

Analyte	OHMW-7 (43 ft.)	OHMW-8 (27 ft.)
Barium	0.07	0.02
Calcium	98.6	94.9
Iron	0.124	0.197
Magnesium	0.77	51.66
Manganese	0.008	0.119
Molybdenum	0.072	0.078
Potassium	14.2	8.45
Sodium	158	136
Strontium	0.714	2.06
Alkalinity as HCO_3^-	364	330
Chloride	6.01	3.8
Sulfate	268	469
Total Dissolved Solids	723	945
pH, units	11.49	7.99
Redox Potential (Eh) (mV)	-257	-23.4
Total Organic Carbon	22.7	32.4

The concentrations of major analytes in the upgradient groundwater varied over time. Sodium and sulfate concentrations declined by approximately 50% over the first three sampling periods. Subsequent measurements of sodium and sulfate concentration showed some fluctuation on an approximately 12-month cycle with a slight downward trend.

The deeper upgradient groundwater from OHMW-7 had an average total dissolved solids content of approximately 720 mg/L and a pH of 11.5. The lower dissolved solids content in OHMW-7 was primarily because of its lower average sulfate and magnesium concentrations, as compared to OHMW-8. The average potassium and chloride concentrations in the deeper well were slightly higher than in the shallow groundwater. The high pH of the deeper groundwater was consistent throughout the monitoring period, and was significantly higher than in any of the other monitoring wells at the site, as shown in Figure 9-7. The water from OHMW-7 was also consistently the most reducing (negative Eh) of any of the monitoring wells.

It appears possible that conditions near OHMW-7 may have become reducing enough to promote sulfate reduction, driving the pyrite oxidation cycle in reverse to create alkalinity rather than acidity. The stability relations of sulfur species indicate that at the pH of 11.5 found in OHMW-7 an Eh of approximately -300 would be required to favor the equilibrium conversion of sulfate to reduced sulfur (3). This was somewhat lower than the measured value, but the precipitation of iron sulfides could promote sulfate reduction under somewhat more oxidizing conditions. A sewage odor, typical of environments containing H_2S , was noted during sampling a number of the wells and lysimeters at the site, supporting the concept of sulfate reduction. Although some dissolved iron was present in the upgradient groundwater, the availability of dissolved iron could limit the amount of alkalinity produced in OHMW-7. Pyrite oxidation, associated highly acidic soils identified in some initial and quarterly cores, may have provided the source of dissolved iron and sulfate that upon reduction deeper in the aquifer, caused the high pH observed in OHMW-7.

9.2.2 Downgradient Water

The major analyte chemistry of the shallow downgradient water is also shown in Figures 9-5 and 9-6, and the average compositions of all the downgradient wells are shown in Table 9-3. Like the upgradient wells, the downgradient water quality showed a wide range of natural variation, both in terms of depth and by horizontal location. The deeper groundwater was primarily a sodium bicarbonate/sodium sulfate/ sodium chloride solution, while the shallow groundwater contained the cations calcium and magnesium in addition to sodium. The sulfate and alkalinity of samples from the wells downgradient of the South Cell varies more with depth than for those of the North Cell. In all wells, there was a trend towards increasing pH and decreasing redox potential (Eh) with depth, in keeping with the discussion of sulfate speciation above.

Figure 9-7. Groundwater pH in Each of the 8 LIMB Site Monitor Wells During the Three-Year Test Period

Table 9-3. Average Concentrations of Analytes Detected in Downgradient Wells

Location ID	North Cell			South Cell		
	OHMW-01 (36 ft.)	OHMW-02 (26 ft.)	OHMW-03 (16 ft.)	OHMW-04 (35 ft.)	OHMW-05 (25 ft.)	OHMW-06 (16 ft.)
Barium	0.034	0.055	0.030	0.014	0.043	0.062
Calcium	10.3	186.1	914.9	8.8	19.3	190.6
Iron	0.104	0.067	0.078	0.096	0.073	0.998
Magnesium	4.4	130.5	166.2	3.5	11.1	85.4
Manganese	0.018	0.164	0.258	0.020	0.017	2.014
Molybdenum	0.043	0.038	0.038	0.389	0.043	0.042
Potassium	12.61	8.27	5.93	6.11	7.25	10.98
Sodium	664	239	99	532	464	167
Strontium	0.35	1.18	0.59	0.20	0.53	1.13
Alkalinity as HCO_3^-	738	674	604	936	915	411
Chloride	169.6	68.9	54.0	218.6	194.3	251.5
Sulfate	703	821	827	199	135	526
Total Dissolved Solids	1831	1881	1706	1386	1234	1528
Total Organic Carbon	5.57	17.28	4.65	2.89	11.13	5.28
Redox Potential (Eh)	-86.8	-6.9	3.6	-71.1	-45.8	12.5
pH	9.38	7.27	6.96	8.56	8.05	6.86

Values are the averages of 12 measurements except for TOC (Total Organic Carbon) which is the average of four measurements.

9.2.3 Transport of Ash-Derived Species

The shallow groundwater downgradient from the South Cell appeared to be affected by migration of chloride, and possibly other species from the test cell ash, as shown in Figure 9-8. Groundwater data was analyzed with several statistical tests to determine the significance of apparent trends.

9.2.4 Statistical Analyses of Results

Statistical analyses were performed on chemical data through February 1992, from the three monitoring wells screened at the top of the saturated zone to check whether the concentrations of chloride or other species were significantly greater in downgradient wells.

The intent of the analysis was to compare average downgradient concentrations of 12 selected analytes to their respective average upgradient concentrations. Average concentrations that can be shown to be statistically different between upgradient and downgradient wells are evidence that some analytes may be leaching from the test cells into the groundwater.

The downgradient data came from the North and South Test Cells, separately. The upgradient data come from between the two test cells and are used as background for both cells. The data were collected from wells installed at different depths below the water table. To better represent the actual conditions of the groundwater table, comparisons were made between data collected from wells screened at similar depths. For this initial analysis, data from monitoring wells downgradient from the North Cell (OHMW-3) and the South Cell (OHMW-6) were compared to data from upgradient monitoring well OHMW-8. All three monitoring wells were screened at the top of the saturated zone. Groundwater at the top of the saturated zone was expected to experience the greatest effects from any leachate discharged by the test cells. Future analysis may be performed on data from wells screened at other depths.

The data, which were collected quarterly over a period of two and a half years, were combined for the statistical comparisons. Because only two samples, upgradient and downgradient, were collected for each location during each quarter, the data could not be compared on a quarterly basis. The small number of samples collected produced a large confidence interval around the measured values, so that statistically valid conclusions about changes in analyte concentrations between upgradient and downgradient wells were not possible on a quarter-by-quarter basis. Therefore, average concentrations from over the two and a half year period were compared.

The sections below discuss the conclusions of the statistical analysis and the statistical methods used.

Figure 9-8. Major Ion Composition of OHMW-6 Over Three Years of Monitoring. Concentrations of several ash-derived constituents, including chloride, sulfate, and sodium, increased over the monitoring period.

9.2.5 Summary of Conclusions

Average downgradient concentrations of several analytes were significantly higher than average upgradient concentrations from both the North and South Cells. In addition, sodium was significantly higher in the South Cell and sulfate was significantly higher in the North Cell. Table 9-4 provides an overall summary of the analysis.

9.2.6 Statistical Methods

Comparison of two average concentrations was performed by means of a statistical test. There are several different types of statistical tests, depending on the numerical distribution of both the upgradient and downgradient data. When both sets of data follow a normal distribution, the averages can be compared using the Student's t-Test. Similarly, if both sets of data follow a log-normal distribution (i.e., the logs of the concentrations follow a normal distribution), then the log averages (average of the log concentrations) can be compared using the Student's t-Test. When both sets of data were determined to be neither normally nor log-normally distributed, then the Wilcoxon Rank Sum Test can be performed. The Wilcoxon Test ranks all of the concentrations from smallest to largest, then compares averages of the ranks.

As each of the three tests is performed, the final conclusion of the test depends on the confidence level chosen for the test. A 95% confidence level was chosen for this analysis. A 95% confidence level means that there is only a 5% chance of concluding that the average downgradient concentration is different from the average upgradient concentration when, in fact, no difference exists. Table 9-4 presents those analytes whose average downgradient concentrations is statistically larger than the average upgradient concentration. Discussion of these tests and their conclusions are presented below.

Table 9-4. Summary of Statistically Significant Analytes

Analyte	Cells Where Significant
Alkalinity	North, South
Calcium	North, South
Chloride	North, South
Filterable Residue	North, South
Magnesium	North, South
Sodium	South
Sulfate	North

9.2.7 Student's t-Test

As stated previously, the data must be normally distributed before the Student's t-Test can be used accurately. The Shapiro-Wilk w-Test is used to test normality of a data set. Data from two analytes, alkalinity from the North Cell and filterable residue from the South Cell, were determined to be normally distributed. Using the Student's t-Test, the average down-gradient value of both of these analytes was determined to be significantly different from the average upgradient value, with 95% confidence. Table 9-5 presents the analytes tested by the Student's t-Test, the number of analyses, the percentage of detected data, the mean concentration, and the standard deviation from both upgradient and downgradient data sets, and the conclusion of the t-Test.

9.2.8 Student's t-Test on Log-Normal Data

To test for log-normality, the Shapiro-Wilk w-Test was performed on the natural logs of the concentrations of each analyte. Chloride from both North and South Cells, magnesium from the South Cell, potassium from both cells, and sulfate from the South Cell were all found to be log-normally distributed. Of these, the average downgradient concentrations of chloride (both cells) and magnesium (South Cell) were found to be statistically larger than the average upgradient concentrations of these analytes, with 95% confidence. Table 9-6 presents information similar to that of Table 9-5, but for the Log-normal t-Test.

9.2.9 Wilcoxon Test

The majority of the analytes tested did not follow a normal or a log-normal distribution, so conclusions were drawn using the Wilcoxon test. Those analytes that had significantly larger average concentrations downgradient than upgradient were alkalinity from the South Cell, calcium from both cells, filterable residue from the North Cell, magnesium from the North Cell, sodium from the South Cell, and sulfate from the North Cell. Table 9-7 presents the analytes tested by the Wilcoxon Test, and the conclusions of that test.

Since the current statistical analysis examines only average concentrations over the entire 2 1/2 years of monitoring from August 1989 to February 1992 it cannot fully address trends of increasing downgradient concentrations. Since there was only a single well at a given depth downgradient of each test cell, the data set was too small to allow detailed statistical treatment of trends. In addition, no groundwater samples were collected before the test cells were constructed. Because of this, there was no baseline data that could be used to unambiguously demonstrate that the test cells were the cause of the differences in composition between the upgradient and downgradient groundwater.

Figures 9-5 and 9-6 show the concentration trends of the seven major species identified as having statistically significantly higher concentrations in the shallow groundwater downgradient of the test cells than in the upgradient groundwater. Each graph follows the concentration of a single species over 3 years of sampling from August 1989 to August 1992 in monitoring wells screened over the top ten feet of the saturated zone. The wells are OHMW-3,

Table 9-5. Ohio Groundwater Data Comparison By Cell -- T-Test Results

Analyte	Cell	B a c k g r o u n d				D o w n g r a d i e n t				Distribution Type	P-Value for t-test	t-test Conclusion
		Total No. of Analyses	% Detected in Background	Mean (mg/kg)	Standard Deviation (mg/kg)	Total No. of Analyses	% Detected Downgradient	Mean (mg/kg)	Standard Deviation (mg/kg)			
Alkalinity	N	8	100	5.554	0.810	8	100	9.88	0.327	Normal	0.000000	Significant
Filterable Residue	S	8	100	985.125	253.245	8	100	128.25	475.787	Normal	0.020433	Significant

Table 9-6. Ohio Groundwater Data Comparison By Cell -- Log-Normal T-Test

Analyte	Cell	Background				Downgradient				Distribution Type	P-Value for Log-Normal t-test	Log-Normal t-test Conclusion
		Total No. of Analyses	% Detected in Background	Log Mean	Log Standard Deviation	Total No. of Analyses	% Detected Downgradient	Log Mean	Log Standard Deviation			
Chloride	N	10	100	1.28817	0.11954	10	100	3.96381	0.31755	Log-normal	0.00000	S
Chloride	S	10	100	1.28817	0.11954	10	100	5.02046	0.88431	Log-normal	0.00000	S
Magnesium	S	10	100	3.97002	0.09847	10	100	4.43259	0.21099	Log-normal	0.00002	S
Potassium	N	10	100	2.15837	0.25039	10	100	1.78863	0.08334	Log-normal	0.99949	NS
Potassium	S	10	100	2.15837	0.25039	10	100	2.24007	0.24978	Log-normal	0.23724	NS
Sulfate	S	10	100	6.18223	0.20292	10	100	6.24266	0.17457	Log-normal	0.24230	NS

Table 9-7. Ohio Groundwater Data Comparison By Cell -- Wilcoxon Test Results

Analyte	Cell	Background				Downgradient				Distribution Type	P-Value for Wilcoxon Test	Wilcoxon Conclusion
		Total No. of Analyses	% Detected in Background	Rank Mean	Expected Rank STD	Total No. of Analyses	% Detected Downgradient	Rank Mean	Expected Rank STD			
Alkalinity	S	8	100.000	4.5000	9.5219	8	100.000	12.5000	9.5219	Neither	0.00240	S
Arsenic	N	12	75.000	12.7917	16.8897	12	66.667	12.2083	16.8897	Neither	0.56970	NS
Arsenic	S	12	75.000	12.2500	16.9706	12	75.000	12.7500	16.9706	Neither	0.44210	NS
Calcium	N	10	100.000	5.5000	13.0283	10	100.000	15.5000	13.0283	Neither	0.00060	S
Calcium	S	10	100.000	5.8500	13.1989	10	100.000	15.1500	13.1989	Neither	0.00125	S
Filterable residue	N	8	100.000	5.0000	9.5219	8	100.000	12.0000	9.5219	Neither	0.00565	S
Magnesium	N	10	100.000	5.5000	13.1289	10	100.000	15.5000	13.1289	Neither	0.00065	S
Molybdenum	N	10	100.000	13.6000	12.0852	10	80.000	7.4000	12.0852	Neither	0.98965	NS
Molybdenum	S	10	100.000	13.2000	12.0852	10	90.000	7.8000	12.0852	Neither	0.97950	NS
Selenium	N	12	66.667	13.0000	15.8909	12	66.667	12.0000	15.8909	Neither	0.63380	NS
Selenium	S	12	66.667	13.0417	15.8868	12	66.667	11.9583	15.8868	Neither	0.64545	NS
Sodium	N	10	100.000	15.5000	13.0283	10	100.000	5.5000	13.0283	Neither	0.99940	NS
Sodium	S	10	100.000	7.4500	13.1339	10	100.000	13.5500	13.1339	Neither	0.01700	S
Strontium	N	10	100.000	15.5000	13.1639	10	100.000	5.5000	13.1639	Neither	0.99935	NS
Strontium	S	10	100.000	15.5000	13.1939	10	100.00	5.5000	13.1939	Neither	0.99930	NS
Sulfate	N	10	100.000	5.5000	13.2088	10	100.00	15.5000	13.2088	Neither	0.00070	S

downgradient of the North Cell, OHMW-6, downgradient of the South Cell, and OHMW-8, upgradient of both cells.

These graphs suggest that some of the statistically significant compositional differences were not associated with leachate from the landfill test cells. For instance, the magnesium concentration downgradient from the North Cell was significantly higher than the upgradient concentration, but there was no evidence that the concentration of magnesium downgradient of the North Cell has increased over time. The calcium concentration downgradient from the North Cell followed a similar pattern. None of the analytes identified as statistically more abundant downgradient from the North Cell reflected the effects of leachate migration. Downgradient from the South Cell, only chloride, and possibly calcium and magnesium, showed long-term increases in concentration that were potentially associated with the test cell.

9.3 Leachate Migration

On several occasions, water seeping from the ground in the area of the downgradient toe of the South Cell was noted. The water from this seep was collected on one occasion and analyzed along with groundwater and porewater samples, as sample OH281. The seep water was found to closely resemble the high-pH, high-TDS porewaters sampled by the lysimeters at the base of the South Cell. The water collected from this seep probably represented a good "composite" sample of the leachate exiting the base of the test cell. Because of the close proximity of this seep to a monitoring well (OHMW-6) and the other wells downgradient from the South Cell, there is a possibility that this surface water percolated down along the well casing. This may have short-circuited the normal flow path through the soils and caused the apparent rise in concentrations of some analytes in monitoring well OHMW-6.

Figure 9-9 compares the composition of groundwater from the upgradient well OHMW-8 (sample OH319), from well OHMW-6 (sample OH317), and from the seep (sample OH 281). Concentrations are shown in millequivalents/liter to better illustrate the relationships of the molar concentrations of the major analytes. Simple mixing of water from the seep with water of an upgradient composition could account for the composition of the water in OHMW-6 downgradient. The major anions, chloride and sulfate, were present in approximately the same relative amounts in both samples, suggesting that there has been relatively little chemical separation of these two species. Since there was very little chloride in the background groundwater at the site, the ratio of chloride concentrations in the seep to that in monitor well OHMW-6 indicates an approximate 1:1 mixing ratio for porewater from the base of the South Cell with the shallow groundwater immediately downgradient.

Cation concentrations in monitor well OHMW-6 appeared to be derived from the composition of the seep water through a combination of mixing, cation exchange, or dissolution/precipitation reactions. Potassium concentrations were very low in the background groundwater at the site and in monitor well OHMW-6, whereas potassium was the most abundant cation in the seep water. Potassium in the leachate from the seep appeared to be exchanged

Upgradient Well OHMW-8

South Cell Seep, OH281

Downgradient Well OHMW-6

Figure 9-9. Comparison of major analyte compositions of seepage from the South Cell and water from the top of the saturated zone immediately downgradient of the South Cell. The differences in composition between water from these two sources, particularly the difference in potassium and magnesium concentrations, indicates that there is no direct flow from the surface seepage into the monitor well.

largely for calcium and magnesium as it moved through the soils between the test cell and OHMW-6.

Based on mixing alone, the expected potassium concentration in OHMW-6 was approximately 15 meq/L. The actual concentration was about 1 meq/L. The missing potassium was replaced by approximately 9 meq/L calcium and 4 meq/L magnesium in excess of what simple mixing would predict. The mechanism for this exchange was not clear. The high potassium concentration in the seep water may have caused potassium ions to replace calcium or magnesium ions on exchange sites of clays. Precipitation reactions that could reduce potassium concentrations in exchange for calcium or magnesium were possible but would involve silicate minerals typically found in hydrothermal systems that are not kinetically favored under the near-surface conditions at the test site.

9.4 References

1. G.M. Duffield and T.O. Rumbaugh, III. "AQTESOLV™ Aquifer Test Solver Version 1.00." Geraghty and Miller Modelling Group, Reston, VA. October 1989.
2. H. Bouwer and R.C. Rice. "A Slug Test Method for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Partially Penetrating Wells." *Water Resources Research*, Vol. 12, No. 3, pp 423-428, 1976.
3. R.M. Garrles and C.L. Christ. Solutions, Minerals and Equilibria. Freeman, Cooper & Co., San Francisco, CA, 1965.

10.0 CONCLUSIONS AND RECOMMENDATIONS

10.1 Conclusions

Landfill construction with LIMB ash can be accomplished largely using standard industry practices to place and compact the materials. When conditioning the reactive LIMB ash with water for compaction, moisture loss to evaporation and mineral hydration must be accounted for to achieve best results. Initial strength development is sufficient to support equipment and additional lifts of ash material. Peak strengths, reached after about six months, approach that of low-strength concrete and could be suitable for structural fill applications, if maintained.

Results from later portions of the study suggest that the strength of the materials declines over the first few years of exposure, while permeability increases. Although the load-bearing strength remains adequate to support equipment, the characteristics of the weathered ash are more similar to soils than to concrete. The loss of strength and increased permeability is related to expansion and heaving which took place in the test cells following the initial consolidation, forming extensive fractures, especially near the surface of the test cells. Hydration products which appear to disrupt the cementitious matrix of the ash continued to form over the entire course of the study, further weakening the material.

As a result of the high permeability of the ash, significant infiltration of water occurred. Model results suggest that as much as 20% of the incident rainfall will pass through the landfill and exit its base as leachate. The composition of this leachate is dominated by concentrations of up to several thousand mg/L each of common ions including sulfate, chloride, sodium, and potassium, and has a high total alkalinity. Concentrations of trace species are generally low. Some elements, including barium, boron, and zinc, appear to be effectively immobilized in the test cells. Other elements, including arsenic and molybdenum, appear to be mobilized in leachate solutions to a greater extent than predicted by initial testing. Leachate solutions in the ash and in the soils immediately beneath the ash exceeded federal regulatory limits for drinking water quality by small amounts for several analytes including arsenic, chromium, and selenium; one sample exceeded limits for lead. None of the leachate samples could be classified as hazardous under RCRA because of trace metal contents.

Groundwater monitoring outside the perimeter of the test cells indicates that impacts on the shallow groundwater have been minimal. Dispersion and attenuation both appear to affect the migration of dissolved species in the groundwater at the test site, respectively diluting the leachate solutions and limiting transport of cationic species. Statistical and trend analysis of groundwater quality data indicates that effects have been limited to an increased chloride concentration in a single, shallow well approximately 100 feet downgradient of the test site.

10.2 Recommendations

This study has produced an extensive database of information on the field behavior of disposed wastes from LIMB processes, however it has also raised new questions about the long-term performance of these materials both in situations where they are disposed and in re-use applications. The knowledge of the mineralogical reactions in the hydrating LIMB ash which this study has helped develop provides a key to understanding, predicting, and controlling the field behavior of these materials.

Ettringite and thaumasite, the two most abundant minerals in the weathered ash, are both associated with failure of Portland cement. In the LIMB ash, ettringite appears to be responsible for much of the self-cementing action, while thaumasite appears much later in samples with much lower load-bearing strength. The relationship between these two structurally similar minerals appears to be crucial to understanding the long-term behavior of the LIMB ash. One goal of future work should be to build on the knowledge gained from this field testing program to provide a better understanding of this unusual mineral system. With such understanding, LIMB ash and similar advanced coal technology by-products may be transformed from hard-to-manage wastes into components of cementitious materials suitable for landfill liners and structural fills.

DOE/METC plans to fund an additional sampling event at the Ohio site which will extend the database to year 5 after cell construction and help answer some questions raised by the work to date. These additional data will help determine whether ettringite and thaumasite production has reached its full extent, or if it will continue. Examination of cores should yield clues as to the fate of the original components of the LIMB ash and their hydration products, and will help clarify the microstructural basis for important changes in the engineering properties of the ash.

Significant questions about the optimal treatment of LIMB ash for disposal or utilization remain to be answered. Some of these issues may be resolved through work included in the remaining portions of this study, while others may require more carefully controlled laboratory studies. Some of the issues which require further study are listed below.

1. What is the basis for expansion and heaving? What combination of pretreatment, additive incorporation, and compaction can best control expansion or limit its effects? Resolving this question may require carefully controlled laboratory study.
2. What role does thaumasite formation have in strength development and stability of the LIMB ash? Is thaumasite formation incremental to ettringite formation, or does it come from ettringite decomposition? Thaumasite is usually considered to have no cementing properties; does its formation also result in expansion and, therefore, further disruption of the matrix? Further, we know very little about the pH stability of thaumasite; it has been observed in deteriorated concrete at close to neutral pH; does this imply that

thaumasite will form at the expense of ettringite as the pH drops? Some of these questions may be resolved by additional sampling and analysis at the Ohio site, while other elements of the thaumasite question will require specifically targeted laboratory studies.

3. What are the roles of calcium-silicate-hydrate and calcium hydroxide in cementation? Current work does not quantify these important phases or their role in determining the bulk engineering properties of the materials. Much of this information should come from analysis of additional cores at the LIMB and other sites.
4. Have hydration reactions to form ettringite and thaumasite essentially ceased or are they continuing? What components ultimately limit the growth of these minerals, and can their growth be accurately predicted? A better mass balance for all the ash components is required. Much of this information should come from data collected in the additional year of monitoring and from comparison of data from all the project test sites.
5. Does thaumasite formation come at the expense of "internal" calcite or carbon dioxide absorbed from the atmosphere. The role of internal calcite may be quite significant in terms of developing an engineering approach to stopping or slowing down thaumasite formation (if that's is found to be the best approach to maintaining strength). Some of this information may come from a refined mass balance, as in 4), while a better definition of thaumasite equilibrium and reaction kinetics may be required for a well understood engineering approach.
6. The effect of low temperature on enhancing thaumasite formation needs investigation. A low initiation temperature is consistent with the transformations occurring in the upper parts of the cell, but may not explain all occurrences of thaumasite. Again, laboratory conditions may be required to answer this question.
7. What engineering approach is best for stopping or slowing down the strength loss, or should "inevitable" strength loss be incorporated in the design? Do trace elements incorporated in ettringite and other solid phases start to be released when the pH drops below some critical value? Extended field monitoring will help to answer this question. Ongoing laboratory research on trace element incorporation in ettringite should also examine this question carefully.
8. Are there chemical approaches that might be considered to adjust or "optimize" the phase chemistry to encourage growth of cement-forming minerals (e.g. calcium-silicate-hydrate), and minimize the growth of undesirable minerals (e.g. thaumasite). Fly ash addition to FBC ash might serve as a model for additional laboratory studies with LIMB ash.

APPENDIX A

PRELIMINARY HELP MODEL RESULTS

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Several computer models are available to partition the hydrologic inputs into the various outputs and storage components of the hydrologic cycle. The Hydrologic Evaluation of Landfill Performance (HELP) model is one such model and was used to estimate leachate production at the LIMB site. HELP was developed to estimate leaching from landfill facilities [Schroeder, et al., 1984(a)(b)]. The model computes runoff by the Soil Conservation Service (SCS) runoff curve number method. Evapotranspiration is computed by the modified Penman method. Percolation is determined by applying Darcy's equation for saturated flow with modifications for unsaturated conditions. The model uses climatologic and design input data in the form of daily rainfall, mean monthly temperatures, mean monthly solar radiation, leaf area indices, soil characteristics, and design specifications to perform a sequential daily analysis to determine runoff, evapotranspiration, and percolation. An important caveat in the model is the assumption that the substrate is an isotropic, unfractured medium. In a natural geologic setting, the substrate will not be uniform and may contain fissures or pore structures that would alter the idealized flow modeled in the hypothetical cases. Fractures and pore structures could result in faster moisture movement in the substrate. Field investigations have demonstrated this deviation from ideality (Groenewold, et al., 1983).

The model was executed for several design scenarios of the test cells and the assumptions utilized are included in Table A-1. A portion of the monitoring schedule will take place when waste is exposed at the surface. Case 1 simulates an unvegetated, 8-foot, horizontal layer of LIMB waste underlain by native soils. Case 2 represents a 2-foot soil layer, underlain by 8 feet of LIMB waste, all overlying the native soils. Case 3 simulates the same design in Case 2; however, the soil layer was compacted to 95% Proctor dry density. Data for the soil were taken from the documentation within the HELP model and based on Soil Conservation Service data (1970); data for waste characteristics were obtained from Radian's files.

TABLE A-1. ASSUMPTION APPLIED WITH THE HELP MODEL TO THREE DESIGN SCENARIOS
AT THE OHIO-LIMB SITE (YEARS MODELED--1974-1978)

Soil/Waste/Rock Properties	Compacted		Waste	Native Soil
	Cover Soil	Cover Soil		
Thickness (inches)	24	24	96	96
Porosity (vol/vol)	0.53	0.46	0.63	0.59
Field Capacity (vol/vol)	0.42	0.37	0.58	0.50
Wilting Point (vol/vol)	0.22	0.22	0.49	0.36
Hydraulic Conductivity (in/hr)	0.3300	0.0165	0.0011	0.0410
Evap. Coefficient [mm/(day) ^{0.5}]	5.0	3.1	3.1	4.2

SEQUENCE OF STRATA

The meteorological data used for the simulation are from Cleveland, Ohio which has approximately 37 inches of rainfall as compared to about 34.5 inches in Lorain County (Soil Conservation Service, 1970). However, the evaporation rates in both areas are comparable with similar mean annual temperatures of 50°F.

The computer simulations were performed under near-level conditions due to limitations of the HELP model. The effective grade of the finished landfill slopes will be a 3 to 1 (horizontal to vertical) slope which will dramatically increase the runoff component.

Results of computer simulations are contained in Table A-2. Case 1 results show that only 1.3% of the available precipitation is expected to percolate into the exposed waste and underlying soil during the five years modeled. The low hydraulic conductivity of the waste and the poor vegetation results in relatively high percentages of runoff in the hydrologic output. Runoff and evapotranspiration percentages are roughly equal (49%).

Case 2 incorporates an uncompacted 2-foot soil cover on the landfill with fair range grass vegetation. Geotechnical investigations at the site report this soil has a silty clay loam texture and the underlying native soils have a silty loam texture. This type of cover soil and vegetative cover will provide an estimate of the greatest possible percolation into the waste layer. The results show 18% of the available precipitation will infiltrate the test cell. Evapotranspiration was the largest net loss in the hydrologic budget (76.2%), and runoff decreased to only 3.7% of the annual precipitation.

Case 3 is identical to Case 2, except that the soil layer was compacted to 95% of Proctor dry density. Compaction decreases the hydraulic conductivity and water holding capacity of the soil. Results of the computer simulation (Table A-2) illustrate that runoff is enhanced by the compaction treatment. Runoff increases to 17.7% of the annual rainfall. Evapotranspiration decreases slightly to 68% and remains the dominant hydrologic output. Percolation decreases slightly to 12.5%.

TABLE A-2. PARTITIONING OF HYDROLOGIC OUTPUTS FOR THREE DESIGN SCENARIOS
AT THE LIMB SITE (YEARS MODELLED--1974-1978)

	Percent of Hydrologic Unit		
	Case 1	Case 2	Case 3
Evapotranspiration	49.6	76.2	68.3
Runoff	49.1	3.7	17.7
Percolation	1.3	18.1	12.5

APPENDIX B

ALPHABETICAL LISTING OF ANALYTICAL PROCEDURES

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Table B-1
Analytical and Test Methods

B-3

<u>Test</u>	<u>Sample Type</u>	<u>Analytical Method</u>	<u>Comments</u>
Acid Dissolution	Soils/Waste	FGD Handbook, Volume 2	Precedes acid-soluble sulfur analysis
Acid-Soluble Sulfur	Soils/Waste	EPA 300.0	Ion chromatography; preceded by acid dissolution
Alkalinity	Wastes	ASTM D1067-70	Electrometric titration to OH, CO ₃ , and HCO ₃ endpoints
Ammonia	Groundwater/ Leachates	APHA-AWWA Standard Method 417	Distillation and nesslerization or titration
Arsenic	Leachates	EPA 206.2 or EPA 206.3	Hydride generation AAS
	Soils/Waste	EPA 206.2 or EPA 206.3	Hydride generation AAS preceded by sample digestion
ASTM Water Extraction	Soils/Waste	ASTM D 3987-81	
Atterberg Limits	Soils	ASTM D 4318-84	Liquid and plastic limits
Available Lime Index	Waste	ASTM C 25-81	
Bulk Density	Soils/Waste	Amer. Soc. of Agron.	Undisturbed Cores
Cadmium	Leachates	EPA 200.7 and EPA 213.2	ICAPES and graphite furnace AAS
	Soils/Waste	EPA 200.7 and EPA 213.2	ICAPES and graphite furnace AAS; preceded by sample digestion
Calcium Carbonate Equivalent	Soils/Waste	Amer. Soc. of Agron.	
Cation Exchange Capacity	Soils	Amer. Soc. of Agron.	
Chloride	Leachates	EPA 300.0	Ion chromatography
	Soils/Waste	EPA 300.0	Ion chromatography; preceded by sample digestion
Crystalline Species	Soils/Waste	Nonstandard	X-ray powder diffraction

Table B-1

(Continued)

Test	Sample Type	Analytical Method	Comments
Cyanide	Groundwater/ Leachates	EPA 335.2/335.3	Reflux distillation, alkaline absorption, colorimetry
Electric Conductivity	Leachates	ASTM D 1125-77 and EPA 120.1	
Elemental Analysis (Ag, Al, B, Ba, Be, Ca, Co, Cr, Cu, Fe, K, Mg, Mn, Mo, Na, Ni, Sb, Si, Sn, Sr, Ti, V, Zn)	Soils/Waste	EPA 200.7	Preceded by digestion
	Leachates	EPA 200.7	
Eh	Waters	ASTM D 1498-76	Solid-state electrode
EP Toxicity	Soils/Waste	EPA 1310	RCRA EP toxicity classification
Extractable Organic Compounds	Leachates/Waters	EPA 625	GC/FID, confirmation by GC/MS
Fluoride	Leachates	EPA 340.2	Specific ion electrode
	Soils/Waste	EPA 340.2	Specific ion electrode; preceded by sample extraction
Heat of Hydration	Soils/Waste	Modified ASTM C 110-85	Heat released upon addition of optimum moisture
Hydrofluoric Acid Digestion	Soils/Waste	Lim and Jackson, 1982	Precedes ICAPES and AAS elemental analyses
Lead	Leachates	EPA 200.7 and EPA 239.2	ICAPES and graphite furnace AAS
	Soils/Waste	EPA 200.7 and EPA 239.2	ICAPES and graphite furnace AAS; preceded by sample digestion
Loss on Ignition	Waste	ASTM C 114-81	
Major Oxides	Soils/Waste	ASTM C 114-81	

Table B-1

(Continued)

Test	Sample Type	Analytical Method	Comments
Mercury	Leachates	SW-846 Method 7470	Cold-vapor AAS
	Solids	SW-846 Method 7471	Cold-vapor AAS, preceded by sample digestion
Moisture Content	Soils/Waste	ASTM D 3173-73	
Optimum Moisture/Maximum Dry Density	Solids	ASTM D 698-78	Optimum moisture content at maximum dry density
Nitrate	Leachates	Modified EPA 300.5	Ion chromatography
Nitric Acid Digestion for Graphite Furnace AAS	Leachates	SW-846 Method 3020	Precedes graphite furnace AAS
Nitric Acid Digestion for ICAPES	Leachates	SW-846 Method 6010	Precedes ICAPES
Organic Acids	Leachates/Waters	Nonstandard	GC/FID
Particle Microchemistry	Soils/Waste	Nonstandard	SEM/EDS
Particle Morphology	Soils/Waste	Nonstandard	Scanning electron microscopy
Particle Size Distribution	Soils/Waste	ASTM D 422-63	
Particulate Specific Gravity	Soils/Waste	ASTM D 854-58	
Percent Organic Matter	Waste	Walkley-Black Procedure	Reference: Agronomy, Methods of Soil Analysis, No. 9, Part I. Physical and Mineralogical Methods. 1986
Permeability	Soils/Waste	Modified Corps of Engineers Manual EM 1110-2-1906	
pH	Leachates	ASTM D 1293-65	

Table B-1

(Continued)

Test	Sample Type	Analytical Method	Comments
Phenols	Leachates/Waters	SW-846 Method 8040	GC/FID
Radionuclides	Waters/Leachates	APHA-AWWA Standard Methods, ASTM D 1890-66, ASTM D 1943-66	
Selenium	Leachates	EPA 270.2 or EPA 270.3 and EPA 200.7	Promotional and scintillation counters
	Soils/Waste	EPA 270.2 or EPA 270.3 and EPA 200.7	Hydride generation AAS and ICAPES
Sodium Carbonate Fusion	Solids	Bock's Handbook	Precedes boron analysis
Specific Gravity	Soils/Waste	ASTM D 85458	Use alternate displacement fluid
Sulfate	Leachates	EPA 300.0	Ion chromatography Titration
Sulfide	Waters/Leachates	Standard Method 427D	
Sulfur Forms	Waste	ASTM D 2492	
Surface Area	Soils/Waste	BET	
Total Dissolved Solids	Waters	EPA 160.1	
Total Suspended Solids	Waters	Standard Method 209 C	
Total Chromatographable Organics	Waste	EPA 624-625	
Triaxial Strength	Soil/Waste	ASTM D 2850	
Unconfined Compressive Strength	Solids	ASTM D 2166	
Water Dissolution	Solids	Nonstandard	Precedes water-soluble species analysis

Table B-1

(Continued)

Test	Sample Type	Analytical Method	Comments
Water-Soluble Carbonate	Solids	Nonstandard	NDIR; preceded by water dissolution
Water-Soluble Chloride	Solids	EPA 300.0	Ion chromatography; preceded by water dissolution
Water Soluble Fluoride	Solids	EPA 340.2 or EPA 300.0	Ion specific electrode or ion chromatography preceded by water dissolution
Water-Soluble Sulfate	Solids	EPA 300.0	Ion chromatography; preceded by water dissolution
Water-Soluble Sulfite	Solids	ASTM D 1339-72	Iodine-thiosulfate titration; preceded by buffer dissolution

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APPENDIX C

X-RAY DIFFRACTION PATTERNS FROM ASH AND SOIL ANALYSES

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6.1.1.*

APPENDIX C-1

SEM Images of Solid Waste

*Back up
1/1/12*

Figure C-1-1. SEM Image of Unconditioned LIMB Ash OHASH-1, North Cell

Figure C-1-2. SEM Image of Unconditioned LIMB Ash OHASH-1, North Cell

Figure C-1-3. SEM Image of Conditioned LIMB Ash OHASH-2, North Cell

Figure C-1-4. SEM Image of Conditioned LIMB Ash OHASH-2, North Cell

Figure C-1-5. SEM Image of Unconditioned LIMB Ash OHASH-3, South Cell

Figure C-1-6. SEM Image of Unconditioned LIMB Ash OHASH-3, South Cell

Figure C-1-7. SEM Image of Conditioned LIMB Ash OHASH-4, South Cell

Figure C-1-8. SEM Image of Conditioned LIMB Ash OHASH-4, South Cell

Figure C-1-9. SEM Image of 1st Quarter LIMB Core Sample OHNT1-3 Showing Gypsum and Ettringite Mineralization, North Cell at 2-3 ft.

Figure C-1-10. SEM Image of 1st Quarter LIMB Core Sample OHNT8-1 Showing Ettringite Mineralization on Ash grains, North Cell at 0-1 ft.

C-1-11. SEM Image Enlargement of OHNT8-1 Showing Cluster of Ettringite Crystals

Figure C-1-12. SEM Image of 1st Quarter LIMB Core Sample OHNT8-5 Showing Fractured Surface of SEM Plus, Sough Cell at 4-5 ft.

Figure C-1-13. SEM Image Enlargement of OHNT8-5 Showing Deformed Ettringite Crystals in Pore Area

Figure C-1-14. SEM Image of 3rd Quarter LIMB Core Sample 90FEBOH2-2 Showing Gypsum Dissolution Along Fracture Face, North Cell at 1-2 ft.

Figure C-1-15. SEM Image of 90FEBOH2-2 Showing Extensive Ettringite Development On and Between Ash Grains

Figure C-1-16. SEM Image of 3rd Quarter LIMB Core Sample 90FEBOH3-2 Showing Ettringite Development Into Pore Throats, South Cell at 1-2 ft.

Figure C-1-17. SEM Image of 3rd Quarter LIMB Core Sample 90FEBOH3-4 Showing Effect of Grain Packing on Strength, South Cell at 3-4 ft.

Figure C-1-18. SEM Image (500X) of Yr. 1 LIMB Core Sample 90AUGOH1-4 Showing Compact Material With 38% Et Plus Th, North Cell at 3-4 ft.

Figure C-1-19. SEM Image (2000X) of Yr. 1 LIMB Core Sample 90AUGOH1-6 With 58% Et Plus Th, North Cell at 5-7 ft.

Figure C-1-20. SEM Image (1500X) of Yr. 1 LIMB Core Sample 90AUGOH3-2 Showing Highly Mineralized, Hard, Low Permeability Material, South Cell at 1-2 ft.

Figure C-1-21. SEM Image (500X) of Yr. 1 Core Sample 90AUGOH5-2 Showing Extensive Mineralization on Ash Grains, South Cell at 1-2 ft.

Figure C-1-22. SEM Image (200X) of Yr. 1 Core Sample 90AUGOH6-1 Showing Macrofracture Lined with Gypsum, South cell at 1-2 ft.

Figure C-1-25. SEM Image of Yr. 2 Core Sample 91AUGOH8-3 Showing Hard, Brittle Material With Extensive Mineralization, North Cell at 2-3 ft.

Figure C-1-26. SEM Image of Yr. 2 Core Sample 91AUGOH8-5 Showing Et Inside Cavity and Weathered Material Outside, North Cell at 4-5 ft.

Figure C-1-27. SEM Image of Yr. 2 Core Sample 91AUGOH8-9 Showing Low Strength, Highly Permeable Material with Et and Th Mineralization, North Cell at 8-9 ft.

Figure C-1-28. SEM Image Enlargement (5000X) of 91AUGOH8-9 Showing Thaumastite Crystals in Pore Area

Figure C-1-29. SEM Image of Yr. 2 Core Sample 91AUGOH2-2 Showing Extensive Thaumassite Mineralization of Ash Grains, South Cell at 1-2 ft.

Figure C-1-30. SEM Image Enlargement (5000X) of 91AUGOH2-2 Showing Thaumassite Microfabric

Figure C-1-31. SEM Image (50X) of Yr. 2 Core Sample 91AUGOH4-4 Showing Mineralized Fracture on Surface of SEM Plug, South Cell at 3-4 ft.

Figure C-1-32. SEM Image Enlargement of Fracture in 91AUGOH4-4

Figure C-1-33. SEM Image (44X) of Yr. 3 Core Sample 92AUGOH7-5 Showing SEM Plug Surface of Low Strength Material, North Cell at 4-5 ft.

Figure C-1-34. SEM Image Enlargement (700X) of 92AUGOH7-5 Showing Th Mineralization of Top Grain and Et Below

Figure C-1-35. SEM Image Enlargement(2000X) of Ettringite Crystals in 92AUGOH7-5

Figure C-1-36. SEM Image Enlargement (2000X) of Thaumasite Crystals in 92AUGOH7-5

Figure C-1-37. SEM Image of Yr. 3 Core Sample 92AUGOH7-7.5 Showing Friable Material With Weathered Minerals, North Cell at 7-8 ft.

Figure C-1-38. SEM Image Enlargement (4490X) of 92AUGOH7-7.5 Showing Mineral Weathering

Figure C-1-39. SEM Image of Yr. 3 Core Sample 92AUGOH7-9.5 Showing SEM Plug Surface of Hard, Fractured Material, North Cell at 9-10 ft.

Figure C-1-40. SEM Image Enlargement (220X) of 92AUGOH7-9.5 Showing Fracture With Gypsum Mineralization

Figure C-1-41. SEM Enlargement (500X) of 92AUGOH7-9.5 Showing Extensive Ettringite Mineralization

Figure C-1-42. SEM Image (44X) of Yr. 3 Core Sample 92AUGOH8-3.5 Showing SEM Plug Surface of Low Strength, High Permeability Material, North Cell at 3-4 ft.

Figure C-1-43. SEM Image Enlargement (500X) of 92AUGOH8-3.5 Showing Dissolution of Calcite Area

Figure C-1-44. SEM Image Enlargement (2000X) of 92AUGOH8-3.5 Showing New Ettringite Growth

Figure C-1-45. SEM Image of Yr. 3 Core Sample 92AUGOH8-7.5 Showing Typical Mineralization On and Between Ash Grains, North Cell at Depth of 7-8 ft.

Figure C-1-46. SEM Image Enlargement (4490X) of 92AUGOH8-7.5 Showing Microporosity of Hard, Brittle Material

Figure C-1-47. SEM Image of Yr. 3 Core Sample 92AUGOH8-10 Showing Pore Lined With Th Surrounded by Et Mineralization of Ash Grains, North Cell at 9-10 ft.

Figure C-1-48. SEM Image Enlargement (4490X) of 92AUGOH8-10 Showing Fabric of Th and Et

Figure C-1-49. SEM Image of Yr. 3 Core Sample 92AUGOH1-3.5 Showing SEM Plug Surface of High Strength, Massive Material, South Cell at 3-4 ft.

Figure C-1-50. SEM Image Enlargement (2000X) of 92AUGOH1-3.5 Showing Weathered Calcium Silicate Grains

Figure C-1-51. SEM Image Enlargement (1000X) of 92AUGOH1-3.5 Showing Weathering in Area of Pore Lined With Et

Figure C-1-52. SEM Image Enlargement (2000X) of 92AUGOH1-3.5 Showing Etching of Secondary Gypsum

Figure C-1-53. SEM Image of Yr. 3 Core Sample 92AUGOH1-5.5 Showing Permeability Material with Extensive Thaumasite Mineralization of Ash Grains and Pores, South Cell at 4-5 ft.

Figure C-1-54. SEM Image Enlargement (2000X) of 92AUGOH1-3.5 Showing Microfabric of Thaumasite Mineralization

Figure C-1-55. SEM Image of Yr. 3 Core Sample 92AUGOH1-9 Showing Low Strength Material with Et and Th Mineralization On and Between Ash Grains, South Cell at 8-9 ft.

Figure C-1-56. SEM Image (44X) of Yr. 3 Core Sample 92AUGOH4-3.5 Showing SEM Plug Surface of Low Strength, Low Permeability Material with Holes and Cracks, South Cell at 3-4 ft.

Figure C-1-57. SEM Image Enlargement (1640X) of 92AUGOH4-3.5 Showing Weathering of Material Outside a Cenosphere Cavity Filled With Ettringite

Figure C-1-58. SEM Image Enlargement (1120X) of 92AUGOH4-3.5 Showing Gypsum Lined Crack and Weathered Exterior of Surrounding Material

Figure C-1-59. SEM Image (44X) of Yr. 3 Core Sample 92AUGOH4-6 Showing Crack in SEM Plug Surface of low Strength, Low Permeability Materials, South Cell at 5-6 ft

Figure C-1-60. SEM Image Enlargement (510X) of 92AUGOH4-6 Showing Thaumassite Mineralization Along Crack

Figure C-1-61. SEM Image (28X) of Yr. 3 Core Sample 92AUGOH4-8 Showing Abundance of Fractures in SEM Plug Surface of Very Low Strength Material, South Cell at 7-8 ft

Figure C-1-62. SEM Image Enlargement (510X) of 92AUGOH4-8 Showing Gypsum Mineralization Along Fracture

Figure C-1-63. SEM Image Enlargement (500X) of 92AUGOH4-8 Showing Gypsum, Ettringite, and Thaumasite Mineralization

Figure C-1-64. SEM Image Enlargement (2000X) of 92AUGOH4-8 Showing Details of Thaumasite Mineralization

APPENDIX C-2

XRD Patterns for Ash Analyses

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back*

OHIO LIMB SITE SOLID WASTE MINERALOGY

I. DRY SOLID WASTE

A composite of two materials:

Coal Ash: Typical ash phases for bituminous coal: Glass plus Quartz (SiO_2), Mullite ($\text{Al}_6\text{Si}_2\text{O}_{13}$), hematite (Fe_2O_3) and minor magnetite (Fe_3O_4). The crystalline phases are generally considered to be inert, but the glass can undergo pozzolanic reactions under the high-pH conditions produced by dissolved $\text{Ca}(\text{OH})_2$.

Scrubber By-products:

Anhydrite, CaSO_4 from reaction of CaO , SO_2 and O_2 in LIMB:

Lime, CaO (unused sorbent); also some hydrated lime (portlandite, $\text{Ca}(\text{OH})_2$) from contact with moisture on handling:

Calcite, CaCO_3 . Unused limestone or calcite that has formed by carbonation (reaction with CO_2 in air) of lime or portlandite:

OHIO LIMB SITE SOLID WASTE MINERALOGY

II. CONDITIONED SOLID WASTE

Conditioning consists of moistening waste to improve handling and minimize dusting. Self-hardening hydration reactions occur after moisture is added:

1. In a reaction similar to that in plaster, anhydrite reacts to form gypsum:

2. A high-pH environment is induced by the presence of free and hydrated lime. In saturated $\text{Ca}(\text{OH})_2$, pH is ca. 12.5. High-pH solutions solubilize some Al from the glassy portion of the coal ash, which reacts with Ca, SO_4 and H_2O to form ettringite:

The high-pH environment may also induce pozzolanic reactions with the glass component of the coal ash to yield some of the x-ray amorphous C-S-H (calcium-silicate-hydrate) phases characteristic of hydrated portland cement.

X-RAY DIFFRACTION MINERALOGY OF OHIO LIMB ASH SAMPLES

Sample	wt% Mineral by XRD											SUM
	Gp	Ah	Mu	Qz	Et	Hm	Cc	Pl	Sp	Lm	Pc	
North cell												
OHASH 1		14.8	5.0	2.8		3.4	5.9	1.6	8.7	11.5		53.8
OHASH 2	8.1	0.9	6.6	3.8		4.6	5.0	6.2	4.2			39.4
OHLY16-1	5.7	1.7	6.1	3.9	29.6	4.6	7.4		4.2			63.3
OHLY16-4	4.3	2.7	4.4	3.1	23.4	4.7	6.7		4.2			53.6
OHLY16-6	3.9	1.0	3.8	3.1	20.7	3.5	8.1		3.0			47.2
South cell												
OHASH 3		14.0	8.1	4.0		5.1	3.9	1.6	9.8	7.7		54.2
OHASH 4	6.8	0.8	6.1	3.3	9.2	4.7	5.0	5.1	3.7			44.8
OHLY8-1	5.4	1.0	7.4	4.9	17.3	6.1	4.6		5.5			52.2
OHLY8-4	7.6	1.1	5.6	3.7	17.8	5.4	7.7		3.5			52.5
OHLY8-7	4.9	1.5	4.6	3.4	19.1	4.7	7.0		4.2			49.5
OHNT1-2	8.2	1.5	4.9	7.3	16.5	4.2	7.0		3.8			53.3
OHNT1-3	6.5	1.4	6.2	4.4	12.5	4.2	9.3		3.5			47.9
OHNT1-5	10.5	1.6	5.0	3.6	20.9	4.2	12.2		3.8			61.9
OHNT8-1	6.0	1.5	4.5	2.7	26.8	3.9	8.1		3.6			57.2
OHNT8-3	10.0	3.1	5.9	3.7	22.3	4.9	10.5		4.5			64.9
OHNT8-5	10.0	1.6	5.3	4.0	29.9	4.5	12.6		3.5			71.4

XRD Mineral Key:

ANHYDRITE	Ah	CaSO ₄
CALCITE	Cc	CaCO ₃
ETTRINGITE	Et	Ca ₆ Al ₂ (SO ₄) ₃ (OH) ₁₂ ·26H 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

ID: OHASH 2
File: OHASH2.MDI

Scan: 5-55/.02/2/#2501, Anode:CU

Zero=0.0

ID: FEBOH2-8
File: FEBOH28.MDI

Scan: 5-55/.025/2/#2001, Anode:CU

Zero=0.0

ID: AUGOH3-4
File: AUGOH34.MDI

Scan: 5-55/.025/1/#2001, Anode:CU

Zero=0.0

ID: 91AUGOH8-5 ASH
File: 91AGOH85.MDI

Scan: 5-65/.025/1/#2401, Anode:CU

Zero=0.0

ID: 92 August Ohio 8 - 3.5 Ash

File: 92AO8-35.MDI

Scan: 5-55/.025/2/#2001, Anode:CU

Zero=0.0

ID: OHASH 4

File: OHASH4.MDI

Scan: 5-55/.02/2/#2501, Anode:CU

Zero=0.0

ID: MAYOH4-4

File: MAYOH44.MDI

Scan: 5-55/.025/2/#2001, Anode:CU

Zero=0.0

ID: AUGOH5-3
File: AUGOH53.MDI

Scan: 5-55/.025/1/#2001, Anode:CU

Zero=0.0

ID: 91AUGOH4-3
File: 91AOH43.MDI

Scan: 5-55/.025/1/#2001, Anode:CU

Zero=0.0

OHASHI 4/ 5/90 S= .02 T= 2.0 OHIDASH 1

OHASH2 4/ 1/90 S= .02 T= 2.0 OHIOASH 2

OHASH3 4/12/90 S= .02 T= 2.0 OHIOASH 3

OHASH4 4/17/90 S= .02 T= 2.0 OHIDASH 4

OHLV16 4/24/90 S= .02 T= 2.0 OHLV16-1

OHLV16 4/24/90 S= .02 T= 2.0 OHLV16-4

ONLY16 4/25/90 S= .02 T= 2.0 ONLY16-6

OHLY81 1/ 1/80 S= .02 T= 2.0 OHLY8-1

OHLV84 4/22/90 S= .02 I= 2.0 OHLV8-4

OHLV87 4/23/90 S= .02 T= 2.0 OHLV8-7

OHNT12 6/27/90 S=.02 T= 2.0 OHNT1-2 ASH

OHNT13 5/17/90 S= .02 T= 2.0 OHNT1-3

OHNT15 5/17/90 S= .02 T= 2.0 OHNT1-5 ASH

OHNT81 6/15/90 S= .02 T= 2.0 OHNT8-1

OHNT83 6/15/90 S= .02 T= 2.0 OHNT8-3

OHNT85 5/17/90 S= .02 T= 2.0 OHNT8-5

OHLY89 4/17/90 S= .02 T= 2.0 OHLY8-9

OHLY81 4/18/90 S= .02 T= 2.0 OHLY8-11

Q1
 OHNT17 5/17/90 S=.02 T= 2.0 OHNT1-7 ASTH NORTH CELL 6-7'

APPENDIX C-3

XRD Patterns for Soil Analyses

OHIO LIMB SITE SOIL/SEDIMENT MINERALOGY

Core studied to date consisted of selected depths from OHLY 8, OHLY 16, OHMW 1, OHMW 4, OHMW 7, OHSS 2 and OHSS 4.

All samples studied to date had the following mineralogy in common:

Quartz, SiO_2 , as the dominant mineral

Feldspars: potassium feldspar, KAlSi_3O_8 and sodic plagioclase, $(\text{Na,Ca})(\text{Al,Si})_4\text{O}_8$.

Clay minerals: mica-illite, $\text{K}_{0.5}\text{Al}_2(\text{Al}_{0.5}\text{Si}_{3.5}\text{O}_{10})(\text{OH})_2 \cdot x\text{H}_2\text{O}$
kaolinite, $\text{Al}_4\text{Si}_4\text{O}_{10}(\text{OH})_8$

Carbonates, calcite (CaCO_3) and dolomite ($\text{CaMg}(\text{CO}_3)_2$), were present in all OHMW 7 samples. Carbonates were also detected in at least one sample from OHLY 11, OHLY 16, and OHSS 4.

Gypsum, $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$, was noted in several samples. The sulfate source could be associated with oxidizing-hydrating pyrite from the sediment's parent material black shale. The calcium source could be the carbonates:

Clay mineral abundance is greater at depth, as expected with the approach to the black shale parent material.

MINERALOGICAL CHARACTERIZATION OF OHIO SOILS

by

K.E. Eylands, J. Crashell and R.A. Kuhnel

Abstract

21 soil samples have been examined by SEM/EPMA in order to establish the mineralogical composition. About 5,000 chemical analyses were interpreted in terms of mineral phases. The presence of mineral phases in submicroscopic particles and common intimate intergrowths between coexisting minerals impair the quantification. A special computer program has been developed for processing of analyses of impure (partially intergrown) minerals.

Samples

All soil samples from several wells (MW-7, MW-1 and MW-4 plus four soil samples labeled SS) were mounted in the original state in liquid epoxy resin, cut and subsequently polished with alumina. During the polishing, some fine fractions (namely clay minerals and iron oxi-hydroxides were washed out in contact with water so that the polished surface was partially depleted for some mineral phases. Because of that, the polished surface was pitted and relief of particles became more pronounced.

Techniques and instrumentation

Spot chemical analysis include figures on 12 oxides. Analyses were carried out by means of SEM/JEOL equipment by means of TRACOR energy dispersive system with BENCE-ALBEE corrections. 30 sec time of counting was applied. Normative data were considered for computer aided recalculations

Because of possible presence of swelling clay minerals, all soil samples were tested by "Benzidine test". The results proven the presence of swelling clay minerals - smectites in majority of examined samples. The presence of smectites explains relatively high CEC values which in some cases exceeds 20 meq/100g soil sample. Results of the benzidine test are shown in Appendix B.

Several electron microscope photomicrographs are applied in order to demonstrate the peculiar multiphase soil aggregates (see appendix C).

Mineralogy

Soil samples consist of the following groups of minerals:

- (1) Detritic silica and silicates
QUARTZ (qz) + PLAGIOCLASES (pg) + K-FELDSPAR (Kf)
- (2) Clay minerals (detritic and newly formed)
ILLITE (I/mi) + KAOLINITE (k) + SMECTITES (swelling clay minerals)
- (3) Carbonates (usually secondary)
CALCITE (c) + DOLOMITE (do)/ANKERITE + SIDERITE (sd)
- (4) Accessory minerals (detritic or secondary*)
PYRITE (py) + ILMENITE (il) + HEMATITE/GOETHITE (he/go) + ZIRCON (zr) + GYPSUM (gy) + MONAZITE (mo) + RUTILE/ANATASE (ru)

Beside the inorganic crystalline mineral phases, soils usually contain some amorphous phases, inorganic alophane-like (Si+Al-rich) phases and also organic matter. With regard to relatively high CEC values and dark colors of the soils, it is expected that amorphous phases are present in minor quantities.

Mode of occurrences

In the soil samples, mineral phases vary in proportions and modes of occurrence. Because of different origin, coexisting minerals show different features and different mutual interrelations. Detritic minerals are usually coarser fragments of minerals from the parent rocks, they are worn and often deformed. Secondary,

newly formed minerals occur often in voids at the surface of primary minerals. Crystallites of these autigenic minerals are well developed forming reaction rims and crusts (e.g. clay minerals which replace feldspars) in contrast with the mechanical coating of primary constituents by adjacent fine detritic particles.

The following table summarizes the mode of occurrence of minerals present in the examined soil samples:

Mineral	Mode of occurrence
QUARTZ	irregular fragments of larger crystals, angular up to rounded shapes, often coated with detritic fine particles (clay minerals and Fe-oxi-hydroxides ..
FELDSPARS	irregular fragments of larger crystals, subangular up to rounded, often overgrown with secondary clay minerals due to the weathering
CLAY MINERALS	powdery, submicroscopical aggregates stained dark by organic matter, coatings, reaction rims and patches
CARBONATES	irregular grains, nodules and coatings closely associated with clay minerals and plagioclases
HEMATITE/ GOETHITE	powdery reddish-brown pigment in aggregates, coatings and reaction rims, seldomly as minute nodules of irregular shapes
GYPSUM	usually elongated tiny crystals with coatings of clay minerals and/or iron oxi-hydroxides
PYRITE	subspherical aggregate of tiny cubic crystalites, so-called "framboidal pyrite"
ILMENITE RUTILE ZIRCON MONAZITE	minute crystals of fragments from the parent rocks
"LEUCOXENE"	powdery material ($\text{Fe}_2\text{O}_3 + \text{TiO}_2$) replacing ilmenite

From the above mentioned characteristics is clear, that mutual intergrowth of coexisting minerals in the examined soil samples is a common feature. Due to the aggregation of small particles and impregnation with epoxy resin, spot analyses often represent a composite grain. Using the stoichiometric formulae for recalculation, the majority of analyses do not lead to an explicit solution and the majority of analyses remain undefined. In order to overcome that problem, a new criteria have been defined for impure constituents as follows :

COLLATE PROGRAM "COLSOIL4.BAS"

(symbols of elements represent their oxides and numbers theirs weight %)

QUARTZ	: Si>90
CALCITE	: (Mn+Ca)>80 and Mg<5 and Fe<6
DOLOMITE	: (Si+Al)<10 and Ca<32 and Mg<21 and Fe<1
GYPSUM	: Ca<42 and 53<S<55.8
RUTILE	: Ti>80
PYRITE	: (Fe+S)>80
ZIRCON	: P>80 *)P is recorded and it interferes with Zr
ILMENITE	: (Ti+Fe)>80
HEMATITE/GOETHITE	: Fe>60

SIDERITE	: (Si+Al) < 10 and Fe < 60
ILLITE/MICA	: (Si+Al) < 80 and K < 8
SMECTITE	: (Si+Al) > 70 and (Fe+Mg) < 20 and (Na+K) < 3
KAOLINITE	: (Si+Al) > 70 and (Si-Al) < 20
K-FELDSPAR	: (Si+Al) > 80 and Fe < 10 and K > 8
PLAGIOCLASES	: (Si+Al) > 80 and (Ca+Na) > 3

All analyses which do not fit to some of these classes are summarized in the file "INTERGROWN" and their nature (intergrown 2 or more minerals) can be solved individually.

Accessory minerals : pyrite, rutile, ilmenite, zircon etc. are summarized in one file called "ACC". Their nature can be recognized according to the criteria.

Any analysis of composite with resin, which supplies lesser amount of c/s is avoided from the recalculation. The discrimination level of 5,000c/s was applied.

ANALYSES

Analyses of particular soil samples are summarized in appendices A 1 through 21.
Analyses of samples from different wells then in appendices A 22 through 24.

Figure 1. Example of clayey subspherical aggregates which consist of several mineral phases

Figure 2. Example of irregular aggregate geometry

Figure 3. A multiphase aggregate consisting of quartz, feldspar and pyrite in clayey matrix
Analysis 90-37-53

Figure 4. Flaky shape of micaceous clay mineral illite with a negative relief due to outwashing
Analysis 90-37-22

Figure 5. Quartz with positive relief due to its high polishing hardness and with a clayey rim
Analysis 90-37-34

Figure 6. Fragment of a potassium feldspar crystal
in clayey matrix. Analysis 90-37-24

Figure 7. Fragment of calcite crystal.
Analysis 90-37-154

Figure 8. Rounded dolomite partical
Analysis 90-37-16

Figure 9. Fragment of plagioclase crystal.
Analysis 90-37-145

Figure 10. Flat fragment of an ilmenite crystal
Analysis 90-37-29

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Figure 11. Aggregate of tiny pyrite crystallites
Analysis 90-37-23

Figure 12. Framboidal pyrite
Analysis 90-37-ex
C-79

OHMW 1

Down-gradient from
the South Cell

OHMW4

Down-gradient from
the South Cell

* sample not available for textural analysis

OHMW7

Up-gradient from
both cells

Continued on next page

OHMW7

Continued

DRY LIMS SOILS

SAMPLE NO.	SOIL	COLOR	YINSELL CODE #	TEXTURE	ACID TEST RESULTS	HARDNESS	DISTINGUISHING CHARACTERISTICS
1-13-1	3-4	DARK GRAY	7.5YR 5/5	CLUMPY; HOMOGENEOUS; VERY SMALL GRAINS. COHESIVENESS DUE TO CEMENTATION. SMALL WHITE, BLACK AND GRAY GRAINS DISTINGUISHABLE UNDER 40X. LUMPS ARE ANGULAR.	SMALLER LUMPS REACT BETTER THAN LARGER LUMPS	LUMPS CAN BE BROKEN WITH FINGERS BUT DOES NOT CRUMBLE.	VERY LITTLE OR NO SOIL PRESENT. TYPICAL GRAY ASH. SMALL, WHITE FRAGMENTS OF CARBONATE PRESENT (appr. 0.5mm)-PROBABLY UNREACTED LIMESTONE. SOME GLASSINESS OBSERVED IN LUMPS.
1-13-11	3-4	LIGHT BROWNISH GRAY	10YR 6/2	SLIGHTLY COHESIVE. Sm. DARK GRAINS (appr. 2mm) LARGER GRAY GRAINS (up to 6mm. shale?) BROWN LUMPS-GRAY ASH INSIDE.	REACTS VIOLENTLY WITH ACID	EASILY BROKEN WITH FINGERS.	MIXTURE OF ASH AND SOIL (CLAY + ROCK FRAGMENTS). POORLY CEMENTED. SHALE FRAGMENTS. LUMPS ARE ROUNDED. NO WHITE PIECES OF UNREACTED CARBONATE (PRESENT IN SOIL).
1-13-7	3	LIGHT YELLOWISH BROWN	10YR 6/4	POWDERY WHEN TOUCHED-LEAVES YELLOW-BROWN CHALKLIKE RESIDUE. FINE GRAINED SANDY TEXTURE. SOME SMALLER DARK GRAINS (<1mm) WITH LARGER GRAINS (SHALTY?-3mm)	LUMPS AND POWDER REACT.	LUMPS EASILY BROKEN WITH FINGERS.	SMALLER DILUTED "PIECES" (0.5mm) THAN DMW7-4. CLAYEY POWDER, SHALE FRAGMENTS, SANDGRAINS(sm).
1-13-2	3	PALE BROWN	10YR 6/3	LUMPY TEXTURE. YELLOW RUST GRAINS WITH SMALL DARK GRAINS AND LARGER GRAINS (QUARTZ?) YELLOWISH POWDER	LUMPS AND POWDER REACT.	CRUMBLES IN FINGERS	INDURATION DUE TO CARBONATE AND IRON. SIMILAR TO GEL16-7
1-13-4	3	PALE BROWN	10YR 6/3	FINE TEXTURE-CLAYEY POWDER. LUMPS COVERED IN THE POWDER-SOME ARE GRAY INSIDE. SHALE FRAGMENTS PRESENT-- (1mm SHINY BLACK SLIPPERY GRAINS)	REACTS	CRUMBLES IN FINGERS	SANDLIKE GRAINS PRESENT. SHALE FRAGMENTS NUMEROUS. OXIDATION OF IRON? SOME RUSTING APPEARS ON THE LUMPS (SCAN DONE ON THEM)
1-13-6	3	LIGHT OLIVE BROWN	2.5Y 5/4	SMALL BROWNISH TAN AND BLACK GRAINS HOMOGENEOUS IN SIZE WITH LARGER STONES (MANY-QUARTZ? 5mm).	REACTS	BREAKS APART WITH FINGERS. SOME NEED FINGERNAIL TO CRUMBLE.	SLIGHTLY COHESIVE. CLAYEY BROWN POWDER NUMEROUS SMALL SHALE FRAGMENTS. FELDSPAR AND/OR QUARTZ PRESENT (CAN BE VERIFIED IF NEEDED)
1-13-9	3	DARK GRAYISH BROWN	2.5Y 4/2	COHESIVE. MAJORITY OF GRAINS ARE DARK GRAYISH BROWN WITH A FEW YELLOWISH RUST COLOR GRAINS (5mm) AND A FEW SOFT REDDISH GRAINS (1mm) (SEPERATED).	REACTS	CRUMBLES EASILY IN FINGERS	COLOR CHANGE. WET-TOIST (DRY OUT DURING OBSERVATION) NOT MUCH IRON (RED). LARGE SAND STONES (QUARTZ? 0 TO 5mm).
1-13-14	3	DARK GRAY	5YR 4/1	PIECES ARE BECOMING INDURATED DARK SHINY GRAINS (SHALE) HOMOGENEOUS.	REACTS	MOST EASILY CRUMBLES IN FINGERS. SOME DARK LUMPS BREAK WITH TWEASERS.	CONSIST OF MANY SMALL LUMPS WITH SOME EASIER TO BREAK THAN OTHERS. SOME MOISTURE. RED SHALE PIECES.
1-13-10	3	GRAY-WET GRAY TO LT. GRAY- DRY.	10YR 5/1 10YR 6/1	MAJORITY IS A BROWNISH GRAY COLOR WITH SMALL DARK GRAINS (2mm) AND QUARTZ(?) STONES (5mm). HOMOGENEOUS. RED SHALE PIECES PRESENT.	REACTS	BROKEN WITH FINGERS. ORGANIC SHELL (DUE TO MICRO-ORGANISMS-ACTING/FEED). MOIST-INDURATED PIECES. DRY OUT DURING OBSERVATIONS. NOT POWDERY.	
1-13-11	3	DARK GRAY	10YR 4/1	VERY COHESIVE AND MOIST. A MIXTURE	REACTS	EASILY CRUMBLES IN	ORGANIC SHELL. SOME GRAINS HAVE

CN10 LINE SOILS

SAMPLE ID.	SOIL/ASH	COLOR	MUNSELL CODE #	TEXTURE	ACID TEST RESULTS	HARDNESS	DISTINGUISHING CHARACTERISTICS
		-WET GRAY-DRY	10YR 5/1	OF LIGHT GRAY AND BROWN GRAY LUMPS. SMALL DARK GRAINS (1mm).		FINGERS.	GRAYISH WHITE POWDER ON THEM. MOISTURE DUE TO SAMPLE BEING BELOW THE WATER TABLE.
JHMW7-25	S	GRAY	10YR 5/1	BROWNISH RED AND GRAY LUMPS. CLAY SIZE GRAINS.	REACTS.	EASILY BROKEN WITH FINGERS.	TYPICAL SOIL SAMPLE EXCEPT DRYER. SHALE FRAGMENTS SMALL. NOT MUCH CLUMPING-COULD BE DUE TO LACK OF MOISTURE.
JHMW4-1	S	DARK GRAYISH BROWN	10YR 4/2	MIXTURE OF QUARTZ(?) GRAINS 1mm MANY) YELLOW GRAINS(2mm FEW). AND RED GRAINS (.2mm GOETHITE). MOSTLY YELLOWISH TO MEDIUM BROWN CLAY SIZE GRAINS.	DOESN'T REACT.	EASILY CRUMBLES IN FINGERS.	PLANT REMAINS. SHALE FRAGMENTS NUMEROUS (1-2mm). NOT COHESIVE. GOETHITE CAN RUN.
JHMW4-3	S	DARK BROWN	10YR 3/3	PLENTY OF SAND (QUARTZ? 10mm) SOME SMALLER BLACK GRAINS (.25mm). COHESIVE. GRAINS ARE COVERED WITH A DARK BROWN CLAY.	DOESN'T REACT.	EASILY CRUMBLES IN FINGERS.	ORGANIC SHELL. MOIST AND NOT POWDERY. SANDY WITH YELLOW CLAY- LIKE LUMPS.
JHMW4-5	S	LIGHT OLIVE BROWN	2.5Y 5/4	SIMILAR TO JHMW4-3. PLENTY OF SAND WITH CLAY LIKE YELLOW LUMPS. SOME SHINY DARK GRAINS.	DOESN'T REACT.	EASILY CRUMBLES IN FINGERS.	MOIST, BUT NOT AS MOIST AS OTHER SAMPLES. COHESIVE ANGULAR SMALL PEBBLE SIZED PIECES. SOME CLAYS LEAVES OLIVE YELLOW POWDER ON HANDS
JHMW4-7	S	LIGHT YELLOWISH BROWN	2.5 6/4	SLIGHTLY COHESIVE. FINE GRAINED CLAY SIZED EXCEPT FOR LARGER SAND STONES (QUARTZ?). HOMOGENEOUS.	DOESN'T REACT.	CRUMBLES IN FINGERS.	DRY, CLAY SIZED GRAINS. HOMOGENEOUS
JHMW1-1	S	YELLOWISH BROWN	10YR 5/6	CLAY SIZED GRAINS. HOMOGENEOUS EXCEPT FOR LARGER DARK GRAINS (3mm QUARTZ?) SOME DARKER BROWN GRAINS COVERED WITH YELLOWISH-BROWN POWDER	DOESN'T REACT.	BREAKS APART IN FINGERS.	NOT AS COHESIVE AS THE OTHER SOILS- DRY. VERY SMALL SHALE-LIKE FRAGMENT
JHMW1-4	S	LIGHT BROWNISH GRAY	10YR 6/2	HOMOGENEOUS. CLAY SIZED GRAINS. GRAY AND WHITE-BROWN POWDER.	DOES NOT REACT.	BREAKS WITH FINGERS.	DRY. NOT COHESIVE. VERY SMALL SHALE FRAGMENTS. DISTINCT COLOR CHANGE FROM JHMW1-1.
JHMW1-8	S	OLIVE BROWN	2.5Y 4/4	MOSTLY BROWN AND YELLOWISH CLAY SIZED GRAINS WITH SOME BLACK GRAINS (<.5mm) AND SOME SMALL OFF WHITE GRAINS (<.5mm)	DOESN'T REACT.	CRUMBLES IN FINGERS.	COHESIVE. MOIST. GRAY LUMPS IN YELLOW/REDDISH BROWN SAND.
JHMW1-10	S	LIGHT BROWNISH GRAY	2.5Y 6/2	HOMOGENEOUS CLAY SIZED GRAINS SOME YELLOWER COLORED GRAINS.	DOESN'T REACT.	CRUMBLES IN FINGERS.	CHANGE IN COLOR AGAIN FROM YELLOW/ REDDISH BROWN TO GRAY. DRY-NOT COHESIVE. SOME HARD PIECES- INDURATED-BREAKS WITH FINGERNAIL.
JHMW1-12	S	OLIVE BROWN	2.5Y 4/4	CLAY SIZED GRAINS. SOME BROWN AND GRAY COLORED LUMPS WITH SOME SMALLER DARK COLORED SHINY GRAINS.	DOESN'T REACT.	CRUMBLES EASILY IN FINGERS.	MIXTURE OF TWO CLAY LIKE SOILS-GRAY AND BROWN. INTERMIXED WITH SOME RED CLAY. SOME OXIDIZED GRAINS.

OHIO LIME SOILS

ANAL. NO.	SOIL/ASH	COLOR	MUNSELL CODE #	TEXTURE	ACID TEST RESULTS	HARDNESS	DISTINGUISHING CHARACTERISTICS
134	3	BROWN	10YR 5/3	MOSTLY CLAY SIZED GRAINS-BROWN AND GRAY WITH VARIOUS COLORED GRAINS-SAND SIZE. SOME SMALLER SHINY BLACK GRAINS (.3mm).	DOESN'T REACT.	CRUMBLES IN FINGERS.	COHESIVE-CLAYEY. SIMILAR TO INCE2. SHALE FRAGMENTS.
172-7	5	PALE BROWN	10YR 7/4	HETEROGENEOUS LUMPS-CONGLOMERATE. LEAVES YELLOW POWDER ON FINGERS.	DOESN'T REACT.	DIFFICULT TO BREAK WITH HANDS, BUT CAN EASILY BE SCRATCHED WITH TWEEZERS.	THICK PRESENT. YELLOW POWDER.
171-7	3+4	SOIL-PALE BROWN ASH-GRAY	10YR 5/3 7.5YR N6/	ASH-SOME CRYSTALS(QUARTZ? GYPSUM?) SOIL-FINE GRAINED WITH RED AND WHITE SPECKS.	SOME SOIL AND ASH LUMPS REACT AND OTHERS DO NOT.	ASH-BREAKS IN FINGERS. SOIL-CRUMBLES IN	INDIVIDUAL TYPICAL ASH AND SOIL LUMPS.

OHIO - XRD

North Cell - soil

OHIO - XRD

North Cell - soil

OHIO - XRD

North Cell - soil

OHIO - XRD

South Cell - soil

OHIO - XRD

South Cell - soil

OHIO - XRD

South Cell - soil

OHIO - XRD

North Cell - soil

OHIO - XRD

South Cell - soil

OHSS2. 4/ 1/90 S= .02 I= 2.0 OHSS-2 South cell 6-7'

OHSS4. 4/ 1/90 S= .02 T= 1.0 OHSS-4 SOUTH CELL 6-7'

OHLY16 S/14/90 S= .02 T= 1.0 OHLY16-7 Q1 Soil. South cell 6-7'

Q1
 OHNT87 5/17/90 S = .02 T = 1.0 OHNT8-7 SOIL - SOUTH CELL S.S-6.5'

OHMW11 4/19/90 S= .02 T= 1.0 OHMW11-1

OHMW14 4/19/90 S= .02 T= 1.0 OHMW1-4

OHMM18 5/14/90 S=.02 T= 1.0 OHMM1-8

OHMM11 5/14/90 S=.02 T= 1.0 OHMM1-10

OHMM41. 4/19/90 S= .02 T= 1.0 OHMM4-1

OHM43 5/14/90 S= .02 T= 1.0 OHM4-3

OHMM45 5/14/90 S=.02 T= 1.0 OHMM4-5

OHNM47 5/14/90 S=.02 T= 1.0 OHNM4-7

OHMJ72 4/18/90 S= .02 T= 1.0 OHMJ7-2

OHMM74 4/20/90 S=.02 T= 1.0 OHMM7-4

QHNW76 6/29/90 S= .02 T= 1.0 QHNW7-6

OHMM79 5/10/90 S=.02 T= 1.0 OHMM7-9

OHM471 5/10/90 S= .02 T= 1.0 OHM47-14

OHMM72 5/10/90 S= .02 T= 1.0 OHMM7-20

OHNN72 5/10/90 S= .02 T= 1.0 OHNN7-25

APPENDIX D

CHEMICAL COMPOSITION OF INITIAL SOIL SAMPLES

*Back up K
1/1*

Table D-1

Initial Chemical Characterization of Soil From Ohio

		Site ID / Location ID							
		Sample ID							
		Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / OHMW01 OHMW01-001 0 - 1		OH / OHMW01 OHMW01-004 3 - 4		OH / OHMW01 OHMW01-008 7 - 8		OH / OHMW01 OHMW01-010 9 - 10	
		-----		-----		-----		-----	
ASTM									
Anions									
Chloride	mg/L	NA		5.2	(.02)	5.3	(.02)	2.4	(.02)
Nitrate-Nitrite as N	mg/L	NA		ND	(.03)	ND	(.03)	ND	(.03)
Sulfate	mg/L	NA		24	(.05)	18	(.05)	420	(.5)
Sulfite	mg/L	3.2	(.1)	4	(.1)	6	(.1)	3.2	(.1)
Elements by ICPEs or AA									
Aluminum	mg/L	NA		.27 @	(.2)	ND	(.2)	1.4	(.2)
Antimony	mg/L	NA		ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	NA		ND	(.005)	ND	(.005)	ND	(.005)
Barium	mg/L	NA		ND	(.01)	ND	(.01)	.026 @	(.01)
Beryllium	mg/L	NA		ND	(.002)	ND	(.002)	.0021 @	(.002)
Boron	mg/L	NA		ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	NA		ND	(1)	ND	(1)	ND	(1)
Calcium	mg/L	NA		5.5	(1)	3.1 @	(1)	77	(1)
Chromium	mg/L	NA		ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	NA		ND	(.01)	ND	(.01)	.16	(.01)
Copper	mg/L	NA		ND	(.02)	ND	(.02)	.065 @	(.02)
Iron	mg/L	NA		.29	(.04)	.31	(.04)	.92	(.04)
Lead	mg/L	NA		.012	(.002)	.013	(.002)	.0086 @	(.002)
Magnesium	mg/L	NA		2.5 @	(1)	ND	(1)	31	(1)
Manganese	mg/L	NA		ND	(.01)	ND	(.01)	1.2	(.01)
Molybdenum	mg/L	NA		ND	(.05)	ND	(.05)	ND	(.05)
Nickel	mg/L	NA		.062 @	(.02)	ND	(.02)	.42	(.02)
Potassium	mg/L	NA		ND	(3)	ND	(3)	13 @	(3)
Selenium	mg/L	NA		ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	NA		2.6 @	(1)	3 @	(1)	3.9 @	(1)
Silver	mg/L	NA		ND	(.01)	ND	(.01)	ND	(.01)

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

Table D-1
(Continued)

		Site ID / Location ID Sample ID Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / OHMW01 OHMW01-001 0 - 1		OH / OHMW01 OHMW01-004 3 - 4		OH / OHMW01 OHMW01-008 7 - 8		OH / OHMW01 OHMW01-010 9 - 10	
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ASTM, cont.									
Elements by ICPEs or AA, cont.									
Sodium	mg/L	NA		6.9	(1)	10	(1)	6.5	(1)
Strontium	mg/L	NA		.012 @	(.003)	.0076 @	(.003)	.11	(.003)
Thallium	mg/L	NA		ND	(.1)	ND	(.1)	ND	(.1)
Tin	mg/L	NA		ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	NA		ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	NA		.025 @	(.02)	ND	(.02)	.4	(.02)
Field measurements									
Conductivity	umhos/cm	100	(5)	100	(5)	95	(5)	765	(5)
pH	pH units	7.91	( )	6.46	( )	6.31	( )	3.44	( )
HF									
Elements by ICPEs or AA									
Antimony	mg/Kg	NA		ND	(49)	ND	(49)	ND	(55)
Arsenic	mg/Kg	87	(4.7)	100	(4.9)	88	(4.9)	140	(5.5)
Barium	mg/Kg	NA		360.5	(2.4)	402.1	(2.5)	428.6	(2.7)
Boron	mg/Kg	ND	(120)	ND	(120)	154 @	(120)	ND	(120)
Cadmium	mg/Kg	ND	(.24)	.42 @	(.24)	1.8	(.25)	ND	(.27)
Chromium	mg/Kg	NA		67.25	(2.4)	53.58	(2.5)	65.08	(2.7)
Cobalt	mg/Kg	NA		27.04	(2.4)	34.32	(2.5)	14.02	(2.7)
Copper	mg/Kg	NA		21.8 @	(4.9)	21.57 @	(4.9)	13.29 @	(5.5)
Lead	mg/Kg	15	(.95)	23	(.98)	15	(.98)	16	(1.1)
Lithium	mg/Kg	NA		18.53 @	(4.9)	26.59	(4.9)	36.08	(5.5)
Manganese	mg/Kg	NA		252.4	(2.4)	1957	(2.5)	162.6	(2.7)
Molybdenum	mg/Kg	NA		12.42 @	(12)	16.1 @	(12)	ND	(14)
Nickel	mg/Kg	NA		110.7	(4.9)	115.8	(4.9)	46.69	(5.5)

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

Table D-1
(Continued)

		Site ID / Location ID Sample ID Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / OHMW01 OHMW01-001 0 - 1		OH / OHMW01 OHMW01-004 3 - 4		OH / OHMW01 OHMW01-008 7 - 8		OH / OHMW01 OHMW01-010 9 - 10	
-----	-----	-----		-----		-----		-----	
HF, cont.									
Elements by ICPEs or AA, cont.									
Selenium	mg/Kg	NA		ND	(4.9)	ND	(4.9)	ND	(5.5)
Silver	mg/Kg	NA		ND	(2.4)	ND	(2.5)	ND	(2.7)
Strontium	mg/Kg	NA		74.93	(.73)	77.97	(.74)	83.44	(.82)
Tin	mg/Kg	NA		ND	(150)	ND	(150)	ND	(160)
Vanadium	mg/Kg	NA		121.9	(4.9)	111.4	(4.9)	108.2	(5.5)
Zinc	mg/Kg	NA		217	(4.9)	146.6	(4.9)	88.42	(5.5)
LIMB									
Elements by ICPEs or AA									
Aluminum	mg/Kg	73700	(410)	82400	(20)	67500	(20)	86200	(20)
Calcium	mg/Kg	4830 @	(2000)	2760 @	(2000)	3730 @	(2000)	3180 @	(2000)
Iron	mg/Kg	160000	(81)	29900	(79)	128000	(80)	25300	(80)
Magnesium	mg/Kg	5850 @	(2000)	6440 @	(2000)	5200 @	(2000)	5940 @	(2000)
Potassium	mg/Kg	21700 @	(6100)	24700 @	(6000)	20600 @	(6000)	25900 @	(6000)
Silicon	mg/Kg	237000	(2000)	312000	(2000)	268000	(2000)	320000	(2000)
Sodium	mg/Kg	4360 @	(2000)	4300 @	(2000)	4170 @	(2000)	4170 @	(2000)
Titanium	mg/Kg	4450	(100)	5620	(99)	4010	(100)	5880	(100)
N									
Bulk chemistry									
Cation exchange capacity	meq/100g	NA		10.0189	(.1)	9.64083	(.1)	11.34215	(.1)
Total inorganic carbon	mg CO3/g	10.0266	(.5898)	3.00798	(.5898)	2.3592	(.5898)	2.47716	(.5898)
Total organic carbon	%	NA		.16 @	(.1)	.22 @	(.1)	.11 @	(.1)

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

D2-3

Table D-1
(Continued)

Parameter	Units	Site ID / Location ID Sample ID		
		Beg. Depth - End Depth (ft.)		
		OH / OHMW01 OHMW01-001 0 - 1	OH / OHMW01 OHMW01-004 3 - 4	OH / OHMW01 OHMW01-008 7 - 8 OH / OHMW01 OHMW01-010 9 - 10
WDIS				
Anions				
Chloride, water soluble	mg/Kg	NA	ND	600
Fluoride, water soluble	mg/Kg	NA	16.5 @	22 @
Sulfate, acid soluble	mg/g as S	1.05	2.35	1.65
Sulfate, water soluble	mg/Kg	NA	700	NA
			(.02)	(.02)
			(6)	(6)
			(.025)	(.025)
			(.05)	(.05)
				240
				15 @
				NA
				3700
				(.02)
				(6)
				(.025)
				(.05)

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

Table D-1

(Continued)

		Site ID / Location ID							
		Sample ID							
		Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / OHMW04 OHMW04-001		OH / OHMW04 OHMW04-003		OH / OHMW04 OHMW04-005		OH / OHMW04 OHMW04-007	
		0 - 1		2 - 3		4 - 5		6 - 7	

ASTM									
Anions									
Chloride	mg/L	2.1	(.02)	2.7	(.02)	2.5	(.02)	3.7	(.02)
Nitrate-Nitrite as N	mg/L	21	(.3)	16	(.03)	3.9	(.03)	1.6	(.03)
Sulfate	mg/L	210	(.5)	97	(.25)	36	(.05)	180	(.25)
Sulfite	mg/L	1.6	(.1)	3.2	(.1)	1.6	(.1)	1.6	(.1)
Elements by ICPES or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Antimony	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Barium	mg/L	.055	(.01)	.04 @	(.01)	ND	(.01)	.011 @	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(1)	ND	(1)	ND	(1)	ND	(1)
Calcium	mg/L	70	(1)	32	(1)	7.9	(1)	26	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	.07 @	(.04)	.085 @	(.04)	.14 @	(.04)
Lead	mg/L	.0031 @	(.002)	ND	(.002)	.015	(.002)	.0057 @	(.002)
Magnesium	mg/L	10	(1)	4.7 @	(1)	3.3 @	(1)	19	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	ND	(.05)	ND	(.05)	ND	(.05)	ND	(.05)
Nickel	mg/L	.038 @	(.02)	.044 @	(.02)	.047 @	(.02)	.034 @	(.02)
Potassium	mg/L	5.3 @	(3)	ND	(3)	ND	(3)	4.9 @	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	3.4 @	(1)	2.8 @	(1)	2.9 @	(1)	1.5 @	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)

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

D2-5

D-7

Table D-1

(Continued)

		Site ID / Location ID Sample ID Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / OHMW04 OHMW04-001		OH / OHMW04 OHMW04-003		OH / OHMW04 OHMW04-005		OH / OHMW04 OHMW04-007	
		0 - 1		2 - 3		4 - 5		6 - 7	

ASTM, cont.									
Elements by ICPEs or AA, cont.									
Sodium	mg/L	4.6	@ (1)	4.3	@ (1)	5.5	(1)	15	(1)
Strontium	mg/L	.18	(.003)	.096	(.003)	.029	(.003)	.14	(.003)
Thallium	mg/L	ND	(.1)	ND	(.1)	ND	(.1)	ND	(.1)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	.037	@ (.02)	ND	(.02)	.023	@ (.02)	.022	@ (.02)
Field measurements									
Conductivity	umhos/cm	480	(5)	255	(5)	115	(5)	400	(5)
pH	pH units	5.44	()	5.21	()	6.01	()	6.02	()
HF									
Elements by ICPEs or AA									
Antimony	mg/Kg	ND	(50)	ND	(49)	ND	(50)	ND	(50)
Arsenic	mg/Kg	85	(5)	130	(5)	120	(5)	75	(5)
Barium	mg/Kg	447.7	(2.5)	308.3	(2.5)	434.5	(2.5)	436.8	(2.5)
Boron	mg/Kg	ND	(120)	ND	(120)	ND	(120)	160	@ (120)
Cadmium	mg/Kg	17	(2)	.27	@ (.25)	ND	(.25)	ND	(.25)
Chromium	mg/Kg	50.81	(2.5)	35.64	(2.5)	61.67	(2.5)	69.34	(2.5)
Cobalt	mg/Kg	36.21	(2.5)	17.81	(2.5)	25.42	(2.5)	23.99	(2.5)
Copper	mg/Kg	25.48	(5)	10.37	@ (4.9)	24.67	@ (5)	26.58	(5)
Lead	mg/Kg	13	(.99)	21	(.99)	13	(1)	12	(1)
Lithium	mg/Kg	32.27	(5)	20.17	@ (4.9)	22.73	@ (5)	42.61	(5)
Manganese	mg/Kg	4316	(2.5)	702.7	(2.5)	652.7	(2.5)	295.6	(2.5)
Molybdenum	mg/Kg	19.01	@ (12)	14.38	@ (12)	14.95	@ (13)	ND	(12)
Nickel	mg/Kg	122.1	(5)	73.18	(4.9)	92.03	(5)	82.85	(5)

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

D2-6

Table D-1
(Continued)

		Site ID / Location ID Sample ID Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / OHMW04 OHMW04-001		OH / OHMW04 OHMW04-003		OH / OHMW04 OHMW04-005		OH / OHMW04 OHMW04-007	
		0 - 1		2 - 3		4 - 5		6 - 7	

HF, cont.									
Elements by ICPES or AA, cont.									
Selenium	mg/Kg	ND	(5)	ND	(5)	ND	(5)	ND	(4.9)
Silver	mg/Kg	ND	(2.5)	ND	(2.5)	ND	(2.5)	ND	(2.5)
Strontium	mg/Kg	69.5	(.74)	105.8	(.74)	99.72	(.75)	91.97	(.75)
Tin	mg/Kg	ND	(150)	ND	(150)	ND	(150)	ND	(150)
Vanadium	mg/Kg	114.9	(5)	45.28	(4.9)	102.6	(5)	115.8	(5)
Zinc	mg/Kg	217.6	(5)	142.3	(4.9)	96.91	(5)	84.82	(5)
LIMB									
Elements by ICPES or AA									
Aluminum	mg/Kg	58700	(20)	50300	(20)	94100	(410)	110000	(390)
Calcium	mg/Kg	8770 @	(2000)	5970 @	(2000)	4300 @	(2000)	2770 @	(2000)
Iron	mg/Kg	38600	(81)	32200	(79)	53600	(81)	51700	(79)
Magnesium	mg/Kg	4500 @	(2000)	3960 @	(2000)	5900 @	(2000)	8240 @	(2000)
Potassium	mg/Kg	16900 @	(6100)	14600 @	(5900)	26100 @	(6100)	31200	(5900)
Silicon	mg/Kg	335000	(2000)	364000	(2000)	302000	(2000)	295000	(2000)
Sodium	mg/Kg	8240 @	(2000)	7800 @	(2000)	4410 @	(2000)	3520 @	(2000)
Titanium	mg/Kg	3550	(100)	3670	(99)	5280	(100)	5890	(99)
N									
Bulk chemistry									
Cation exchange capacity	meq/100g	18.90359	(.1)	10.96408	(.1)	24.57466	(.1)	14.17769	(.1)
Total inorganic carbon	mg CO3/g	3.65676	(.5898)	5.24922	(.5898)	4.92483	(.5898)	2.83104	(.5898)
Total organic carbon	%	1.5	(.1)	.62	(.1)	.18 @	(.1)	.16 @	(.1)

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

Table D-1

(Continued)

		Site ID / Location ID							
		Sample ID							
		Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / OHMW04 OHMW04-001		OH / OHMW04 OHMW04-003		OH / OHMW04 OHMW04-005		OH / OHMW04 OHMW04-007	
		0 - 1		2 - 3		4 - 5		6 - 7	

WDIS									
Acid or water soluble anions									
Chloride, water soluble	mg/L	NA		NA		NA		.761	(.1)
Sulfate, acid soluble	mg/g as S	NA		NA		NA		2.028	(.05)
Sulfate, water soluble	mg/L	NA		NA		NA		2.442	(.1)
Anions									
Chloride, water soluble	mg/Kg	160	(.02)	160	(.02)	170	(.02)	160	(.02)
Fluoride, water soluble	mg/Kg	17 @	(6)	15 @	(6)	17 @	(6)	16 @	(6)
Sulfate, acid soluble	mg/g as S	3	(.025)	1.95	(.025)	1.65	(.025)	2.6	(.025)

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

D2-8

D-10

Table D-1
(Continued)

		Site ID / Location ID							
		Sample ID							
		Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / OHMW07 OHMW07-002		OH / OHMW07 OHMW07-004		OH / OHMW07 OHMW07-006		OH / OHMW07 OHMW07-009	
		1 - 2		3 - 4		5 - 6		8 - 9	

ASTM									
Anions									
Chloride	mg/L	1.1	(.02)	1.2	(.02)	1.2	(.02)	1.1	(.02)
Nitrate-Nitrite as N	mg/L	ND	(.03)	.99	(.03)	ND	(.03)	ND	(.03)
Sulfate	mg/L	7.8	(.05)	8.3	(.05)	40	(.05)	400	(.5)
Sulfite	mg/L	8	(.4)	4	(.4)	.8 @	(.4)	.8 @	(.4)
Elements by ICPES or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	1.1	(.2)	ND	(.2)
Antimony	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Barium	mg/L	ND	(.01)	ND	(.01)	.017 @	(.01)	.021 @	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(1)	ND	(1)	ND	(1)	ND	(1)
Calcium	mg/L	10	(1)	12	(1)	19	(1)	110	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	.041 @	(.04)	.22	(.04)	1.4	(.04)	ND	(.04)
Lead	mg/L	.0023 @	(.002)	.0046 @	(.002)	.0034 @	(.002)	.0022 @	(.002)
Magnesium	mg/L	2.5 @	(1)	2.9 @	(1)	5	(1)	23	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	.013 @	(.01)	.094	(.01)
Molybdenum	mg/L	.064 @	(.05)	.055 @	(.05)	.1 @	(.05)	.085 @	(.05)
Nickel	mg/L	.047 @	(.02)	.037 @	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	ND	(3)	ND	(3)	3.4 @	(3)	7.6 @	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	2.3 @	(1)	2.7 @	(1)	5	(1)	1.6 @	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)

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

Table D-1

(Continued)

		Site ID / Location ID Sample ID Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / OHMW07 OHMW07-002		OH / OHMW07 OHMW07-004		OH / OHMW07 OHMW07-006		OH / OHMW07 OHMW07-009	
		1 - 2		3 - 4		5 - 6		8 - 9	

ASTM, cont.									
Elements by ICPEs or AA, cont.									
Sodium	mg/L	3.1	@ (1)	3.8	@ (1)	4.4	@ (1)	5.9	(1)
Strontium	mg/L	.026	(.003)	.036	(.003)	.067	(.003)	.42	(.003)
Thallium	mg/L	ND	(.1)	ND	(.1)	ND	(.1)	ND	(.1)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	ND	(.02)	.041	@ (.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	90	(5)	100	(5)	160	(5)	760	(5)
pH	pH units	8.34	()	8.13	()	7.77	()	7.52	()
HF									
Elements by ICPEs or AA									
Antimony	mg/Kg	ND	(51)	ND	(50)	ND	(49)	ND	(50)
Arsenic	mg/Kg	69	(5.1)	130	(5)	70	(4.9)	73	(5)
Barium	mg/Kg	388.1	(2.5)	328.8	(2.5)	379.27	(2.4)	385.32	(2.5)
Boron	mg/Kg	ND	(120)	ND	(120)	164	@ (120)	241	@ (120)
Cadmium	mg/Kg	ND	(.25)	.75	@ (.25)	ND	(.24)	ND	(.25)
Chromium	mg/Kg	49.02	(2.5)	43.6	(2.5)	51.46	(2.4)	51.49	(2.5)
Cobalt	mg/Kg	18	(2.5)	17.59	(2.5)	18.05	(2.4)	17.91	(2.5)
Copper	mg/Kg	14.75	@ (5.1)	16.31	@ (5)	14.88	@ (4.9)	15.71	@ (5)
Lead	mg/Kg	17	(1)	48	(2)	14	(.98)	16	(1)
Lithium	mg/Kg	32.07	(5.1)	28.21	(5)	33.41	(4.9)	34.82	(5)
Manganese	mg/Kg	615.9	(2.5)	1212	(2.5)	522.44	(2.4)	434.33	(2.5)
Molybdenum	mg/Kg	ND	(13)	14.61	@ (12)	ND	(12)	ND	(12)
Nickel	mg/Kg	80.53	(5.1)	93.81	(5)	92.93	(4.9)	98.26	(5)

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

D2-10

Table D-1

(Continued)

		Site ID / Location ID							
		Sample ID							
		Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / OHMW07 OHMW07-002		OH / OHMW07 OHMW07-004		OH / OHMW07 OHMW07-006		OH / OHMW07 OHMW07-009	
		1 - 2		3 - 4		5 - 6		8 - 9	

HF, cont.									
Elements by ICPEs or AA, cont.									
Selenium	mg/Kg	ND	(5.1)	ND	(5)	ND	(4.9)	ND	(5)
Silver	mg/Kg	ND	(2.5)	ND	(2.5)	ND	(2.4)	ND	(2.5)
Strontium	mg/Kg	131.8	(.76)	99.62	(.75)	140.49	(.73)	150.25	(.75)
Tin	mg/Kg	ND	(150)	ND	(150)	ND	(150)	ND	(150)
Vanadium	mg/Kg	70.47	(5.1)	60.58	(5)	73.17	(4.9)	71.14	(5)
Zinc	mg/Kg	93.73	(5.1)	176.3	(5)	87.07	(4.9)	109.95	(5)
LIMB									
Elements by ICPEs or AA									
Aluminum	mg/Kg	77800	(390)	77200	(20)	75700	(390)	74700	(390)
Calcium	mg/Kg	46600	(2000)	51600	(2000)	55200	(1900)	63400	(1900)
Iron	mg/Kg	41000	(78)	43600	(80)	47800	(78)	41900	(77)
Magnesium	mg/Kg	13500	(2000)	14800	(2000)	14900	(1900)	17000	(1900)
Potassium	mg/Kg	26900 @	(5900)	26400 @	(6000)	25800 @	(5800)	25300 @	(5800)
Silicon	mg/Kg	280000	(2000)	286000	(2000)	285000	(1900)	267000	(1900)
Sodium	mg/Kg	8000 @	(2000)	7690 @	(2000)	7860 @	(1900)	7700 @	(1900)
Titanium	mg/Kg	4510	(98)	4680	(100)	4550	(97)	4310	(97)
N									
Bulk chemistry									
Cation exchange capacity	meq/100g	11.72022	(.1)	12.47637	(.1)	8.31758	(.1)	10.39697	(.1)
Total inorganic carbon	mg CO3/g	14.8433	(.5898)	NA		11.0096	(.5898)	9.45646	(.5898)
Total organic carbon	%	.23 @	(.1)	.26 @	(.1)	.41 @	(.1)	.37 @	(.1)

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

D2-II

Table D-1

(Continued)

		Site ID / Location ID							
		Sample ID							
		Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / OHMW07 OHMW07-002 1 - 2		OH / OHMW07 OHMW07-004 3 - 4		OH / OHMW07 OHMW07-006 5 - 6		OH / OHMW07 OHMW07-009 8 - 9	
		-----		-----		-----		-----	
WDIS									
Anions									
Chloride, water soluble	mg/Kg	110	(.02)	150	(.02)	150	(.02)	150	(.02)
Fluoride, water soluble	mg/Kg	16 @	(6)	23 @	(6)	19 @	(6)	17 @	(6)
Sulfate, acid soluble	mg/g as S	1.7	(.025)	NA		1.8	(.025)	3.5	(.025)
Sulfate, water soluble	mg/Kg	ND	(.05)	ND	(.05)	1200	(.05)	NA	

Table D-1

(Continued)

		Site ID / Location ID							
		Sample ID							
		Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / OHMW07 OHMW07-014 13 - 14		OH / OHMW07 OHMW07-016 15 - 16		OH / OHMW07 OHMW07-020 19 - 20		OH / OHMW07 OHMW07-025 24 - 25	
ASTM									
Anions									
Chloride	mg/L	1.5	(.02)	1.3	(.02)	.95	(.02)	1	(.02)
Nitrate-Nitrite as N	mg/L	1.1	(.03)	ND	(.03)	ND	(.03)	ND	(.03)
Sulfate	mg/L	130	(.25)	490	(.5)	130	(.25)	280	(.25)
Sulfite	mg/L	2.4	(.4)	.8 @	(.4)	2	(.4)	3.2	(.4)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Antimony	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Barium	mg/L	.025 @	(.01)	.023 @	(.01)	.018 @	(.01)	.017 @	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(1)	ND	(1)	ND	(1)	ND	(1)
Calcium	mg/L	36	(1)	60	(1)	29	(1)	71	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	.065 @	(.04)	.12 @	(.04)	ND	(.04)
Lead	mg/L	.0043 @	(.002)	ND	(.002)	.0045 @	(.002)	.011	(.002)
Magnesium	mg/L	11	(1)	17	(1)	10	(1)	16	(1)
Manganese	mg/L	.029 @	(.01)	.053	(.01)	.027 @	(.01)	.083	(.01)
Molybdenum	mg/L	.055 @	(.05)	.071 @	(.05)	ND	(.05)	ND	(.05)
Nickel	mg/L	ND	(.02)	.021 @	(.02)	ND	(.02)	.023 @	(.02)
Potassium	mg/L	4.8 @	(3)	11 @	(3)	4.5 @	(3)	8.2 @	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	1.3 @	(1)	1.5 @	(1)	1.3 @	(1)	ND	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)

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

D2-13

Table D-1

(Continued)

		Site ID / Location ID							
		Sample ID							
		Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / OHMW07 OHMW07-014 13 - 14		OH / OHMW07 OHMW07-016 15 - 16		OH / OHMW07 OHMW07-020 19 - 20		OH / OHMW07 OHMW07-025 24 - 25	
ASTM, cont.									
Elements by ICPEs or AA, cont.									
Sodium	mg/L	10	(1)	14	(1)	19	(1)	23	(1)
Strontium	mg/L	.43	(.003)	.78	(.003)	.67	(.003)	.96	(.003)
Thallium	mg/L	ND	(.1)	ND	(.1)	ND	(.1)	ND	(.1)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	330	(5)	520	(5)	335	(5)	620	(5)
pH	pH units	7.71	()	7.52	()	8.55	()	7.3	()
HF									
Elements by ICPEs or AA									
Antimony	mg/Kg	ND	(50)	ND	(49)	ND	(49)	ND	(51)
Arsenic	mg/Kg	81	(5)	71	(4.9)	75	(4.9)	76	(5.1)
Barium	mg/Kg	376.4	(2.5)	385.13	(2.4)	379	(2.5)	371.1	(2.5)
Boron	mg/Kg	ND	(120)	ND	(120)	ND	(120)	ND	(120)
Cadmium	mg/Kg	2	(.25)	ND	(.25)	ND	(.25)	ND	(.25)
Chromium	mg/Kg	49.04	(2.5)	51.17	(2.4)	48.07	(2.5)	46.25	(2.5)
Cobalt	mg/Kg	11.95 @	(2.5)	13.96	(2.4)	15.63	(2.5)	14.83	(2.5)
Copper	mg/Kg	14.55 @	(5)	12.01 @	(4.9)	15.48 @	(4.9)	16.15 @	(5.1)
Lead	mg/Kg	16	(1)	16	(.98)	16	(.98)	19	(1)
Lithium	mg/Kg	33.85	(5)	35.09	(4.9)	34.15	(4.9)	33.94	(5.1)
Manganese	mg/Kg	470	(2.5)	445.6	(2.4)	423.1	(2.5)	378.7	(2.5)
Molybdenum	mg/Kg	ND	(13)	ND	(12)	ND	(12)	ND	(13)
Nickel	mg/Kg	89.24	(5)	93.47	(4.9)	87.14	(4.9)	79.58	(5.1)

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

D2=14

Table D-1

(Continued)

		Site ID / Location ID							
		Sample ID							
		Beg. Depth - End Depth (ft.)							
		OH / OHMW07 OHMW07-014 13 - 14		OH / OHMW07 OHMW07-016 15 - 16		OH / OHMW07 OHMW07-020 19 - 20		OH / OHMW07 OHMW07-025 24 - 25	
Parameter	Units								
HF, cont.									
Elements by ICPEs or AA, cont.									
Selenium	mg/Kg	ND	(5)	ND	(4.9)	ND	(4.9)	ND	(5.1)
Silver	mg/Kg	ND	(2.5)	ND	(2.4)	ND	(2.5)	ND	(2.5)
Strontium	mg/Kg	168.8	(.76)	175.6	(.73)	179.1	(.74)	129.9	(.76)
Tin	mg/Kg	ND	(150)	ND	(150)	ND	(150)	ND	(150)
Vanadium	mg/Kg	63.92	(5)	67.11	(4.9)	63.61	(4.9)	59.89	(5.1)
Zinc	mg/Kg	175.8	(5)	110.8	(4.9)	85.33	(4.9)	77.44	(5.1)
LIMB									
Elements by ICPEs or AA									
Aluminum	mg/Kg	78000	(20)	79300	(390)	76500	(390)	68400	(20)
Calcium	mg/Kg	74800	(2000)	68200	(2000)	67500	(2000)	31900	(2000)
Iron	mg/Kg	45400	(80)	43600	(78)	44200	(79)	39400	(80)
Magnesium	mg/Kg	18600	(2000)	18300	(2000)	18200	(2000)	13100	(2000)
Potassium	mg/Kg	26500 @	(6000)	28300 @	(5900)	27200 @	(5900)	22500 @	(6000)
Silicon	mg/Kg	283000	(2000)	292000	(2000)	300000	(2000)	310000	(2000)
Sodium	mg/Kg	7870 @	(2000)	8350 @	(2000)	7660 @	(2000)	7800 @	(2000)
Titanium	mg/Kg	4540	(99)	4640	(98)	4470	(99)	4490	(100)
N									
Bulk chemistry									
Cation exchange capacity	meq/100g	7.56143	(.1)	8.69565	(.1)	6.42722	(.1)	7.3724	(.1)
Total inorganic carbon	mg CO3/g	9.80051	(.5898)	10.6164	(.5898)	11.796	(.5898)	11.5011	(.5898)
Total organic carbon	%	.69	(.1)	.79	(.1)	.61	(.1)	.8	(.1)

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

D2-15

Table D-1

(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID							
		Beg. Depth - End Depth (ft.)							
		OH / OHMW07 OHMW07-014 13 - 14		OH / OHMW07 OHMW07-016 15 - 16		OH / OHMW07 OHMW07-020 19 - 20		OH / OHMW07 OHMW07-025 24 - 25	
WDIS									
Anions									
Chloride, water soluble	mg/Kg	1200	(.02)	150	(.02)	150	(.02)	4600	(.02)
Fluoride, water soluble	mg/Kg	16 @	(6)	13 @	(6)	20 @	(6)	14 @	(6)
Sulfate, acid soluble	mg/g as S	5.5	(.025)	4.95	(.025)	NA		7.5	(.025)
Sulfate, water soluble	mg/Kg	1600	(.05)	1900	(.05)	1500	(.05)	9400	(.05)

Table D-1

(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID							
		Beg. Depth - End Depth (ft.)							
		OH / OHMW08 OHMW08-001 0 - 1	OH / OHMW08 OHMW08-004 3 - 4	OH / OHMW08 OHMW08-007 6 - 7	OH / OHMW08 OHMW08-009 8 - 9				

ASTM									
Field measurements									
Conductivity	umhos/cm	2450	(5)	6000	(5)	8500	(5)	2730	(5)
pH	pH units	10.94	( )	11.84	( )	11.93	( )	11.55	( )
N									
Bulk chemistry									
Total inorganic carbon	mg CO3/g	5.6031	(.5898)	7.65757	(.5898)	8.847	(.5898)	9.48595	(.5898)

( ) = Detection Limit

ND = Not Detected

NA = Not Analyzed

0 = < 5X Det. Limit

D2-17

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

Table D-1

(Continued)

		Site ID / Location ID Sample ID Beg. Depth - End Depth (ft.)	
Parameter	Units	OH / OHMW08 OHMW08-011 10 - 11	

ASTM			
Field measurements			
Conductivity	umhos/cm	210	(5)
pH	pH units	8.56	()
N			
Bulk chemistry			
Total inorganic carbon	mg C03/g	3.18492	(.5898)

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

APPENDIX E

**CHEMICAL CHARACTERIZATION OF DEIONIZED WATER
LEACHATES OF SOIL AND ASH**

Table E-1

Chemical Characterization of Deionized Water Leachates of Ohio Ash, Event 1

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
Parameter	Units	OH / OHLY08 OHLY08-001		OH / OHLY08 OHLY08-004		OH / OHLY08 OHLY08-007		OH / OHLY08 OHLY08-009	
		ASTM 6/15/89		ASTM 6/15/89		ASTM 6/15/89		ASTM 6/15/89	

Anions									
Chloride	mg/L	57	(.2)	290	(1)	210	(1)	54	(.2)
Nitrate-Nitrite as N	mg/L	ND	(.03)	ND	(.03)	ND	(.03)	ND	(.03)
Sulfate	mg/L	1400	(5)	1700	(2.5)	1400	(2.5)	480	(.5)
Sulfite	mg/L	2	(.4)	3.6	(.4)	6	(.4)	10.8	(.4)
Bulk chemistry									
Cation exchange capacity	meq/100g	16.63516	(.1)	26.46502	(.1)	22.68431	(.1)	24.57466	(.1)
Total inorganic carbon	mg CO3/g	49.785018	(.5898)	71.979192	(.5898)	71.979192	(.5898)	65.980926	(.5898)
Total organic carbon	%	.16 a	(.1)	.48 a	(.1)	.93	(.1)	.19 a	(.1)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	.25 a	(.2)	ND	(.2)	ND	(.2)
Antimony	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	.0076 a	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Barium	mg/L	.09	(.01)	.084	(.01)	.13	(.01)	.053	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(1)	ND	(1)	ND	(1)	ND	(1)
Calcium	mg/L	420	(1)	500	(1)	840	(1)	260	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	.33	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	.0058 a	(.002)	.0028 a	(.002)	.005 a	(.002)	.0029 a	(.002)
Magnesium	mg/L	ND	(1)	ND	(1)	ND	(1)	ND	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	.25	(.05)	.17 a	(.05)	.24 a	(.05)	.17 a	(.05)

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

Table E-1

(Continued)

		Site ID / Location ID Sample ID Preparation Method Log Date							
Parameter	Units	OH / OHLY08 OHLY08-001 ASTM 6/15/89		OH / OHLY08 OHLY08-004 ASTM 6/15/89		OH / OHLY08 OHLY08-007 ASTM 6/15/89		OH / OHLY08 OHLY08-009 ASTM 6/15/89	
		-----	-----	-----	-----	-----	-----	-----	-----
Nickel	mg/L	ND	(.02)	ND	(.02)	.022 @	(.02)	.027 @	(.02)
Potassium	mg/L	170	(3)	500	(3)	450	(3)	150	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	9	(1)	1.5 @	(1)	ND	(1)	2.4 @	(1)
Silver	mg/L	.013 @	(.01)	.023 @	(.01)	.031 @	(.01)	.011 @	(.01)
Sodium	mg/L	38	(1)	110	(1)	94	(1)	40	(1)
Strontium	mg/L	2.7	(.003)	2.4	(.003)	4	(.003)	1	(.003)
Thallium	mg/L	ND	(.1)	ND	(.1)	ND	(.1)	ND	(.1)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	.044 @	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	ND	(.02)	.022 @	(.02)	.044 @	(.02)	.022 @	(.02)
Field measurements									
Conductivity	umhos/cm	2450	(5)	6000	(5)	8500	(5)	2730	(5)
pH	pH units	10.94	( )	11.84	( )	11.93	( )	11.55	( )

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

D2-2

Table E-1
(Continued)

E-5

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
		OH / OHLY16		OH / OHLY16		OH / OHLY16		OH / OHLY16	
		OHLY16-001		OHLY16-004		OHLY16-006		OHLY16-007	
		ASTM		ASTM		ASTM		ASTM	
Parameter	Units	6/15/89		6/15/89		6/15/89		6/15/89	
-----	-----	-----		-----		-----		-----	
Anions									
Chloride	mg/L	140	(.2)	71	(.2)	120	(.4)	2.5	(.02)
Nitrate-Nitrite as N	mg/L	ND	(.03)	ND	(.03)	ND	(.03)	ND	(.03)
Sulfate	mg/L	440	(.5)	840	(.5)	660	(1)	110	(.25)
Sulfite	mg/L	6	(.4)	2	(.4)	12	(.4)	ND	(.4)
Bulk chemistry									
Cation exchange capacity	meq/100g	28.35538	(.1)	26.46502	(.1)	24.57466	(.1)	12.85444	(.1)
Total inorganic carbon	mg CO3/g	83.975724	(.5898)	83.975724	(.5898)	71.979192	(.5898)	NA	
Total organic carbon	% ^g	.21 a	(.1)	.84	(.1)	.14 a	(.1)	.16 a	(.1)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Antimony	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Barium	mg/L	.1	(.01)	.1	(.01)	.12	(.01)	ND	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(1)	ND	(1)	ND	(1)	ND	(1)
Calcium	mg/L	170	(1)	380	(1)	410	(1)	31	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	.045 a	(.04)	ND	(.04)	ND	(.04)	.063 a	(.04)
Lead	mg/L	.0072 a	(.002)	ND	(.002)	.0046 a	(.002)	.008 a	(.002)
Magnesium	mg/L	ND	(1)	ND	(1)	ND	(1)	9	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	.15 a	(.05)	.13 a	(.05)	.12 a	(.05)	ND	(.05)

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

Table E-1
(Continued)

E-6

		Site ID / Location ID Sample ID Preparation Method Log Date							
Parameter	Units	OH / OHLY16 OHLY16-001 ASTM 6/15/89		OH / OHLY16 OHLY16-004 ASTM 6/15/89		OH / OHLY16 OHLY16-006 ASTM 6/15/89		OH / OHLY16 OHLY16-007 ASTM 6/15/89	
Nickel	mg/L	.076	Ⓐ (.02)	.061	Ⓐ (.02)	.056	Ⓐ (.02)	.058	Ⓐ (.02)
Potassium	mg/L	200	(3)	250	(3)	290	(3)	ND	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	4.3	Ⓐ (1)	1.4	Ⓐ (1)	ND	(1)	1.4	Ⓐ (1)
Silver	mg/L	ND	(.01)	.017	Ⓐ (.01)	.014	Ⓐ (.01)	ND	(.01)
Sodium	mg/L	38	(1)	41	(1)	43	(1)	9.4	(1)
Strontium	mg/L	1.1	(.003)	1.8	(.003)	2	(.003)	.078	(.003)
Thallium	mg/L	ND	(.1)	ND	(.1)	ND	(.1)	ND	(.1)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	ND	(.02)	ND	(.02)	.022	Ⓐ (.02)	.023	Ⓐ (.02)
Field measurements									
Conductivity	umhos/cm	2150	(5)	3850	(5)	4800	(5)	285	(5)
pH	pH units	11.16	( )	11.68	( )	11.8	( )	7.95	( )

Table E-2

Chemical Characteristics of Deionized Water Leachates of Ohio Soils, Event 1

		Site ID / Location ID	
		Sample ID	
		Preparation Method	
		Beg. Depth - End Depth (ft.)	
		OH / OHLY08	
		OHLY08-011	
		ASTM	
		10 - 11	
Parameter	Units		
-----	----	-----	-----
Anions			
Chloride	mg/L	1.6	(.02)
Nitrate-Nitrite as N	mg/L	ND	(.03)
Sulfate	mg/L	81	(.5)
Sulfite	mg/L	.8 a	(.4)
Bulk chemistry			
Cation exchange capacity	meq/100g	7.56143	(.1)
Total organic carbon	%	.24 a	(.1)
Elements by ICPEs or AA			
Aluminum	mg/L	.27 a	(.2)
Antimony	mg/L	ND	(.2)
Arsenic	mg/L	ND	(.005)
Barium	mg/L	ND	(.01)
Beryllium	mg/L	ND	(.002)
Boron	mg/L	ND	(.6)
Cadmium	mg/L	ND	(1)
Calcium	mg/L	30	(1)
Chromium	mg/L	ND	(.01)
Cobalt	mg/L	ND	(.01)
Copper	mg/L	ND	(.02)
Iron	mg/L	.061 a	(.04)
Lead	mg/L	.021	(.002)
Magnesium	mg/L	4.3 a	(1)
Manganese	mg/L	ND	(.01)
Molybdenum	mg/L	ND	(.05)
Nickel	mg/L	.054 a	(.02)

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

Table E-2

(Continued)

Site ID / Location ID
 Sample ID
 Preparation Method
 Beg. Depth - End Depth (ft.)

Parameter	Units	OH / OHLY08 OHLY08-011 ASTM 10 - 11	

Potassium	mg/L	ND	(3)
Selenium	mg/L	ND	(.005)
Silicon	mg/L	2 @	(1)
Silver	mg/L	ND	(.01)
Sodium	mg/L	4.4 @	(1)
Strontium	mg/L	.071	(.003)
Thallium	mg/L	ND	(.1)
Tin	mg/L	ND	(.6)
Vanadium	mg/L	ND	(.02)
Zinc	mg/L	ND	(.02)
Field measurements			
Conductivity	umhos/cm	210	(5)
pH	pH units	8.56	( )

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

Table E-3

Chemical Characteristics of Deionized Water Leachates of Ohio Ash, Event 2

		Site ID / Location ID Sample ID Preparation Method Log Date							
		OH / 90FEB0H01 90FEB0H01-01 ASTM 2/05/90		OH / 90FEB0H01 90FEB0H01-02 ASTM 2/05/90		OH / 90FEB0H01 90FEB0H01-03 ASTM 2/05/90		OH / 90FEB0H01 90FEB0H01-04 ASTM 2/05/90	
Parameter	Units								
-----	-----	-----		-----		-----		-----	
Anions									
Chloride	mg/L	400	(.2)	550	(.2)	250	(.4)	160	(.2)
Nitrate-Nitrite as N	mg/L	ND	(.1)	ND	(.1)	ND	(.1)	ND	(.4)
Sulfate	mg/L	1200	(.5)	800	(.5)	500	(.5)	460	(.5)
Sulfite	mg/L	ND	(.4)	ND	(.4)	ND	(.4)	4	(.4)
Bulk chemistry									
Total inorganic carbon	mg CO3/g	67.248406	(.5898)	71.967592	(.5898)	48.371660	(.5898)	60.759524	(.5898)
Elements by ICPES or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	.7 a	(.2)	.41 a	(.2)
Arsenic	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Barium	mg/L	.18	(.01)	.21	(.01)	.12	(.01)	.12	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	.0023 a	(.001)
Calcium	mg/L	1200	(.5)	640	(.1)	130	(.1)	160	(.1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	.0055 a	(.003)	ND	(.003)	.0059 a	(.003)	.011 a	(.003)
Magnesium	mg/L	ND	(.1)	ND	(.1)	ND	(.1)	ND	(.1)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	.34	(.05)	.22 a	(.05)	.21 a	(.05)	.14 a	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	340	(.3)	600	(.3)	420	(.3)	330	(.3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)

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

Table E-3
(Continued)

E-10

		Site ID / Location ID Sample ID Preparation Method Log Date							
Parameter	Units	OH / 90FEB0H01 90FEB0H01-01		OH / 90FEB0H01 90FEB0H01-02		OH / 90FEB0H01 90FEB0H01-03		OH / 90FEB0H01 90FEB0H01-04	
		ASTM 2/05/90		ASTM 2/05/90		ASTM 2/05/90		ASTM 2/05/90	
Silver	mg/L	.054	(.01)	.04 a	(.01)	.022 a	(.01)	.026 a	(.01)
Sodium	mg/L	82	(1)	130	(1)	87	(1)	66	(1)
Strontium	mg/L	8.5	(.003)	3.8	(.003)	.97	(.003)	1.2	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	.029 a	(.02)
Field measurements									
Conductivity	umhos/cm	8150	(5)	7300	(5)	2800	(5)	2500	(5)
pH	pH units	12.49	( )	12.29	( )	11.77	( )	11.81	( )

Table E-3

(Continued)

E-11

Parameter	Units	Site ID / Location ID					
		Sample ID		Preparation Method		Log Date	
		OH / 90FEB0H01		OH / 90FEB0H01		OH / 90FEB0H04	
		90FEB0H01-07		90FEB0H01-08		90FEB0H04-01	
		ASTM		ASTM		ASTM	
		2/05/90		2/05/90		2/05/90	
-----	-----	-----	-----	-----	-----	-----	-----
Anions							
Chloride	mg/L	40	(.1)	23	(.1)	170	(.2)
Nitrate-Nitrite as N	mg/L	ND	(1)	ND	(1)	ND	(1)
Sulfate	mg/L	960	(1)	270	(.25)	1300	(5)
Sulfite	mg/L	2.2	(.4)	2	(.4)	2	(.4)
Bulk chemistry							
Total inorganic carbon	mg CO ₃ /g	65.478711	(.5898)	68.428202	(.5898)	58.98983	(.5898)
Elements by ICPEs or AA							
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.005)	ND	(.005)	ND	(.005)
Barium	mg/L	.16	(.01)	.21	(.01)	.12	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	840	(1)	430	(1)	590	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	.013 a	(.003)	.013 a	(.003)	.0059 a	(.003)
Magnesium	mg/L	ND	(1)	ND	(1)	ND	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	.19 a	(.05)	.11 a	(.05)	.24 a	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	180	(3)	160	(3)	560	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)

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

Table E-3

(Continued)

		Site ID / Location ID Sample ID Preparation Method Log Date					
Parameter	Units	OH / 90FEBOH01 90FEBOH01-07 ASTM 2/05/90		OH / 90FEBOH01 90FEBOH01-08 ASTM 2/05/90		OH / 90FEBOH04 90FEBOH04-01 ASTM 2/05/90	
		-----		-----		-----	
Silver	mg/L	.048	a (.01)	.033	a (.01)	.039	a (.01)
Sodium	mg/L	41	(1)	42	(1)	91	(1)
Strontium	mg/L	6.6	(.003)	5	(.003)	3	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements							
Conductivity	umhos/cm	6800	(5)	5300	(5)	6400	(5)
pH	pH units	12.07	()	11.94	()	12.08	()

E-12

Table E-4

Chemical Characteristics of Deionized Water Leachates of Ohio Soils, Event 2

		Site ID / Location ID			
		Sample ID			
		Preparation Method			
		Beg. Depth - End Depth (ft.)			
		OH / 90FEB0H01		OH / 90FEB0H01	
		90FEB0H01-09		90FEB0H01-10	
		ASTM		ASTM	
		8 - 9		9 - 10	
Parameter	Units	-----		-----	
-----	----	-----		-----	
Anions					
Chloride	mg/L	1.6	(.02)	1.8	(.02)
Nitrate-Nitrite as N	mg/L	ND	(1)	ND	(1)
Sulfate	mg/L	130	(.25)	170	(.25)
Sulfite	mg/L	4.2	(.4)	2	(.4)
Bulk chemistry					
Total inorganic carbon	mg CO3/g	48.961558	(.5898)	54.270643	(.5898)
Elements by ICPES or AA					
Aluminum	mg/L	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.005)	ND	(.005)
Barium	mg/L	.03 @	(.01)	.021 @	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)
Calcium	mg/L	48	(1)	63	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)
Lead	mg/L	.011 @	(.003)	.012 @	(.003)
Magnesium	mg/L	8.7	(1)	11	(1)
Manganese	mg/L	.055	(.01)	.072	(.01)
Molybdenum	mg/L	.054 @	(.05)	ND	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)
Potassium	mg/L	5 @	(3)	5.6 @	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)

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

Table E-4

(Continued)

		Site ID / Location ID Sample ID Preparation Method Beg. Depth - End Depth (ft.)			
Parameter	Units	OH / 90FEB0H01 90FEB0H01-09 ASTM 8 - 9		OH / 90FEB0H01 90FEB0H01-10 ASTM 9 - 10	
		-----		-----	
Silver	mg/L	.022	@ (.01)	.021	@ (.01)
Sodium	mg/L	2.7	@ (1)	3.1	@ (1)
Strontium	mg/L	.16	(.003)	.21	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)
Zinc	mg/L	ND	(.02)	ND	(.02)
Field measurements					
Conductivity	umhos/cm	325	(5)	410	(5)
pH	pH units	8.06	()	7.9	()

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

Table E-5

Chemical Characteristics of Deionized Water Leachates of Ohio Ash, Event 3

		Site ID / Location ID Sample ID Preparation Method Log Date							
		OH / 90MAYOH03 90MAYOH03-01 ASTM 6/04/90		OH / 90MAYOH03 90MAYOH03-02 ASTM 6/04/90		OH / 90MAYOH03 90MAYOH03-03 ASTM 6/04/90		OH / 90MAYOH03 90MAYOH03-04 ASTM 6/04/90	
Parameter	Units								

Anions									
Ammonia as N	mg/L	.25	(.01)	.18	(.01)	.21	(.02)	.25	(.02)
Chloride	mg/L	140	(.2)	98	(.2)	67	(.2)	56	(.2)
Nitrate-Nitrite as N	mg/L	1.1	(.03)	1	(.03)	.89	(.03)	.81	(.03)
Sulfate	mg/L	450	(.5)	720	(.5)	550	(.5)	460	(.5)
Sulfite	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Bulk chemistry									
Total inorganic carbon	mg CO3/g	83.961962	(.5898)	53.975547	(.5898)	52.776090	(.5898)	55.175003	(.5898)
Total organic carbon	mg/L	3.6 @	(1)	3.3 @	(1)	3 @	(1)	2.8 @	(1)
Total phenolics	mg/L	.06	(.005)	.032	(.005)	.02 @	(.005)	.013 @	(.005)
Elements by ICPES									
Silicon	mg/L	5.36 @	(1)	5.04 @	(1)	4.2 @	(1)	3.75 @	(1)
Sodium	mg/L	45.2	(1)	35.6	(1)	33.1	(1)	29.5	(1)
Vanadium	mg/L	ND	(.02)	.035 @	(.02)	ND	(.02)	ND	(.02)
Elements by ICPES or AA									
Aluminum	mg/L	.58 @	(.2)	.56 @	(.2)	.24 @	(.2)	.24 @	(.2)
Arsenic	mg/L	ND	(.005)	.013 @	(.005)	ND	(.005)	ND	(.005)
Barium	mg/L	.1	(.01)	.097	(.01)	.1	(.01)	.11	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	140	(1)	240	(1)	200	(1)	190	(1)
Chromium	mg/L	.019 @	(.01)	.013 @	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)

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

D2-1

Table E-5

(Continued)

		Site ID / Location ID Sample ID Preparation Method Log Date							
Parameter	Units	OH / 90MAYOH03 90MAYOH03-01 ASTM 6/04/90		OH / 90MAYOH03 90MAYOH03-02 ASTM 6/04/90		OH / 90MAYOH03 90MAYOH03-03 ASTM 6/04/90		OH / 90MAYOH03 90MAYOH03-04 ASTM 6/04/90	
Iron	mg/L	.13	a (.04)	.042	a (.04)	ND	(.04)	.081	a (.04)
Lead	mg/L	ND	(.003)	ND	(.003)	ND	(.003)	ND	(.003)
Magnesium	mg/L	ND	(1)	ND	(1)	ND	(1)	ND	(1)
Manganese	mg/L	.013	a (.01)	ND	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	.17	a (.05)	.17	a (.05)	.12	a (.05)	.1	a (.05)
Nickel	mg/L	.05	a (.02)	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	260	(3)	170	(3)	210	(3)	190	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	5.36	(1)	5.04	(1)	4.2	a (1)	3.75	a (1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Strontium	mg/L	1.1	(.003)	1.2	(.003)	1	(.003)	.99	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Zinc	mg/L	ND	(.02)	ND	(.02)	.025	a (.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	1500	(5)	1375	(5)	1575	(5)	1720	(5)
pH	pH units	11.05	( )	10.56	( )	11.29	( )	11.39	( )

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

Table E-5

(Continued)

		Site ID / Location ID					
		Sample ID		Preparation Method		Log Date	
		OH / 90MAYOH03		OH / 90MAYOH03		OH / 90MAYOH03	
		90MAYOH03-05		90MAYOH03-06		90MAYOH03-07	
		ASTM		ASTM		ASTM	
		6/04/90		6/04/90		6/04/90	
Parameter	Units						
-----	-----	-----		-----		-----	
Anions							
Ammonia as N	mg/L	.38	(.02)	.43	(.02)	.22	(.02)
Chloride	mg/L	230	(1)	330	(.4)	120	(.2)
Nitrate-Nitrite as N	mg/L	2.1	(.03)	1.6	(.03)	1.2	(.03)
Sulfate	mg/L	1400	(1)	1200	(1)	430	(.5)
Sulfite	mg/L	ND	(.2)	ND	(.2)	ND	(.2)
Bulk chemistry							
Total inorganic carbon	mg CO3/g	83.961962	(.5898)	77.964679	(.5898)	83.961962	(.5898)
Total organic carbon	mg/L	5.3	(1)	3.6 a	(1)	3.3 a	(1)
Total phenolics	mg/L	.1	(.005)	.08	(.005)	.048	(.005)
Elements by ICPES							
Silicon	mg/L	1.3 a	(1)	1 a	(1)	1 a	(1)
Sodium	mg/L	71.8	(1)	54.9	(1)	43.7	(1)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)
Elements by ICPES or AA							
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.005)	ND	(.005)	ND	(.005)
Barium	mg/L	.12	(.01)	.13	(.01)	.15	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	290	(1)	390	(1)	340	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)

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

Table E-5

(Continued)

E-18

		Site ID / Location ID Sample ID Preparation Method Log Date					
Parameter	Units	OH / 90MAYOH03 90MAYOH03-05		OH / 90MAYOH03 90MAYOH03-06		OH / 90MAYOH03 90MAYOH03-07	
		ASTM 6/04/90		ASTM 6/04/90		ASTM 6/04/90	
Iron	mg/L	ND	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	ND	(.003)	ND	(.003)	ND	(.003)
Magnesium	mg/L	ND	(1)	ND	(1)	ND	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	.23 @	(.05)	.17 @	(.05)	.12 @	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	500	(3)	390	(3)	300	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	1.3 @	(1)	ND	(1)	ND	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)
Strontium	mg/L	2.1	(.003)	2.5	(.003)	2.3	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements							
Conductivity	umhos/cm	2850	(5)	3420	(5)	2880	(5)
pH	pH units	11.76	( )	11.71	( )	11.66	( )

Table E-6

Chemical Characteristics of Deionized Water Leachates of Ohio Soils, Event 3

Site ID / Location ID
 Sample ID
 Preparation Method
 Beg. Depth - End Depth (ft.)

OH / 90MAYOH03
 90MAYOH03-08
 ASTM
 7 - 8

Parameter	Units	7 - 8	
-----	-----	-----	
Anions			
Ammonia as N	mg/L	.17	(.02)
Chloride	mg/L	19	(.1)
Nitrate-Nitrite as N	mg/L	.5	(.03)
Sulfate	mg/L	200	(.25)
Sulfite	mg/L	ND	(.2)
Bulk chemistry			
Total inorganic carbon	mg CO3/g	43.180437	(.5898)
Total organic carbon	mg/L	3.2 a	(1)
Total phenolics	mg/L	ND	(.005)
Elements by ICPES			
Silicon	mg/L	2.55 a	(1)
Sodium	mg/L	14.9	(1)
Vanadium	mg/L	ND	(.02)
Elements by ICPES or AA			
Aluminum	mg/L	.29 a	(.2)
Arsenic	mg/L	ND	(.005)
Barium	mg/L	ND	(.01)
Beryllium	mg/L	ND	(.002)
Boron	mg/L	ND	(.6)
Cadmium	mg/L	ND	(.001)
Calcium	mg/L	79	(1)
Chromium	mg/L	ND	(.01)
Cobalt	mg/L	ND	(.01)
Copper	mg/L	ND	(.02)

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

Table E-6

(Continued)

Site ID / Location ID
 Sample ID
 Preparation Method
 Beg. Depth - End Depth (ft.)

OH / 90MAYOH03
 90MAYOH03-08
 ASTM
 7 - 8

Parameter	Units	7 - 8	
-----	-----	-----	
Iron	mg/L	ND	(.04)
Lead	mg/L	ND	(.003)
Magnesium	mg/L	ND	(1)
Manganese	mg/L	ND	(.01)
Molybdenum	mg/L	ND	(.05)
Nickel	mg/L	ND	(.02)
Potassium	mg/L	21	(3)
Selenium	mg/L	ND	(.005)
Silicon	mg/L	2.55	a (1)
Silver	mg/L	ND	(.01)
Strontium	mg/L	.17	(.003)
Tin	mg/L	ND	(.6)
Zinc	mg/L	ND	(.02)
Field measurements			
Conductivity	umhos/cm	390	(5)
pH	pH units	10.13	( )

Table E-7

Chemical Characteristics of Deionized Water Leachates of Ohio Ash, Event 4

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
		OH / 90AUGOH02		OH / 90AUGOH02		OH / 90AUGOH02		OH / 90AUGOH02	
		90AUGOH02-01		90AUGOH02-02		90AUGOH02-03		90AUGOH02-04	
		ASTM		ASTM		ASTM		ASTM	
Parameter	Units	8/02/90		8/02/90		8/02/90		8/02/90	
-----	-----	-----		-----		-----		-----	
Anions									
Ammonia as N	mg/L	.5	(.02)	.3	(.02)	.52	(.02)	ND	(.02)
Chloride	mg/L	7.6	(.04)	21	(.04)	24	(.1)	140	(.4)
Nitrate-Nitrite as N	mg/L	.3	(.02)	.056 a	(.02)	ND	(.02)	.025 a	(.02)
Sulfate	mg/L	800	(.5)	650	(.5)	810	(.5)	1200	(1)
Sulfite	mg/L	1 a	(.4)	1.2 a	(.4)	1.5 a	(.4)	.4 a	(.4)
Bulk chemistry									
Total inorganic carbon	mg CO3/g	51.116	(.14745)	58.98	(.13762)	61.929	(.12779)	62.912	(.14745)
Total organic carbon	mg/L	4.6 a	(1)	5.7	(1)	1.4 a	(1)	2.1 a	(1)
Total phenolics	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Elements by ICPES or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Antimony	mg/L	ND	(.1)	ND	(.1)	ND	(.1)	ND	(.1)
Arsenic	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Barium	mg/L	.084	(.01)	.15	(.01)	.11	(.01)	.13	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	400	(1)	750	(1)	730	(1)	570	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	ND	(.003)	ND	(.003)	ND	(.003)	ND	(.003)
Magnesium	mg/L	ND	(1)	ND	(1)	ND	(1)	ND	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)

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

Table E-7

(Continued)

		Site ID / Location ID Sample ID Preparation Method Log Date							
Parameter	Units	OH / 90AUGOH02 90AUGOH02-01		OH / 90AUGOH02 90AUGOH02-02		OH / 90AUGOH02 90AUGOH02-03		OH / 90AUGOH02 90AUGOH02-04	
		ASTM 8/02/90		ASTM 8/02/90		ASTM 8/02/90		ASTM 8/02/90	
Molybdenum	mg/L	.18	Ⓐ (.05)	.22	Ⓐ (.05)	.19	Ⓐ (.05)	.36	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	38	(3)	86	(3)	110	(3)	560	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	10	(1)	ND	(1)	ND	(1)	ND	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	7	(1)	16	(1)	20	(1)	100	(1)
Strontium	mg/L	1.8	(.003)	6.3	(.003)	4.6	(.003)	5.1	(.003)
Thallium	mg/L	ND	(.1)	ND	(.1)	ND	(.1)	ND	(.1)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	.032	Ⓐ (.02)	ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	ND	(.02)	.029	Ⓐ (.02)	ND	(.02)	.022	Ⓐ (.02)
Field measurements									
Conductivity	umhos/cm	2100	(5)	6000	(5)	5500	(5)	6200	(5)
pH	pH units	10.89	( )	11.64	( )	11.61	( )	11.67	( )

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

D2-2

Table E-7

(Continued)

		Site ID / Location ID Sample ID Preparation Method Log Date							
Parameter	Units	OH / 90AUGOH02 90AUGOH02-05 ASTM 8/02/90		OH / 90AUGOH02 90AUGOH02-06 ASTM 8/02/90		OH / 90AUGOH02 90AUGOH02-07 ASTM 8/02/90		OH / 90AUGOH02 90AUGOH02-08 ASTM 8/02/90	
		-----		-----		-----		-----	
Anions									
Ammonia as N	mg/L	ND	(.02)	.049 a	(.02)	.049 a	(.02)	.087 a	(.02)
Chloride	mg/L	330	(1)	510	(1)	240	(.4)	52	(.2)
Nitrate-Nitrite as N	mg/L	.032 a	(.02)	.24	(.02)	.093 a	(.02)	.073 a	(.02)
Sulfate	mg/L	1300	(2.5)	1500	(2.5)	700	(1)	370	(.5)
Sulfite	mg/L	1.2 a	(.4)	.79 a	(.4)	.4 a	(.4)	.4 a	(.4)
Bulk chemistry									
Total inorganic carbon	mg CO3/g	78.64	(.14745)	74.708	(.14745)	62.912	(.14745)	62.912	(.14745)
Total organic carbon	mg/L	4.7 a	(1)	2.5 a	(1)	9	(1)	9.9	(1)
Total phenolics	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Elements by ICPES or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Antimony	mg/L	ND	(.1)	ND	(.1)	ND	(.1)	ND	(.1)
Arsenic	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Barium	mg/L	.12	(.01)	.12	(.01)	.12	(.01)	.11	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	750	(1)	760	(1)	380	(1)	180	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	ND	(.003)	ND	(.003)	ND	(.003)	ND	(.003)
Magnesium	mg/L	ND	(1)	ND	(1)	ND	(1)	ND	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)

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

D2-3

Table E-7

(Continued)

		Site ID / Location ID Sample ID Preparation Method Log Date							
Parameter	Units	OH / 90AUGOH02 90AUGOH02-05		OH / 90AUGOH02 90AUGOH02-06		OH / 90AUGOH02 90AUGOH02-07		OH / 90AUGOH02 90AUGOH02-08	
		ASTM		ASTM		ASTM		ASTM	
		8/02/90		8/02/90		8/02/90		8/02/90	
Molybdenum	mg/L	.42	(.05)	.42	(.05)	.24 @	(.05)	.13 @	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	1000	(3)	1000	(3)	500	(3)	210	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	ND	(1)	ND	(1)	1.9 @	(1)	4 @	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	210	(1)	210	(1)	100	(1)	40	(1)
Strontium	mg/L	4.6	(.003)	4.6	(.003)	2.6	(.003)	1.4	(.003)
Thallium	mg/L	ND	(.1)	ND	(.1)	ND	(.1)	ND	(.1)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	ND	(.02)	ND	(.02)	.027 @	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	11000	(5)	14000	(5)	4800	(5)	2520	(5)
pH	pH units	11.93	( )	12.01	( )	11.56	( )	11.43	( )

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

D2-4

Table E-7

(Continued)

Parameter	Units	Site ID / Location ID Sample ID Preparation Method Log Date							
		OH / 90AUGOH02		OH / 90AUGOH04		OH / 90AUGOH04		OH / 90AUGOH04	
		90AUGOH02-09		90AUGOH04-01		90AUGOH04-02		90AUGOH04-03	
		ASTM 8/02/90		ASTM 8/03/90		ASTM 8/03/90		ASTM 8/03/90	
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Anions									
Ammonia as N	mg/L	.15	(.02)	1.8	(.02)	1.6	(.02)	.062 a	(.02)
Chloride	mg/L	30	(.2)	2.5	(.02)	120	(.2)	110	(.2)
Nitrate-Nitrite as N	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Sulfate	mg/L	280	(.5)	1000	(1)	880	(.5)	950	(1)
Sulfite	mg/L	.4 a	(.4)	1 a	(.4)	.4 a	(.4)	.4 a	(.4)
Bulk chemistry									
Total inorganic carbon	mg CO ₃ /g	62.912	(.14745)	78.64	(.13762)	68.81	(.13762)	66.844	(.14745)
Total organic carbon	mg/L	9	(1)	1.4 a	(1)	1.1 a	(1)	ND	(1)
Total phenolics	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Antimony	mg/L	ND	(.1)	NA		NA		NA	
Arsenic	mg/L	ND	(.005)	.034	(.005)	ND	(.005)	ND	(.005)
Barium	mg/L	.12	(.01)	.046 a	(.01)	.13	(.01)	.12	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	140	(1)	460	(1)	670	(1)	520	(1)
Chromium	mg/L	ND	(.01)	.032 a	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	ND	(.003)	.0071 a	(.003)	.0059 a	(.003)	.0053 a	(.003)
Magnesium	mg/L	ND	(1)	ND	(1)	ND	(1)	ND	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)

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

Table E-7
(Continued)

E-26

		Site ID / Location ID Sample ID Preparation Method Log Date							
Parameter	Units	OH / 90AUGOH02 90AUGOH02-09		OH / 90AUGOH04 90AUGOH04-01		OH / 90AUGOH04 90AUGOH04-02		OH / 90AUGOH04 90AUGOH04-03	
		ASTM 8/02/90		ASTM 8/03/90		ASTM 8/03/90		ASTM 8/03/90	
Molybdenum	mg/L	.16	ⓐ (.05)	.071	ⓐ (.05)	.24	ⓐ (.05)	.24	ⓐ (.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	210	(3)	19	(3)	370	(3)	320	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	3.4	ⓐ (1)	5.8	(1)	ND	(1)	ND	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	43	(1)	3.7	ⓐ (1)	76	(1)	59	(1)
Strontium	mg/L	1.7	(.003)	.92	(.003)	4.8	(.003)	4.4	(.003)
Thallium	mg/L	ND	(.1)	NA		NA		NA	
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	.069	ⓐ (.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	2700	(5)	1730	(5)	1680	(5)	1780	(5)
pH	pH units	11.53	( )	9.46	( )	11.93	( )	11.72	( )

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

Table E-7
(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID				Preparation Method			
		Log Date							
		OH / 90AUGOH04 90AUGOH04-04		OH / 90AUGOH04 90AUGOH04-05		OH / 90AUGOH04 90AUGOH04-06		OH / 90AUGOH04 90AUGOH04-07	
		ASTM 8/03/90		ASTM 8/03/90		ASTM 8/03/90		ASTM 8/03/90	
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Anions									
Ammonia as N	mg/L	1.8	(.02)	1.7	(.02)	.79	(.02)	1.7	(.02)
Chloride	mg/L	130	(.2)	88	(.2)	180	(.4)	150	(.4)
Nitrate-Nitrite as N	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Sulfate	mg/L	1000	(1)	390	(.5)	1200	(1)	1000	(1)
Sulfite	mg/L	2.3	(.4)	.4 a	(.4)	1.3 a	(.4)	1.2 a	(.4)
Bulk chemistry									
Total inorganic carbon	mg CO3/g	57.997	(.14745)	60.946	(.14745)	64.878	(.14745)	76.674	(.14745)
Total organic carbon	mg/L	1.6 a	(1)	1.3 a	(1)	1.8 a	(1)	1.9 a	(1)
Total phenolics	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Barium	mg/L	.1	(.01)	.12	(.01)	.11	(.01)	.15	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	410	(1)	210	(1)	570	(1)	930	(1)
Chromium	mg/L	.024 a	(.01)	ND	(.01)	.015 a	(.01)	.11	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	.0062 a	(.003)	.005 a	(.003)	ND	(.003)	.014 a	(.003)
Magnesium	mg/L	ND	(1)	ND	(1)	ND	(1)	ND	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	.24 a	(.05)	.12 a	(.05)	.37	(.05)	.24 a	(.05)

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

Table E-7

(Continued)

		Site ID / Location ID Sample ID Preparation Method Log Date							
Parameter	Units	OH / 90AUGOH04 90AUGOH04-04		OH / 90AUGOH04 90AUGOH04-05		OH / 90AUGOH04 90AUGOH04-06		OH / 90AUGOH04 90AUGOH04-07	
		ASTM 8/03/90		ASTM 8/03/90		ASTM 8/03/90		ASTM 8/03/90	
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	340	(3)	210	(3)	490	(3)	360	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	1.8 a	(1)	2.7 a	(1)	ND	(1)	ND	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	68	(1)	40	(1)	100	(1)	75	(1)
Strontium	mg/L	2.8	(.003)	1.3	(.003)	3.9	(.003)	4.5	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	1750	(5)	2700	(5)	8600	(5)	9000	(5)
pH	pH units	11.5	( )	11.45	( )	11.75	( )	11.86	( )

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

D2-8

Table E-7

(Continued)

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
		OH / 90AUGOH04 90AUGOH04-08		OH / 90AUGOH04 90AUGOH04-09		OH / 90AUGOH07 90AUGOH07-01		OH / 90AUGOH07 90AUGOH07-02	
Parameter	Units	ASTM 8/03/90		ASTM 8/03/90		ASTM 8/03/90		ASTM 8/03/90	
-----	-----	-----		-----		-----		-----	
Anions									
Ammonia as N	mg/L	1.4	(.02)	1.7	(.02)	.83	(.02)	.28	(.02)
Chloride	mg/L	75	(.2)	7.5	(.02)	61	(.2)	150	(.2)
Nitrate-Nitrite as N	mg/L	ND	(.02)	ND	(.02)	ND	(.08)	ND	(.02)
Sulfate	mg/L	890	(1)	370	(.5)	500	(.5)	630	(.5)
Sulfite	mg/L	.82 a	(.4)	.8 a	(.4)	.61 a	(.4)	5.2	(.4)
Bulk chemistry									
Total inorganic carbon	mg CO3/g	70.776	(.14745)	19.66	(.13762)	69.793	(.14745)	55.048	(.15728)
Total organic carbon	mg/L	1.4 a	(1)	3.6 a	(1)	2.6 a	(1)	2 a	(1)
Total phenolics	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	.46 a	(.2)	.76 a	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Barium	mg/L	.15	(.01)	.026 a	(.01)	.083	(.01)	ND	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	.0015 a	(.001)
Calcium	mg/L	990	(1)	180	(1)	180	(1)	240	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	.0062 a	(.003)	.0035 a	(.003)	.032	(.003)	.043	(.003)
Magnesium	mg/L	ND	(1)	ND	(1)	ND	(1)	ND	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	.23 a	(.05)	ND	(.05)	.18 a	(.05)	.35	(.05)

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

D2-9

Table E-7

(Continued)

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
Parameter	Units	OH / 90AUGOH04 90AUGOH04-08		OH / 90AUGOH04 90AUGOH04-09		OH / 90AUGOH07 90AUGOH07-01		OH / 90AUGOH07 90AUGOH07-02	
		ASTM 8/03/90		ASTM 8/03/90		ASTM 8/03/90		ASTM 8/03/90	
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	190	(3)	10 a	(3)	180	(3)	320	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	ND	(1)	4.1 a	(1)	8.3	(1)	5.7	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	39	(1)	4.7 a	(1)	32	(1)	62	(1)
Strontium	mg/L	7.4	(.003)	.45	(.003)	2	(.003)	3.3	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)	.037 a	(.02)	ND	(.02)
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	8800	(5)	830	(5)	1560	(5)	3000	(5)
pH	pH units	11.8	( )	10.14	( )	10.92	( )	11.17	( )

Table E-7

(Continued)

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
		OH / 90AUGOH07		OH / 90AUGOH07		OH / 90AUGOH07		OH / 90AUGOH07	
		90AUGOH07-03		90AUGOH07-04		90AUGOH07-05		90AUGOH07-06	
		ASTM		ASTM		ASTM		ASTM	
Parameter	Units	8/03/90		8/03/90		8/03/90		8/03/90	
-----	-----	-----		-----		-----		-----	
Anions									
Ammonia as N	mg/L	.061	a (.02)	ND	(.02)	ND	(.02)	1.7	(.02)
Chloride	mg/L	140	(.2)	180	(.2)	160	(.2)	110	(.02)
Nitrate-Nitrite as N	mg/L	ND	(.02)	.035	a (.02)	.025	a (.02)	ND	(.02)
Sulfate	mg/L	670	(.5)	880	(.5)	1000	(.5)	700	(.5)
Sulfite	mg/L	24	(.4)	7.2	(.4)	8.2	(.4)	1.7	a (.4)
Bulk chemistry									
Total inorganic carbon	mg CO3/g	53.082	(.14745)	54.065	(.13762)	43.252	(.15728)	62.912	(.14745)
Total organic carbon	mg/L	2.4	a (1)	2.2	a (1)	2.1	a (1)	1.7	a (1)
Total phenolics	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Elements by ICPEs or AA									
Aluminum	mg/L	.46	a (.2)	.26	a (.2)	.37	a (.2)	ND	(.2)
Arsenic	mg/L	.021	a (.005)	.0059	a (.005)	.012	a (.005)	ND	(.005)
Barium	mg/L	.081	(.01)	.14	(.01)	.1	(.01)	.13	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	260	(1)	300	(1)	320	(1)	410	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	.052	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	.031	(.003)	.025	(.003)	.0092	a (.003)	.0096	a (.003)
Magnesium	mg/L	ND	(1)	ND	(1)	ND	(1)	ND	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	.26	(.05)	.31	(.05)	.35	(.05)	.19	a (.05)

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

Table E-7

(Continued)

		Site ID / Location ID Sample ID Preparation Method Log Date							
Parameter	Units	OH / 90AUGOH07 90AUGOH07-03		OH / 90AUGOH07 90AUGOH07-04		OH / 90AUGOH07 90AUGOH07-05		OH / 90AUGOH07 90AUGOH07-06	
		ASTM 8/03/90		ASTM 8/03/90		ASTM 8/03/90		ASTM 8/03/90	
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	210	(3)	330	(3)	310	(3)	300	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	6.1	(1)	8.6	(1)	7.6	(1)	ND	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	46	(1)	64	(1)	66	(1)	50	(1)
Strontium	mg/L	1.1	(.003)	1.9	(.003)	1.7	(.003)	2.3	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	.047 a	(.02)	.027 a	(.02)	.044 a	(.02)	ND	(.02)
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	2050	(5)	2850	(5)	2800	(5)	4800	(5)
pH	pH units	10.15	( )	10.84	( )	10.56	( )	11.45	( )

Table E-7

(Continued)

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
		OH / 90AUGOH07		OH / 90AUGOH07		OH / 90AUGOH08		OH / 90AUGOH08	
		90AUGOH07-07		90AUGOH07-08		90AUGOH08-01		90AUGOH08-02	
		ASTM		ASTM		ASTM		ASTM	
Parameter	Units	8/03/90		8/03/90		8/07/90		8/07/90	
-----	-----	-----		-----		-----		-----	
Anions									
Ammonia as N	mg/L	1.5	(.02)	1.9	(.02)	1.8	(.04)	.87	(.02)
Chloride	mg/L	120	(.2)	26	(.2)	130	(.2)	250	(.4)
Nitrate-Nitrite as N	mg/L	ND	(.02)	ND	(.02)	.36	(.04)	ND	(.02)
Sulfate	mg/L	480	(.5)	150	(.5)	850	(.5)	1600	(1)
Sulfite	mg/L	1.1 a	(.4)	.92 a	(.4)	4.4	(.4)	3.9	(.4)
Bulk chemistry									
Total inorganic carbon	mg CO3/g	71.759	(.14745)	49.15	(.14745)	78.64	(.15728)	55.048	(.14745)
Total organic carbon	mg/L	3.4 a	(1)	3.4 a	(1)	2.1 a	(1)	1.5 a	(1)
Total phenolics	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Elements by ICPES									
Sodium	mg/L	NA		NA		46.1 a	(1)	102	(1)
Vanadium	mg/L	NA		NA		ND	(.02)	.03 a	(.02)
Elements by ICPES or AA									
Aluminum	mg/L	ND	(.2)	.22 a	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.005)	.0079 a	(.005)	ND	(.005)	ND	(.005)
Barium	mg/L	.13	(.01)	.014 a	(.01)	.1	(.01)	.1	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	.0033 a	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	260	(1)	72	(1)	330	(1)	460	(1)
Chromium	mg/L	ND	(.01)	.019 a	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	ND	(.04)	ND	(.04)

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

Table E-7
(Continued)

E-34

		Site ID / Location ID Sample ID Preparation Method Log Date							
Parameter	Units	OH / 90AUGOH07 90AUGOH07-07 ASTM 8/03/90		OH / 90AUGOH07 90AUGOH07-08 ASTM 8/03/90		OH / 90AUGOH08 90AUGOH08-01 ASTM 8/07/90		OH / 90AUGOH08 90AUGOH08-02 ASTM 8/07/90	
Lead	mg/L	.029	(.003)	.012 a	(.003)	ND	(.003)	ND	(.003)
Magnesium	mg/L	ND	(1)	ND	(1)	ND	(1)	ND	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	.2 a	(.05)	.28	(.05)	.36	(.05)	.47	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	500	(3)	36	(3)	260	(3)	530	(3)
Selenium	mg/L	ND	(.005)	.011 a	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	1.4 a	(1)	2.7 a	(1)	2.5 a	(1)	6.8	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	73	(1)	19	(1)	NA		NA	
Strontium	mg/L	1.8	(.003)	.32	(.003)	3.8	(.003)	4.9	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)	NA		NA	
Zinc	mg/L	.026 a	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	4800	(5)	630	(5)	3200	(5)	4100	(5)
pH	pH units	11.47	( )	9.92	( )	11.44	( )	11.09	( )

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

Table E-7
(Continued)

		Site ID / Location ID Sample ID Preparation Method Log Date							
Parameter	Units	OH / 90AUGOH08 90AUGOH08-03 ASTM 8/07/90		OH / 90AUGOH08 90AUGOH08-04 ASTM 8/07/90		OH / 90AUGOH08 90AUGOH08-05 ASTM 8/07/90		OH / 90AUGOH08 90AUGOH08-06 ASTM 8/07/90	
		-----	-----	-----	-----	-----	-----	-----	-----
Anions									
Ammonia as N	mg/L	1.4	(.02)	.65	(.02)	.18	(.02)	.3	(.02)
Chloride	mg/L	240	(.4)	250	(.4)	250	(.4)	140	(.2)
Nitrate-Nitrite as N	mg/L	.026 a	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Sulfate	mg/L	1800	(1)	1000	(5)	1300	(1)	1100	(1)
Sulfite	mg/L	2.2	(.4)	3.9	(.4)	1.7 a	(.4)	15.6	(.4)
Bulk chemistry									
Total inorganic carbon	mg CO3/g	46.201	(.14745)	53.082	(.14745)	72.742	(.14745)	70.776	(.13762)
Total organic carbon	mg/L	1.4 a	(1)	2 a	(1)	2.8 a	(1)	1.9 a	(1)
Total phenolics	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Elements by ICPES									
Sodium	mg/L	103	(1)	119	(1)	75	(1)	38.8 a	(1)
Vanadium	mg/L	.039 a	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Elements by ICPES or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	.0085 a	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Barium	mg/L	.09	(.01)	.1	(.01)	.093	(.01)	.11	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	.0021 a	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	530	(1)	550	(1)	760	(1)	860	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	ND	(.04)	ND	(.04)

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

Table E-7

(Continued)

Parameter	Units	Site ID / Location ID Sample ID Preparation Method Log Date							
		OH / 90AUGOH08 90AUGOH08-03 ASTM 8/07/90		OH / 90AUGOH08 90AUGOH08-04 ASTM 8/07/90		OH / 90AUGOH08 90AUGOH08-05 ASTM 8/07/90		OH / 90AUGOH08 90AUGOH08-06 ASTM 8/07/90	
Lead	mg/L	ND	(.003)	ND	(.003)	ND	(.003)	ND	(.003)
Magnesium	mg/L	ND	(1)	ND	(1)	ND	(1)	ND	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	.5	(.05)	.48	(.05)	.32	(.05)	.24 a	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	520	(3)	750	(3)	500	(3)	240	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	8.6	(1)	2.1 a	(1)	ND	(1)	1 a	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Strontium	mg/L	3.3	(.003)	4.1	(.003)	6.8	(.003)	6.5	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	4300	(5)	5680	(5)	7300	(5)	6900	(5)
pH	pH units	11.03	( )	11.54	( )	11.85	( )	11.83	( )

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

D2-16

Table E-7
(Continued)

		Site ID / Location ID					
		Sample ID					
		Preparation Method					
		Log Date					
Parameter	Units	OH / 90AUGOH08 90AUGOH08-06D Dup of 90AUGOH08-06		OH / 90AUGOH08 90AUGOH08-07		OH / 90AUGOH08 90AUGOH08-08	
		ASTM 8/07/90		ASTM 8/07/90		ASTM 8/07/90	
-----	-----	-----	-----	-----	-----	-----	-----
Anions							
Ammonia as N	mg/L	.15	(.02)	.21	(.02)	1.4	(.04)
Chloride	mg/L	250	(.4)	130	(.2)	40	(.2)
Nitrate-Nitrite as N	mg/L	.039 a	(.02)	ND	(.02)	ND	(.02)
Sulfate	mg/L	1200	(1)	990	(1)	240	(.5)
Sulfite	mg/L	NA		3.6	(.4)	1.6 a	(.4)
Bulk chemistry							
Total inorganic carbon	mg CO3/g	NA		25.558	(.13762)	28.507	(.13762)
Total organic carbon	mg/L	3.5 a	(1)	2.7 a	(1)	ND	(1)
Total phenolics	mg/L	ND	(.005)	ND	(.005)	ND	(.005)
Elements by ICPEs							
Sodium	mg/L	NA		33.6 a	(1)	19.5 a	(1)
Vanadium	mg/L	NA		ND	(.02)	ND	(.02)
Elements by ICPEs or AA							
Aluminum	mg/L	ND	(.2)	ND	(.2)	.39 a	(.2)
Arsenic	mg/L	ND	(.005)	ND	(.005)	ND	(.005)
Barium	mg/L	.099	(.01)	.11	(.01)	.025 a	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	660	(1)	690	(1)	150	(1)
Chromium	mg/L	.078	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	ND	(.04)

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

Table E-7

(Continued)

		Site ID / Location ID Sample ID Preparation Method Log Date					
		OH / 90AUGOH08 90AUGOH08-06D Dup of 90AUGOH08-06		OH / 90AUGOH08 90AUGOH08-07		OH / 90AUGOH08 90AUGOH08-08	
Parameter	Units	ASTM 8/07/90		ASTM 8/07/90		ASTM 8/07/90	
Lead	mg/L	.0061	a (.003)	ND	(.003)	ND	(.003)
Magnesium	mg/L	ND	(1)	ND	(1)	ND	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	.27	(.05)	.22 a	(.05)	.24 a	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	530	(3)	180	(3)	92	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	ND	(1)	ND	(1)	4.9 a	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	81	(1)	NA		NA	
Strontium	mg/L	5.8	(.003)	4.8	(.003)	.56	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	NA		NA	
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements							
Conductivity	umhos/cm	NA		5380	(5)	1700	(5)
pH	pH units	NA		11.72	( )	11.39	( )

Table E-8

Chemical Characteristics of Deionized Water Leachates of Ohio Soils, Event 4

		Site ID / Location ID Sample ID Preparation Method Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / 90AUGOH02 90AUGOH02-10 ASTM 9 - 10		OH / 90AUGOH02 90AUGOH02-11 ASTM 10 - 11		OH / 90AUGOH02 90AUGOH02-12 ASTM 11 - 12		OH / 90AUGOH02 90AUGOH02-13 ASTM 12 - 13	
		-----	-----	-----	-----	-----	-----	-----	-----
Anions									
Ammonia as N	mg/L	ND	(.02)	.27	(.02)	.11	(.02)	.4	(.02)
Chloride	mg/L	6.7	(.04)	4.5	(.02)	4.3	(.02)	3.3	(.02)
Nitrate-Nitrite as N	mg/L	.17	(.02)	ND	(.02)	.021 a	(.02)	ND	(.02)
Sulfate	mg/L	140	(.1)	67	(.05)	320	(.5)	82	(.05)
Sulfite	mg/L	.4 a	(.4)	.4 a	(.4)	41.1	(.4)	33.4	(.4)
Bulk chemistry									
Total inorganic carbon	mg CO3/g	2.8507	(.14745)	17.694	(.084538)	NA		48.167	(.086504)
Total organic carbon	mg/L	11	(1)	11	(1)	10	(1)	15	(1)
Total phenolics	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Elements by ICPEs or AA									
Aluminum	mg/L	.86 a	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Antimony	mg/L	ND	(.1)	ND	(.1)	ND	(.1)	ND	(.1)
Arsenic	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Barium	mg/L	.014 a	(.01)	.01 a	(.01)	.028 a	(.01)	.012 a	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	110	(1)	28	(1)	150	(1)	26	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	ND	(.003)	.0062 a	(.003)	.0051 a	(.003)	ND	(.003)
Magnesium	mg/L	ND	(1)	2 a	(1)	9.9	(1)	5.2	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	.046 a	(.01)	.014 a	(.01)

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

Table E-8

(Continued)

		Site ID / Location ID Sample ID Preparation Method Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / 90AUGOH02 90AUGOH02-10		OH / 90AUGOH02 90AUGOH02-11		OH / 90AUGOH02 90AUGOH02-12		OH / 90AUGOH02 90AUGOH02-13	
		ASTM 9 - 10		ASTM 10 - 11		ASTM 11 - 12		ASTM 12 - 13	
Molybdenum	mg/L	ND	(.05)	ND	(.05)	ND	(.05)	ND	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	9.5 a	(3)	ND	(3)	5.7 a	(3)	ND	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	5.4	(1)	2 a	(1)	2.4 a	(1)	2.2 a	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	8.8	(1)	4.7 a	(1)	5.5	(1)	5.3	(1)
Strontium	mg/L	.23	(.003)	.043	(.003)	.23	(.003)	.062	(.003)
Thallium	mg/L	ND	(.1)	ND	(.1)	ND	(.1)	ND	(.1)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	.024 a	(.02)	ND	(.02)	.037 a	(.02)	.031 a	(.02)
Field measurements									
Conductivity	umhos/cm	670	(5)	210	(5)	810	(5)	240	(5)
pH	pH units	10.52	( )	8.59	( )	7.75	( )	7.31	( )

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

D2-2

E-40

Table E-8

(Continued)

		Site ID / Location ID Sample ID Preparation Method Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / 90AUGOH02 90AUGOH02-14 ASTM 13 - 14		OH / 90AUGOH02 90AUGOH02-15 ASTM 14 - 15		OH / 90AUGOH02 90AUGOH02-16 ASTM 15 - 16		OH / 90AUGOH04 90AUGOH04-10 ASTM 9 - 10	

Anions									
Ammonia as N	mg/L	.13	(.02)	.095 a	(.02)	.1	(.02)	ND	(.02)
Chloride	mg/L	1.8	(.02)	1.5	(.02)	1.6	(.02)	4.7	(.02)
Nitrate-Nitrite as N	mg/L	.028 a	(.02)	ND	(.02)	ND	(.02)	.34	(.02)
Sulfate	mg/L	290	(.5)	120	(.5)	140	(.5)	100	(.5)
Sulfite	mg/L	1.4 a	(.4)	4	(.4)	2	(.4)	.4 a	(.4)
Bulk chemistry									
Total inorganic carbon	mg CO3/g	62.912	(.12779)	36.371	(.14745)	86.504	(.14745)	1.7694	(.14745)
Total organic carbon	mg/L	1.9 a	(1)	1.6 a	(1)	2.9 a	(1)	2.3 a	(1)
Total phenolics	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Elements by ICPES or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Barium	mg/L	.023 a	(.01)	.022 a	(.01)	.022 a	(.01)	.011 a	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	.001 a	(.001)	ND	(.001)
Calcium	mg/L	120	(1)	56.4	(1)	68	(1)	51	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	.03 a	(.02)	.031 a	(.02)	.023 a	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	.057 a	(.04)	ND	(.04)
Lead	mg/L	.02	(.003)	.025	(.003)	.037	(.003)	.0071 a	(.003)
Magnesium	mg/L	17	(1)	10	(1)	11	(1)	2 a	(1)
Manganese	mg/L	.2	(.01)	.065	(.01)	.1	(.01)	ND	(.01)
Molybdenum	mg/L	ND	(.05)	ND	(.05)	ND	(.05)	ND	(.05)

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

D2-3

E-41

Table E-8

(Continued)

		Site ID / Location ID Sample ID Preparation Method Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / 90AUGOH02 90AUGOH02-14 ASTM 13 - 14		OH / 90AUGOH02 90AUGOH02-15 ASTM 14 - 15		OH / 90AUGOH02 90AUGOH02-16 ASTM 15 - 16		OH / 90AUGOH04 90AUGOH04-10 ASTM 9 - 10	
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	6.7 @	(3)	4.9 @	(3)	5.7 @	(3)	ND	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	ND	(1)	ND	(1)	ND	(1)	1.8 @	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	2.5 @	(1)	2.4 @	(1)	2.1 @	(1)	2.1 @	(1)
Strontium	mg/L	.19	(.003)	.12	(.003)	.14	(.003)	.075	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	660	(5)	370	(5)	480	(5)	310	(5)
pH	pH units	7.39	( )	7.63	( )	7.62	( )	8.42	( )

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

Table E-8

(Continued)

		Site ID / Location ID Sample ID Preparation Method Beg. Depth - End Depth (ft.)							
		OH / 90AUGOH04 90AUGOH04-11 ASTM 10 - 11		OH / 90AUGOH04 90AUGOH04-12 ASTM 11 - 12		OH / 90AUGOH04 90AUGOH04-13 ASTM 12 - 13		OH / 90AUGOH04 90AUGOH04-14 ASTM 13 - 14	
Parameter	Units								
-----	----	-----		-----		-----		-----	
Anions									
Ammonia as N	mg/L	1.7	(.02)	1.8	(.02)	1.8	(.02)	1.3	(.02)
Chloride	mg/L	5	(.02)	2.8	(.02)	2.2	(.02)	1.6	(.02)
Nitrate-Nitrite as N	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Sulfate	mg/L	85	(.5)	130	(.5)	340	(.5)	26	(.05)
Sulfite	mg/L	.4 a	(.4)	.4 a	(.4)	.41 a	(.4)	.4 a	(.4)
Bulk chemistry									
Total inorganic carbon	mg CO3/g	2.0643	(.15728)	1.7694	(.12779)	13.762	(.13762)	3.932	(.13762)
Total organic carbon	mg/L	1.8 a	(1)	5.7	(1)	ND	(1)	2.8 a	(1)
Total phenolics	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Elements by ICPES or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Barium	mg/L	.011 a	(.01)	.014 a	(.01)	.026 a	(.01)	ND	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	41	(1)	64	(1)	150	(1)	11	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	.026 a	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	.058 a	(.04)	.16 a	(.04)
Lead	mg/L	ND	(.003)	ND	(.003)	ND	(.003)	.0046 a	(.003)
Magnesium	mg/L	3 a	(1)	5.3	(1)	7.9	(1)	2.5 a	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	ND	(.05)	ND	(.05)	ND	(.05)	ND	(.05)

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

D2-5

Table E-8
(Continued)

E-44

		Site ID / Location ID Sample ID Preparation Method Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / 90AUGOH04 90AUGOH04-11		OH / 90AUGOH04 90AUGOH04-12		OH / 90AUGOH04 90AUGOH04-13		OH / 90AUGOH04 90AUGOH04-14	
		ASTM 10 - 11		ASTM 11 - 12		ASTM 12 - 13		ASTM 13 - 14	
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	ND	(3)	ND	(3)	4.2 a	(3)	ND	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	1.8 a	(1)	2.2 a	(1)	1.8 a	(1)	1.9 a	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	2.5 a	(1)	2.4 a	(1)	2.2 a	(1)	1.6 a	(1)
Strontium	mg/L	.061	(.003)	.096	(.003)	.23	(.003)	.024	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	260	(5)	350	(5)	730	(5)	260	(5)
pH	pH units	8	( )	8.25	( )	8.09	( )	10.02	( )

Table E-8

(Continued)

		Site ID / Location ID Sample ID Preparation Method Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / 90AUGOH04 90AUGOH04-15 ASTM 14 - 15		OH / 90AUGOH04 90AUGOH04-16 ASTM 15 - 16		OH / 90AUGOH07 90AUGOH07-09 ASTM 8 - 9		OH / 90AUGOH07 90AUGOH07-10 ASTM 9 - 10	
Anions									
Ammonia as N	mg/L	1.7	(.02)	1.4	(.02)	2	(.02)	.39	(.02)
Chloride	mg/L	2.7	(.02)	1.4	(.02)	5	(.02)	1.4	(.02)
Nitrate-Nitrite as N	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Sulfate	mg/L	230	(.5)	17	(.05)	90	(.5)	260	(.5)
Sulfite	mg/L	.4 @	(.4)	2	(.4)	2.9	(.4)	1.1 @	(.4)
Bulk chemistry									
Total inorganic carbon	mg CO3/g	17.694	(.13762)	43.252	(.12779)	.28507 @	(.14745)	ND	(.13762)
Total organic carbon	mg/L	1.2 @	(1)	ND	(1)	5.7	(1)	2.1 @	(1)
Total phenolics	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Elements by ICPES or AA									
Aluminum	mg/L	.28 @	(.2)	ND	(.2)	ND	(.2)	.46 @	(.2)
Arsenic	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Barium	mg/L	.018 @	(.01)	ND	(.01)	ND	(.01)	.015 @	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	.044 @	(.01)
Calcium	mg/L	110	(1)	14	(1)	29	(1)	67	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	.051	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	.08	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	.032 @	(.02)
Iron	mg/L	ND	(.04)	.089 @	(.04)	ND	(.04)	.46	(.04)
Lead	mg/L	.004 @	(.003)	.0086 @	(.003)	.016	(.003)	.049	(.003)
Magnesium	mg/L	2.9 @	(1)	2.2 @	(1)	6.8	(1)	21	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	.13	(.01)
Molybdenum	mg/L	ND	(.05)	ND	(.05)	ND	(.05)	ND	(.05)

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

D2-7

Table E-8

(Continued)

Parameter	Units	Field measurements																			
Nickel	mg/L	ND	(.02)	mg/L	ND	(.02)	mg/L	ND	(.02)	mg/L	ND	(.02)	mg/L	ND	(.02)	mg/L	ND	(.02)			
Potassium	mg/L	3.2	a	(3)	ND	(.005)	mg/L	1.6	a	(1)	ND	(.01)	mg/L	1.8	a	(1)	.17	(.003)			
Selenium	mg/L	ND	(.005)	mg/L	ND	(.005)	mg/L	1.3	a	(1)	ND	(.01)	mg/L	1.1	a	(1)	.023	(.003)			
Silicon	mg/L	1.6	a	(1)	ND	(.005)	mg/L	3.5	a	(1)	ND	(.01)	mg/L	8.4	(1)	(1)	.027	a	(.02)		
Silver	mg/L	ND	(.01)	mg/L	ND	(.01)	mg/L	ND	(.01)	(1)	ND	(.01)	mg/L	ND	(.01)	(1)	ND	(.02)	(.02)		
Sodium	mg/L	1.8	a	(1)	ND	(.003)	mg/L	1.1	a	(1)	ND	(.01)	mg/L	1.1	a	(1)	ND	(.02)	(.02)		
Strontium	mg/L	.17	(.003)	mg/L	ND	(.003)	mg/L	1.6	a	(1)	ND	(.01)	mg/L	1.8	a	(1)	ND	(.02)	(.02)		
Tin	mg/L	ND	(.6)	mg/L	ND	(.6)	mg/L	ND	(.6)	(1)	ND	(.01)	mg/L	ND	(.01)	(1)	ND	(.02)	(.02)		
Vanadium	mg/L	ND	(.02)	mg/L	ND	(.02)	mg/L	ND	(.02)	(1)	ND	(.01)	mg/L	ND	(.01)	(1)	ND	(.02)	(.02)		
Zinc	mg/L	ND	(.02)	mg/L	ND	(.02)	mg/L	ND	(.02)	(1)	ND	(.01)	mg/L	ND	(.01)	(1)	ND	(.02)	(.02)		

OH / 90AUGOH04	ASTM	14 - 15	15 - 16	8 - 9	9 - 10																
90AUGOH04-15	90AUGOH04-16	90AUGOH07-09	90AUGOH07-10																		
Beg. Depth - End Depth (ft.)																					
Preparation Method																					
Sample ID																					
Site ID / Location ID																					

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

Table E-8

(Continued)

		Site ID / Location ID Sample ID Preparation Method Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / 90AUGOH07 90AUGOH07-11 ASTM 10 - 11		OH / 90AUGOH07 90AUGOH07-12 ASTM 11 - 12		OH / 90AUGOH07 90AUGOH07-13 ASTM 12 - 13		OH / 90AUGOH07 90AUGOH07-14 ASTM 13 - 14	
		-----	-----	-----	-----	-----	-----	-----	-----
Anions									
Ammonia as N	mg/L	1	(.02)	1	(.02)	.46	(.02)	.7	(.02)
Chloride	mg/L	5.2	(.02)	1.9	(.02)	3.3	(.02)	2.1	(.02)
Nitrate-Nitrite as N	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Sulfate	mg/L	610	(.5)	560	(.5)	420	(.5)	530	(.5)
Sulfite	mg/L	2.2	(.4)	.54 a	(.4)	1.5 a	(.4)	.4 a	(.4)
Bulk chemistry									
Total inorganic carbon	mg CO3/g	ND	(.13762)	ND	(.12779)	1.6711	(.14745)	2.6541	(.12779)
Total organic carbon	mg/L	2.2 a	(1)	2.7 a	(1)	2.1 a	(1)	2.4 a	(1)
Total phenolics	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Elements by ICPEs or AA									
Aluminum	mg/L	3.7	(.2)	1	(.2)	2	(.2)	ND	(.2)
Arsenic	mg/L	.01 a	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Barium	mg/L	.014 a	(.01)	.028 a	(.01)	.013 a	(.01)	ND	(.01)
Beryllium	mg/L	.0062 a	(.002)	ND	(.002)	.0041 a	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	.046 a	(.01)	.08 a	(.02)	.0072	(.001)	.0026 a	(.001)
Calcium	mg/L	160	(1)	140	(1)	98.1	(1)	150	(1)
Chromium	mg/L	.014 a	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	.26	(.01)	.22	(.01)	.36	(.01)	.18	(.01)
Copper	mg/L	.075 a	(.02)	.052 a	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	14	(.04)	1.3	(.04)	1.7	(.04)	ND	(.04)
Lead	mg/L	.074	(.006)	.076	(.006)	.1	(.006)	.018	(.003)
Magnesium	mg/L	30.5	(1)	45	(1)	30	(1)	47	(1)
Manganese	mg/L	.37	(.01)	1.3	(.01)	.65	(.01)	1.6	(.01)
Molybdenum	mg/L	ND	(.05)	ND	(.05)	ND	(.05)	ND	(.05)

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

D2-9

E-47

Table E-8

(Continued)

		Site ID / Location ID Sample ID Preparation Method Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / 90AUGOH07 90AUGOH07-11		OH / 90AUGOH07 90AUGOH07-12		OH / 90AUGOH07 90AUGOH07-13		OH / 90AUGOH07 90AUGOH07-14	
		ASTM 10 - 11		ASTM 11 - 12		ASTM 12 - 13		ASTM 13 - 14	
Nickel	mg/L	1.7	(.02)	1.2	(.02)	1.9	(.02)	.89	(.02)
Potassium	mg/L	16	(3)	22	(3)	12 a	(3)	8.7 a	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	7.9	(1)	7	(1)	6.9	(1)	1.6 a	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	8.9	(1)	9.7	(1)	8.4	(1)	8.3	(1)
Strontium	mg/L	.48	(.003)	.36	(.003)	.31	(.003)	.3	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	7.2	(.02)	5.8	(.02)	8.7	(.02)	.83	(.02)
Field measurements									
Conductivity	umhos/cm	1190	(5)	1120	(5)	880	(5)	990	(5)
pH	pH units	3.67	( )	4.15	( )	4	( )	6.48	( )

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

02-10

E-48

Table E-8

(Continued)

		Site ID / Location ID Sample ID Preparation Method Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / 90AUGOH07 90AUGOH07-15 ASTM 14 - 15		OH / 90AUGOH07 90AUGOH07-16 ASTM 15 - 16		OH / 90AUGOH08 90AUGOH08-09 ASTM 8 - 9		OH / 90AUGOH08 90AUGOH08-10 ASTM 9 - 10	
		-----	-----	-----	-----	-----	-----	-----	-----
Anions									
Ammonia as N	mg/L	1.2	(.02)	1.1	(.02)	.7	(.02)	.73	(.02)
Chloride	mg/L	1	(.02)	.96	(.02)	6.6	(.04)	4.7	(.04)
Nitrate-Nitrite as N	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Sulfate	mg/L	770	(.5)	470	(.5)	120	(.5)	89	(.5)
Sulfite	mg/L	9.3	(.4)	1.4 @	(.4)	.77 @	(.4)	.4 @	(.4)
Bulk chemistry									
Total inorganic carbon	mg CO3/g	ND	(.13762)	ND	(.14745)	22.609	(.13762)	18.677	(.13762)
Total organic carbon	mg/L	2.4 @	(1)	2.4 @	(1)	3.6 @	(1)	2.1 @	(1)
Total phenolics	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Elements by ICPES									
Sodium	mg/L	NA		NA		6.66 @	(1)	5.75 @	(1)
Vanadium	mg/L	NA		NA		ND	(.02)	ND	(.02)
Elements by ICPES or AA									
Aluminum	mg/L	7.2	(.2)	4.1	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	.014 @	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Barium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	.011 @	(.01)
Beryllium	mg/L	.02	(.002)	.0045 @	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	.044 @	(.01)	.029 @	(.01)	ND	(.001)	ND	(.001)
Calcium	mg/L	130	(1)	77	(1)	78	(1)	48	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	.89	(.01)	.71	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	.041 @	(.02)	.026 @	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	57	(.04)	7.6	(.04)	ND	(.04)	ND	(.04)

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

D2-11

E-49

Table E-8

(Continued)

		Site ID / Location ID Sample ID Preparation Method Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / 90AUGOH07 90AUGOH07-15 ASTM 14 - 15		OH / 90AUGOH07 90AUGOH07-16 ASTM 15 - 16		OH / 90AUGOH08 90AUGOH08-09 ASTM 8 - 9		OH / 90AUGOH08 90AUGOH08-10 ASTM 9 - 10	
Lead	mg/L	.037	(.003)	.05	(.003)	ND	(.003)	ND	(.003)
Magnesium	mg/L	46	(1)	30.5	(1)	7.2	(1)	7.7	(1)
Manganese	mg/L	1.1	(.01)	.73	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	.084 a	(.05)	.06 a	(.05)	ND	(.05)	ND	(.05)
Nickel	mg/L	5.6	(.02)	4	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	6 a	(3)	8.6 a	(3)	5 a	(3)	5.2 a	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	8.3	(1)	8	(1)	1.8 a	(1)	1.4 a	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	9.1	(1)	7.2	(1)	NA		NA	
Strontium	mg/L	.25	(.003)	.22	(.003)	.14	(.003)	.11	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)	NA		NA	
Zinc	mg/L	18	(.02)	26	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	1240	(5)	870	(5)	500	(5)	360	(5)
pH	pH units	3.39	( )	3.26	( )	7.99	( )	7.83	( )

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

D2-12

Table E-8

(Continued)

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / 90AUGOH08 90AUGOH08-11		OH / 90AUGOH08 90AUGOH08-12		OH / 90AUGOH08 90AUGOH08-13		OH / 90AUGOH08 90AUGOH08-14	
		ASTM 10 - 11		ASTM 11 - 12		ASTM 12 - 13		ASTM 13 - 14	
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Anions									
Ammonia as N	mg/L	.69	(.02)	.24	(.02)	.1	(.02)	.8	(.02)
Chloride	mg/L	2.7	(.02)	4.7	(.02)	2.2	(.04)	2.2	(.04)
Nitrate-Nitrite as N	mg/L	ND	(.02)	ND	(.02)	.2	(.02)	.088 a	(.02)
Sulfate	mg/L	770	(.5)	1000	(1)	120	(.5)	250	(.5)
Sulfite	mg/L	.4 a	(.4)	.4 a	(.4)	1.5 a	(.4)	3	(.4)
Bulk chemistry									
Total inorganic carbon	mg CO ₃ /g	9.83	(.12779)	11.796	(.13762)	1.2779	(.14745)	.983	(.14745)
Total organic carbon	mg/L	2.3 a	(1)	1.8 a	(1)	7.6	(1)	2.3 a	(1)
Total phenolics	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Elements by ICPEs									
Sodium	mg/L	5.08 a	(1)	6.61 a	(1)	6.16 a	(1)	6.14 a	(1)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.005)	ND	(.005)	.0081 a	(.005)	.0071 a	(.005)
Barium	mg/L	ND	(.01)	.012 a	(.01)	.017 a	(.01)	.019 a	(.01)
Beryllium	mg/L	.0023 a	(.002)	ND	(.002)	ND	(.002)	.0021 a	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	300	(1)	410	(1)	56	(1)	75	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	ND	(.04)	.076 a	(.04)

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

D2-13

Table E-8

(Continued)

		Site ID / Location ID Sample ID Preparation Method Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / 90AUGOH08 90AUGOH08-11 ASTM 10 - 11		OH / 90AUGOH08 90AUGOH08-12 ASTM 11 - 12		OH / 90AUGOH08 90AUGOH08-13 ASTM 12 - 13		OH / 90AUGOH08 90AUGOH08-14 ASTM 13 - 14	
Lead	mg/L	ND	(.003)	ND	(.003)	ND	(.003)	ND	(.003)
Magnesium	mg/L	19	(1)	25	(1)	17	(1)	17	(1)
Manganese	mg/L	.015 @	(.01)	.066	(.01)	.059	(.01)	.042 @	(.01)
Molybdenum	mg/L	ND	(.05)	ND	(.05)	ND	(.05)	ND	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	6.3 @	(3)	14 @	(3)	21	(3)	22	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	1.4 @	(1)	1.8 @	(1)	2 @	(1)	2.3 @	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Strontium	mg/L	.29	(.003)	.39	(.003)	.16	(.003)	.18	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements:									
Conductivity	umhos/cm	1500	(5)	1850	(5)	380	(5)	620	(5)
pH	pH units	7.47	( )	7.5	( )	7.55	( )	8.29	( )

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

D2-14

Table E-8

(Continued)

		Site ID / Location ID	
		Sample ID	
		Preparation Method	
		Beg. Depth - End Depth (ft.)	
		OH / 90AUGOH08	
		90AUGOH08-15	
		ASTM	
		14 - 15	
Parameter	Units		
-----	-----	-----	-----
Anions			
Ammonia as N	mg/L	.32	(.02)
Chloride	mg/L	2.2	(.04)
Nitrate-Nitrite as N	mg/L	1.1	(.02)
Sulfate	mg/L	160	(.5)
Sulfite	mg/L	1.4 @	(.4)
Bulk chemistry			
Total inorganic carbon	mg CO3/g	3.3422	(.13762)
Total organic carbon	mg/L	1.8 @	(1)
Total phenolics	mg/L	ND	(.005)
Elements by ICPES			
Sodium	mg/L	6.68 @	(1)
Vanadium	mg/L	ND	(.02)
Elements by ICPES or AA			
Aluminum	mg/L	ND	(.2)
Arsenic	mg/L	ND	(.005)
Barium	mg/L	.016 @	(.01)
Beryllium	mg/L	.0021 @	(.002)
Boron	mg/L	ND	(.6)
Cadmium	mg/L	ND	(.001)
Calcium	mg/L	38	(1)
Chromium	mg/L	ND	(.01)
Cobalt	mg/L	ND	(.01)
Copper	mg/L	ND	(.02)
Iron	mg/L	ND	(.04)

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

Table E-8

(Continued)

Site ID / Location ID
 Sample ID
 Preparation Method
 Beg. Depth - End Depth (ft.)

Parameter	Units	OH / 90AUGOH08 90AUGOH08-15	
		ASTM 14 - 15	
Lead	mg/L	ND	(.003)
Magnesium	mg/L	11	(1)
Manganese	mg/L	.014 a	(.01)
Molybdenum	mg/L	ND	(.05)
Nickel	mg/L	ND	(.02)
Potassium	mg/L	20	(3)
Selenium	mg/L	ND	(.005)
Silicon	mg/L	2.3 a	(1)
Silver	mg/L	ND	(.01)
Strontium	mg/L	.11	(.003)
Tin	mg/L	ND	(.6)
Zinc	mg/L	ND	(.02)
Field measurements			
Conductivity	umhos/cm	380	(5)
pH	pH units	7.78	()

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

Table E-9

Chemical Characteristics of Deionized Water Leachates of Ohio Ash, Event 8

		Site ID / Location ID Sample ID Preparation Method Log Date							
Parameter	Units	OH / 91AUGOH01 91AUGOH01-01 ASTM 8/29/91		OH / 91AUGOH01 91AUGOH01-02 ASTM 8/29/91		OH / 91AUGOH01 91AUGOH01-03 ASTM 8/29/91		OH / 91AUGOH01 91AUGOH01-04 ASTM 8/29/91	
		-----		-----		-----		-----	
Anions									
Chloride	mg/L	1.5	(.026)	17	(.026)	23	(.052)	120	(.26)
Sulfate	mg/L	120	(.1)	180	(.1)	490	(.5)	620	(1)
Bulk chemistry									
Total inorganic carbon	mg/g	58	(.00073)	55	(.00073)	30	(.00073)	46	(.00073)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	.83 @	(.2)	.49 @	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.004)	ND	(.004)	ND	(.004)	ND	(.004)
Barium	mg/L	.022 @	(.01)	.096	(.01)	.1	(.01)	.1	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	47	(1)	100	(1)	180	(1)	270	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	.1 @	(.04)	ND	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	ND	(.003)	ND	(.003)	ND	(.003)	ND	(.003)
Magnesium	mg/L	8	(1)	ND	(1)	ND	(1)	ND	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	.076 @	(.05)	.15 @	(.05)	.066 @	(.05)	.44	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	3.2 @	(3)	43	(3)	94	(3)	230	(3)
Selenium	mg/L	.005 @	(.005)	.006 @	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	4.5 @	(1)	5.3	(1)	7.3	(1)	2.9 @	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)

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

D2-1

Table E-9

(Continued)

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
Parameter	Units	OH / 91AUGOH01 91AUGOH01-01		OH / 91AUGOH01 91AUGOH01-02		OH / 91AUGOH01 91AUGOH01-03		OH / 91AUGOH01 91AUGOH01-04	
		ASTM 8/29/91		ASTM 8/29/91		ASTM 8/29/91		ASTM 8/29/91	
Sodium	mg/L	10	(1)	15	(1)	15	(1)	48	(1)
Strontium	mg/L	.17	(.003)	1.9	(.003)	1.6	(.003)	2.8	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	.024 @	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	315	(5)	100	(5)	125	(5)	265	(5)
pH	pH units	7.91	( )	11.15	( )	10.95	( )	11.45	( )

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

Table E-9
(Continued)

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
Parameter	Units	OH / 91AUGOH01		OH / 91AUGOH01		OH / 91AUGOH01		OH / 91AUGOH01	
		91AUGOH01-06		91AUGOH01-07		91AUGOH01-08		91AUGOH01-09	
		ASTM		ASTM		ASTM		ASTM	
		8/29/91		8/29/91		8/29/91		8/29/91	
-----	-----	-----		-----		-----		-----	
Anions									
Chloride	mg/L	180	(.52)	230	(.52)	260	(.52)	260	(.52)
Sulfate	mg/L	980	(1)	580	(1)	710	(1)	720	(1)
Bulk chemistry									
Total inorganic carbon	mg/g	74	(.00073)	64	(.00073)	78	(.00073)	80	(.00073)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.004)	ND	(.004)	ND	(.004)	ND	(.004)
Barium	mg/L	.1	(.01)	.13	(.01)	.12	(.01)	.13	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	320	(1)	230	(1)	360	(1)	440	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	ND	(.003)	ND	(.003)	ND	(.003)	ND	(.003)
Magnesium	mg/L	ND	(1)	ND	(1)	ND	(1)	ND	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	.36	(.05)	.36	(.05)	.34	(.05)	.27	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	410	(3)	540	(3)	610	(3)	570	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	.033	(.005)	ND	(.005)
Silicon	mg/L	2.6 @	(1)	3 @	(1)	ND	(1)	ND	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)

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

D2-3

E-57

Table E-9

(Continued)

		Site ID / Location ID Sample ID Preparation Method Log Date							
Parameter	Units	OH / 91AUGOH01 91AUGOH01-06		OH / 91AUGOH01 91AUGOH01-07		OH / 91AUGOH01 91AUGOH01-08		OH / 91AUGOH01 91AUGOH01-09	
		ASTM 8/29/91		ASTM 8/29/91		ASTM 8/29/91		ASTM 8/29/91	
Sodium	mg/L	74	(1)	93	(1)	100	(1)	92	(1)
Strontium	mg/L	2.7	(.003)	3.4	(.003)	4.1	(.003)	4.6	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	.034 @	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	3650	(5)	4700	(5)	5700	(5)	6200	(5)
pH	pH units	11.46	( )	11.7	( )	11.78	( )	11.86	( )

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

Table E-9

(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID		Preparation Method		Log Date			
		OH / 91AUGOH03		OH / 91AUGOH03		OH / 91AUGOH03		OH / 91AUGOH03	
		91AUGOH03-01		91AUGOH03-02		91AUGOH03-03		91AUGOH03-04	
		ASTM		ASTM		ASTM		ASTM	
		8/29/91		8/29/91		8/29/91		8/29/91	
Anions									
Chloride	mg/L	8.3	(.026)	6.8	(.052)	100	(.26)	200	(.52)
Sulfate	mg/L	380	(1)	330	(.5)	340	(.5)	580	(1)
Bulk chemistry									
Total inorganic carbon	mg/g	55	(.00073)	41	(.00073)	66	(.00073)	50	(.00073)
Elements by ICPES or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	.69 @	(.2)
Arsenic	mg/L	ND	(.004)	ND	(.004)	ND	(.004)	.0065 @	(.004)
Barium	mg/L	.023 @	(.01)	.029 @	(.01)	.13	(.01)	.11	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	130	(1)	79	(1)	240	(1)	180	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	.1 @	(.04)	ND	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	ND	(.003)	ND	(.003)	.0045 @	(.003)	ND	(.003)
Magnesium	mg/L	25	(1)	18	(1)	ND	(1)	ND	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	ND	(.05)	ND	(.05)	.25	(.05)	.19 @	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	3.6 @	(3)	3.7 @	(3)	110	(3)	280	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	.0066 @	(.005)	ND	(.005)
Silicon	mg/L	4.2 @	(1)	3.4 @	(1)	2.6 @	(1)	7.2	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)

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

D2-5

E-59

Table E-9

(Continued)

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
Parameter	Units	OH / 91AUG0H03		OH / 91AUG0H03		OH / 91AUG0H03		OH / 91AUG0H03	
		91AUG0H03-01		91AUG0H03-02		91AUG0H03-03		91AUG0H03-04	
		ASTM		ASTM		ASTM		ASTM	
		8/29/91		8/29/91		8/29/91		8/29/91	
Sodium	mg/L	16	(1)	13	(1)	27	(1)	57	(1)
Strontium	mg/L	.34	(.003)	.22	(.003)	3.6	(.003)	1.3	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	ND	(.02)	ND	(.02)	.022 @	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	800	(5)	560	(5)	2350	(5)	2100	(5)
pH	pH units	7.25	()	7.51	()	11.38	()	10.77	()

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

D2-6

Table E-9
(Continued)

		Site ID / Location ID Sample ID Preparation Method Log Date							
Parameter	Units	OH / 91AUG0H03 91AUG0H03-05 ASTM 8/29/91		OH / 91AUG0H03 91AUG0H03-06 ASTM 8/29/91		OH / 91AUG0H03 91AUG0H03-07 ASTM 8/29/91		OH / 91AUG0H03 91AUG0H03-08 ASTM 8/29/91	
		-----		-----		-----		-----	
Anions									
Chloride	mg/L	210	(.52)	280	(.52)	240	(.52)	230	(.52)
Sulfate	mg/L	990	(1)	1400	(1)	540	(1)	660	(1)
Bulk chemistry									
Total inorganic carbon	mg/g	55	(.00073)	70	(.00073)	76	(.00073)	62	(.00073)
Elements by ICPEs or AA									
Aluminum	mg/L	.34 @	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	.0056 @	(.004)	ND	(.004)	.0044 @	(.004)	.004 @	(.004)
Barium	mg/L	.1	(.01)	.11	(.01)	.13	(.01)	.13	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	310	(1)	520	(1)	270	(1)	400	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	ND	(.003)	ND	(.003)	.0066 @	(.003)	ND	(.003)
Magnesium	mg/L	ND	(1)	ND	(1)	ND	(1)	ND	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	.31	(.05)	.32	(.05)	.27	(.05)	.2 @	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	370	(3)	650	(3)	500	(3)	470	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	7.7	(1)	ND	(1)	1.2 @	(1)	ND	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)

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

Table E-9

(Continued)

		Site ID / Location ID Sample ID Preparation Method Log Date							
Parameter	Units	OH / 91AUG0H03 91AUG0H03-05		OH / 91AUG0H03 91AUG0H03-06		OH / 91AUG0H03 91AUG0H03-07		OH / 91AUG0H03 91AUG0H03-08	
		ASTM 8/29/91		ASTM 8/29/91		ASTM 8/29/91		ASTM 8/29/91	
Sodium	mg/L	76	(1)	110	(1)	80	(1)	76	(1)
Strontium	mg/L	1.6	(.003)	4.1	(.003)	4.1	(.003)	4	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	.049 @	(.02)
Field measurements									
Conductivity	umhos/cm	2600	(5)	6000	(5)	5000	(5)	5600	(5)
pH	pH units	10.92	( )	11.8	( )	11.68	( )	11.8	( )

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

Table E-9

(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID		Preparation Method		Log Date			
		OH / 91AUGOH05		OH / 91AUGOH05		OH / 91AUGOH05		OH / 91AUGOH05	
		91AUGOH05-01		91AUGOH05-02		91AUGOH05-03		91AUGOH05-04	
		ASTM		ASTM		ASTM		ASTM	
		8/30/91		8/30/91		8/30/91		8/30/91	
-----	-----	-----		-----		-----		-----	
Anions									
Chloride	mg/L	.95	(.026)	7.2	(.026)	34	(.26)	59	(.26)
Sulfate	mg/L	190	(.5)	730	(.5)	360	(.5)	1100	(5)
Bulk chemistry									
Total inorganic carbon	mg/g	63	(.00073)	62	(.00073)	76	(.00073)	76	(.00073)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	.41 @	(.2)	ND	(.2)	ND	(.8)
Arsenic	mg/L	ND	(.004)	.022	(.004)	ND	(.004)	ND	(.004)
Barium	mg/L	.035 @	(.01)	.053	(.01)	.15	(.01)	.15 @	(.04)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.008)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(2.4)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	89	(1)	300	(1)	450	(1)	1300	(4)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.04)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.04)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.08)
Iron	mg/L	ND	(.04)	ND	(.04)	ND	(.04)	ND	(.16)
Lead	mg/L	ND	(.003)	ND	(.003)	ND	(.003)	ND	(.003)
Magnesium	mg/L	7.7	(1)	ND	(1)	ND	(1)	ND	(4)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.04)
Molybdenum	mg/L	ND	(.05)	.073 @	(.05)	.18 @	(.05)	.22 @	(.2)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.08)
Potassium	mg/L	ND	(3)	24	(3)	45	(3)	110	(12)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	2.1 @	(1)	8.2	(1)	ND	(1)	ND	(4)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.04)

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

D2-9

Table E-9
(Continued)

		Site ID / Location ID Sample ID Preparation Method Log Date							
Parameter	Units	OH / 91AUG0H05 91AUG0H05-01 ASTM 8/30/91		OH / 91AUG0H05 91AUG0H05-02 ASTM 8/30/91		OH / 91AUG0H05 91AUG0H05-03 ASTM 8/30/91		OH / 91AUG0H05 91AUG0H05-04 ASTM 8/30/91	
		-----	-----	-----	-----	-----	-----	-----	-----
Sodium	mg/L	1.6 @	(1)	5.7	(1)	9.8	(1)	22	(4)
Strontium	mg/L	.16	(.003)	.92	(.003)	5.6	(.003)	10	(.012)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(2.4)
Vanadium	mg/L	ND	(.02)	.056 @	(.02)	ND	(.02)	ND	(.08)
Zinc	mg/L	.25	(.02)	.11	(.02)	ND	(.02)	ND	(.08)
Field measurements									
Conductivity	umhos/cm	300	(5)	1250	(5)	4000	(5)	7500	(5)
pH	pH units	7.41	( )	10.17	( )	11.69	( )	12	( )

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

Table E-9
(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID		Preparation Method		Log Date			
		OH / 91AUG0H05		OH / 91AUG0H05		OH / 91AUG0H05		OH / 91AUG0H05	
		91AUG0H05-05		91AUG0H05-06		91AUG0H05-07		91AUG0H05-08	
		ASTM		ASTM		ASTM		ASTM	
		8/30/91		8/30/91		8/30/91		8/30/91	
-----	-----	-----		-----		-----		-----	
Anions									
Chloride	mg/L	130	(1.3)	190	(1.3)	280	(1.3)	170	(1.3)
Sulfate	mg/L	1000	(2.5)	850	(2.5)	1200	(2.5)	740	(2.5)
Bulk chemistry									
Total inorganic carbon	mg/g	74	(.00073)	67	(.00073)	80	(.00073)	60	(.00073)
Elements by ICPES or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.004)	.0041 @	(.004)	.0048 @	(.004)	.0048 @	(.004)
Barium	mg/L	.13	(.01)	.12	(.01)	.12	(.01)	.13	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	870	(4)	360	(1)	700	(4)	500	(1)
Chromium	mg/L	.025 @	(.01)	.11	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	.12 @	(.04)	ND	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	.0081 @	(.003)	.0026	(.003)	.0055 @	(.003)	.0029	(.003)
Magnesium	mg/L	ND	(1)	ND	(1)	ND	(1)	ND	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	.21 @	(.05)	.24 @	(.05)	.3	(.05)	.22 @	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	260	(3)	460	(3)	530	(3)	410	(3)
Selenium	mg/L	ND	(.005)	.0073 @	(.005)	.0073 @	(.005)	ND	(.005)
Silicon	mg/L	ND	(1)	1.6 @	(1)	ND	(1)	ND	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)

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

Table E-9
(Continued)

		Site ID / Location ID		Sample ID		Preparation Method		Log Date	
Parameter	Units	OH / 91AUGOH05 91AUGOH05-05 ASTM	8/30/91	OH / 91AUGOH05 91AUGOH05-06 ASTM	8/30/91	OH / 91AUGOH05 91AUGOH05-07 ASTM	8/30/91	OH / 91AUGOH05 91AUGOH05-08 ASTM	8/30/91
Sodium	mg/L	53	(1)	97	(1)	110	(1)	88	(1)
Strontium	mg/L	6.7	(.003)	3.5	(.003)	5.9	(.003)	5.2	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	.3	(.02)	1.3	(.02)	.074	(.02)	.026	(.02)
Field measurements									
Conductivity	umhos/cm	6500	(5)	4500	(5)	6500	(5)	6000	(5)
pH	pH units	11.82	( )	11.62	( )	11.88	( )	11.88	( )

Table E-9
(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID				Preparation Method			
		Log Date							
		OH / 91AUGOH05 91AUGOH05-09 ASTM 8/30/91		OH / 91AUGOH05 91AUGOH05-10 ASTM 8/30/91		OH / 91AUGOH05 91AUGOH05-11 ASTM 8/30/91		OH / 91AUGOH07 91AUGOH07-01 ASTM 8/30/91	
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Anions									
Chloride	mg/L	130	(.52)	41	(.26)	16	(.13)	1.4	(.026)
Sulfate	mg/L	390	(1)	150	(.5)	82	(.25)	9.4	(.05)
Bulk chemistry									
Total inorganic carbon	mg/g	71	(.00073)	72	(.00073)	54	(.00073)	9.4	(.00073)
Elements by ICPES or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	.62 @	(.2)	.21 @	(.2)
Arsenic	mg/L	ND	(.004)	ND	(.004)	ND	(.004)	ND	(.004)
Barium	mg/L	.15	(.01)	.24	(.01)	.066	(.01)	.015 @	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	.0013 @	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	300	(1)	380	(1)	130	(1)	26	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	.072 @	(.04)	ND	(.04)	.043 @	(.04)	.19 @	(.04)
Lead	mg/L	.0096 @	(.003)	.021	(.003)	ND	(.003)	.0044 @	(.003)
Magnesium	mg/L	ND	(1)	ND	(1)	ND	(1)	2.9 @	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	.19 @	(.05)	.1 @	(.05)	.13 @	(.05)	ND	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	300	(3)	73	(3)	34	(3)	ND	(3)
Selenium	mg/L	.0067 @	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	ND	(1)	ND	(1)	4 @	(1)	2.3 @	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)

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

Table E-9

(Continued)

		Site ID / Location ID Sample ID Preparation Method Log Date							
Parameter	Units	OH / 91AUG0H05 91AUG0H05-09		OH / 91AUG0H05 91AUG0H05-10		OH / 91AUG0H05 91AUG0H05-11		OH / 91AUG0H07 91AUG0H07-01	
		ASTM 8/30/91		ASTM 8/30/91		ASTM 8/30/91		ASTM 8/30/91	
Sodium	mg/L	66	(1)	16	(1)	9.5	(1)	1.2 @	(1)
Strontium	mg/L	3.7	(.003)	4.8	(.003)	.8	(.003)	.061	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	.27	(.02)	.14	(.02)	.042 @	(.02)	.17	(.02)
Field measurements									
Conductivity	umhos/cm	4100	(5)	4000	(5)	700	(5)	150	(5)
pH	pH units	11.64	( )	11.59	( )	11.21	( )	7.59	( )

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

02-14

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Table E-9

(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID		Preparation Method		Log Date			
		OH / 91AUGOH07		OH / 91AUGOH07		OH / 91AUGOH07		OH / 91AUGOH07	
		91AUGOH07-02		91AUGOH07-03		91AUGOH07-04		91AUGOH07-05	
		ASTM		ASTM		ASTM		ASTM	
		8/30/91		8/30/91		8/30/91		8/30/91	
-----	-----	-----		-----		-----		-----	
Anions									
Chloride	mg/L	.7	(.026)	21	(.52)	40	(.52)	77	(.52)
Sulfate	mg/L	86	(.1)	1300	(1)	350	(1)	150	(1)
Bulk chemistry									
Total inorganic carbon	mg/g	3.3	(.00073)	40	(.00073)	60	(.00073)	65	(.00073)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	.29 @	(.2)	.47 @	(.2)	.39 @	(.2)
Arsenic	mg/L	ND	(.004)	.071	(.008)	ND	(.004)	ND	(.004)
Barium	mg/L	.022 @	(.01)	.054	(.01)	.093	(.01)	.14	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	2.9 @	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	47	(1)	550	(1)	210	(1)	130	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	.17 @	(.04)	.087 @	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	ND	(.003)	ND	(.003)	ND	(.003)	ND	(.003)
Magnesium	mg/L	5.9	(1)	2.3 @	(1)	ND	(1)	ND	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	ND	(.05)	.17 @	(.05)	.21 @	(.05)	.15 @	(.05)
Nickel	mg/L	.032 @	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	ND	(3)	7.5 @	(3)	78	(3)	180	(3)
Selenium	mg/L	ND	(.005)	.0067 @	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	1.6 @	(1)	6.5	(1)	5.1	(1)	3 @	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)

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

D2-15

Table E-9

(Continued)

		Site ID / Location ID				Sample ID				Preparation Method				Log Date			
		OH / 91AUGOH07				OH / 91AUGOH07				OH / 91AUGOH07				OH / 91AUGOH07			
		91AUGOH07-02				91AUGOH07-03				91AUGOH07-04				91AUGOH07-05			
		ASTM				ASTM				ASTM				ASTM			
Parameter	Units	8/30/91				8/30/91				8/30/91				8/30/91			
Sodium	mg/L	3	@	(1)		3.6	@	(1)		16		(1)		32		(1)	
Strontium	mg/L	.1		(.003)		.97		(.003)		2.8		(.003)		3.6		(.003)	
Tin	mg/L	ND		(.6)		ND		(.6)		ND		(.6)		ND		(.6)	
Vanadium	mg/L	ND		(.02)		.079	@	(.02)		ND		(.02)		ND		(.02)	
Zinc	mg/L	.078	@	(.02)		ND		(.02)		.14		(.02)		.046	@	(.02)	
Field measurements																	
Conductivity	umhos/cm	270		(5)		1800		(5)		160		(5)		2300		(5)	
pH	pH units	7.58		( )		9.19		( )		11.25		( )		11.52		( )	

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

Table E-9

(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID		Preparation Method		Log Date			
		OH / 91AUGOH07		OH / 91AUGOH07		OH / 91AUGOH07		OH / 91AUGOH07	
		91AUGOH07-06		91AUGOH07-07		91AUGOH07-08		91AUGOH07-09	
		ASTM		ASTM		ASTM		ASTM	
		8/30/91		8/30/91		8/30/91		8/30/91	
Anions									
Chloride	mg/L	460	(.2.6)	290	(.52)	290	(.52)	180	(.52)
Sulfate	mg/L	1200	(1)	1400	(1)	1600	(1)	1100	(1)
Bulk chemistry									
Total inorganic carbon	mg/g	77	(.00073)	78	(.00073)	77	(.00073)	61	(.00073)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.004)	ND	(.004)	.0046 @	(.004)	.0049 @	(.004)
Barium	mg/L	.11	(.01)	.12	(.01)	.12	(.01)	.12	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	.0014 @	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	400	(1)	570	(1)	740	(1)	360	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	ND	(.003)	.0096 @	(.003)	ND	(.003)	ND	(.003)
Magnesium	mg/L	ND	(1)	ND	(1)	ND	(1)	ND	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	.15 @	(.05)	.15 @	(.05)	.14 @	(.05)	.12 @	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	670	(3)	590	(3)	700	(3)	480	(3)
Selenium	mg/L	.036	(.005)	.024 @	(.005)	.014 @	(.005)	ND	(.005)
Silicon	mg/L	2.1 @	(1)	1.1 @	(1)	ND	(1)	2.1 @	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)

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

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Table E-9

(Continued)

		Site ID / Location ID			
		Sample ID			
		Preparation Method			
		Log Date			
		OH / 91AUGOH07	OH / 91AUGOH07	OH / 91AUGOH07	OH / 91AUGOH07
		91AUGOH07-06	91AUGOH07-07	91AUGOH07-08	91AUGOH07-09
		ASTM	ASTM	ASTM	ASTM
		8/30/91	8/30/91	8/30/91	8/30/91
Parameter	Units				
Sodium	mg/L	150 (1)	130 (1)	140 (1)	88 (1)
Strontium	mg/L	2.7 (.003)	3.9 (.003)	6.5 (.003)	3.8 (.003)
Tin	mg/L	ND (.6)	ND (.6)	ND (.6)	ND (.6)
Vanadium	mg/L	ND (.02)	ND (.02)	ND (.02)	ND (.02)
Zinc	mg/L	ND (.02)	ND (.02)	.34 (.02)	.1 (.02)
Field measurements					
Conductivity	umhos/cm	5700 (5)	6000 (5)	7800 (5)	4000 (5)
pH	pH units	11.66 ( )	11.87 ( )	11.79 ( )	11.65 ( )

Table E-9

(Continued)

		Site ID / Location ID	
		Sample ID	
		Preparation Method	
		Log Date	
		OH / 91AUG0H07	
		91AUG0H07-10	
		ASTM	
		8/30/91	
Parameter	Units		
-----	-----	-----	-----
Anions			
Chloride	mg/L	190	(.52)
Sulfate	mg/L	1300	(5)
Bulk chemistry			
Total inorganic carbon	mg/g	73	(.00073)
Elements by ICPEs or AA			
Aluminum	mg/L	ND	(.2)
Arsenic	mg/L	.0065 @	(.004)
Barium	mg/L	.12	(.01)
Beryllium	mg/L	ND	(.002)
Boron	mg/L	ND	(.6)
Cadmium	mg/L	.001 @	(.001)
Calcium	mg/L	600	(1)
Chromium	mg/L	ND	(.01)
Cobalt	mg/L	ND	(.01)
Copper	mg/L	ND	(.02)
Iron	mg/L	ND	(.04)
Lead	mg/L	ND	(.003)
Magnesium	mg/L	ND	(1)
Manganese	mg/L	ND	(.01)
Molybdenum	mg/L	.22 @	(.05)
Nickel	mg/L	ND	(.02)
Potassium	mg/L	500	(3)
Selenium	mg/L	ND	(.005)
Silicon	mg/L	1 @	(1)
Silver	mg/L	ND	(.01)

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

Table E-9
(Continued)

			Site ID / Location ID
			Sample ID
			Preparation Method
			Log Date
		OH / 91AUGOH07	
		91AUGOH07-10	
		ASTM	
		8/30/91	
Parameter	Units		
-----	-----	-----	-----
Sodium	mg/L	100	(1)
Strontium	mg/L	5.6	(.003)
Tin	mg/L	ND	(.6)
Vanadium	mg/L	ND	(.02)
Zinc	mg/L	.025 @	(.02)
Field measurements			
Conductivity	umhos/cm	5500	(5)
pH	pH units	11.81	( )

Table E-10

Chemical Characteristics of Deionized Water Leachates of Ohio Soils, Event 8

		Site ID / Location ID Sample ID Preparation Method Beg. Depth - End Depth (ft.)							
		OH / 91AUGOH01 91AUGOH01-10 ASTM 9 - 10		OH / 91AUGOH01 91AUGOH01-11 ASTM 10 - 11		OH / 91AUGOH01 91AUGOH01-12 ASTM 11 - 12		OH / 91AUGOH01 91AUGOH01-13 ASTM 12 - 13	
Parameter	Units	-----		-----		-----		-----	
Anions									
Chloride	mg/L	9.1	(.026)	17	(.026)	18	(.052)	13	(.026)
Sulfate	mg/L	42	(.05)	61	(.05)	67	(5)	180	(.25)
Bulk chemistry									
Total inorganic carbon	mg/g	.24	(.00073)	.086	(.00073)	.16	(.00073)	.85	(.00073)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.004)	ND	(.004)	ND	(.004)	ND	(.004)
Barium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	12	(1)	16	(1)	17	(1)	39	(1)
Chromium	mg/L	.066	(.01)	.046 @	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	.11 @	(.04)	.062 @	(.04)
Lead	mg/L	ND	(.003)	ND	(.003)	ND	(.003)	ND	(.003)
Magnesium	mg/L	4.2 @	(1)	6.3	(1)	7	(1)	18	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	ND	(.05)	ND	(.05)	ND	(.05)	ND	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	ND	(3)	ND	(3)	ND	(3)	ND	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	2.4 @	(1)	2.8 @	(1)	2.5 @	(1)	1.2 @	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)

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

D2-1

E-75

Table E-10

(Continued)

		Site ID / Location ID Sample ID Preparation Method Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / 91AUGOH01 91AUGOH01-10		OH / 91AUGOH01 91AUGOH01-11		OH / 91AUGOH01 91AUGOH01-12		OH / 91AUGOH01 91AUGOH01-13	
		ASTM 9 - 10		ASTM 10 - 11		ASTM 11 - 12		ASTM 12 - 13	
Sodium	mg/L	5	(1)	8.7	(1)	9.2	(1)	14	(1)
Strontium	mg/L	.03	(.003)	.042	(.003)	.042	(.003)	.081	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	.72	(.02)	.53	(.02)	.12	(.02)	.034 @	(.02)
Field measurements									
Conductivity	umhos/cm	140	(5)	190	(5)	200	(5)	420	(5)
pH	pH units	6.31	()	6.33	()	6.7	()	7.33	()

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

D2-2

Table E-10

(Continued)

		Site ID / Location ID Sample ID Preparation Method Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / 91AUGOH01 91AUGOH01-15 ASTM 14 - 15		OH / 91AUGOH01 91AUGOH01-16 ASTM 15 - 16		OH / 91AUGOH01 91AUGOH01-17 ASTM 16 - 17		OH / 91AUGOH03 91AUGOH03-10 ASTM 8 - 9	
		-----		-----		-----		-----	
Anions									
Chloride	mg/L	5.5	(.026)	1.8	(.026)	1.3	(.026)	5.4	(.026)
Sulfate	mg/L	340	(.5)	620	(1)	690	(1)	72	(.05)
Bulk chemistry									
Total inorganic carbon	mg/g	.22	(.00073)	.025	(.00073)	.21	(.00073)	3.2	(.00073)
Elements by ICPE or AA									
Aluminum	mg/L	.3 @	(.2)	5.7	(.2)	8.4	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.004)	ND	(.004)	ND	(.004)	ND	(.004)
Barium	mg/L	.013 @	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Beryllium	mg/L	ND	(.002)	.0094 @	(.002)	.018	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	.0082	(.001)	.012	(.002)	ND	(.001)
Calcium	mg/L	51	(1)	110	(1)	91	(1)	23	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	.21	(.01)	1.3	(.01)	5.2	(.01)	ND	(.01)
Copper	mg/L	.043 @	(.02)	.49	(.02)	.15	(.02)	ND	(.02)
Iron	mg/L	.054 @	(.04)	4.7	(.04)	32	(.04)	ND	(.04)
Lead	mg/L	.003 @	(.003)	.014 @	(.003)	ND	(.003)	.0048 @	(.003)
Magnesium	mg/L	40	(1)	44	(1)	54	(1)	6.9	(1)
Manganese	mg/L	.48	(.01)	1.4	(.01)	1.8	(.01)	.024 @	(.01)
Molybdenum	mg/L	ND	(.05)	ND	(.05)	ND	(.05)	ND	(.05)
Nickel	mg/L	.44	(.02)	2.5	(.02)	6.7	(.02)	ND	(.02)
Potassium	mg/L	7.6 @	(3)	6.5 @	(3)	9.5 @	(3)	ND	(3)
Selenium	mg/L	.0059 @	(.005)	.025	(.005)	.018 @	(.005)	ND	(.005)
Silicon	mg/L	3 @	(1)	4 @	(1)	7.7	(1)	1.9 @	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)

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

D2-3

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Table E-10

(Continued)

		Site ID / Location ID Sample ID Preparation Method Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / 91AUGOH01 91AUGOH01-15		OH / 91AUGOH01 91AUGOH01-16		OH / 91AUGOH01 91AUGOH01-17		OH / 91AUGOH03 91AUGOH03-10	
		ASTM		ASTM		ASTM		ASTM	
		14 - 15		15 - 16		16 - 17		8 - 9	
Sodium	mg/L	14	(1)	10	(1)	13	(1)	5.8	(1)
Strontium	mg/L	.092	(.003)	.034	(.003)	.15	(.003)	.079	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	.28	(.02)	4.1	(.02)	8.3	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	620	(5)	1050	(5)	1060	(5)	200	(5)
pH	pH units	5.24	()	3.47	()	3.4	()	9.05	()

Table E-10
(Continued)

Parameter	Units	Site ID / Location ID Sample ID Preparation Method Beg. Depth - End Depth (ft.)							
		OH / 91AUGOH03 91AUGOH03-11		OH / 91AUGOH03 91AUGOH03-13		OH / 91AUGOH03 91AUGOH03-14		OH / 91AUGOH03 91AUGOH03-15	
		ASTM		ASTM		ASTM		ASTM	
		10 - 11		12 - 13		13 - 14		14 - 15	
-----	-----	-----		-----		-----		-----	
Anions									
Chloride	mg/L	2	(.026)	5.6	(.026)	1.4	(.026)	1.4	(.026)
Sulfate	mg/L	56	(.05)	410	(.25)	420	(.5)	460	(.5)
Bulk chemistry									
Total inorganic carbon	mg/g	.13	(.00073)	.16	(.00073)	.041	(.00073)	.048	(.00073)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	1.5	(.2)	1.6	(.2)	2.6	(.2)
Arsenic	mg/L	ND	(.004)	.0057 @	(.004)	.009 @	(.004)	.0096 @	(.004)
Barium	mg/L	ND	(.01)	.012 @	(.01)	.015 @	(.01)	.014 @	(.01)
Beryllium	mg/L	ND	(.002)	.0039 @	(.002)	.0044 @	(.002)	.0056 @	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	11	(1)	75	(1)	69	(1)	72	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	.46	(.01)	.51	(.01)	.6	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	.037 @	(.02)
Iron	mg/L	ND	(.04)	12	(.04)	12	(.04)	15	(.04)
Lead	mg/L	.0043 @	(.003)	.0081 @	(.003)	.012 @	(.003)	.02	(.003)
Magnesium	mg/L	4.4 @	(1)	24	(1)	26	(1)	27	(1)
Manganese	mg/L	ND	(.01)	.55	(.01)	.64	(.01)	.9	(.01)
Molybdenum	mg/L	ND	(.05)	ND	(.05)	ND	(.05)	ND	(.05)
Nickel	mg/L	ND	(.02)	1	(.02)	1.2	(.02)	1.5	(.02)
Potassium	mg/L	3.2 @	(3)	11 @	(3)	14 @	(3)	15	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	.01 @	(.005)
Silicon	mg/L	1.4 @	(1)	4.1 @	(1)	4.8 @	(1)	4.9 @	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)

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

Table E-10

(Continued)

		Site ID / Location ID Sample ID Preparation Method Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / 91AUGOH03 91AUGOH03-11 ASTM 10 - 11		OH / 91AUGOH03 91AUGOH03-13 ASTM 12 - 13		OH / 91AUGOH03 91AUGOH03-14 ASTM 13 - 14		OH / 91AUGOH03 91AUGOH03-15 ASTM 14 - 15	
		-----		-----		-----		-----	
Sodium	mg/L	4.7	@ (1)	7.1	(1)	8	(1)	7.2	(1)
Strontium	mg/L	.042	(.003)	.22	(.003)	.23	(.003)	.23	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	ND	(.02)	1.4	(.02)	.76	(.02)	.52	(.02)
Field measurements									
Conductivity	umhos/cm	130	(5)	730	(5)	740	(5)	800	(5)
pH	pH units	7.03	( )	3.8	( )	3.59	( )	3.48	( )

Table E-10

(Continued)

Parameter	Units	Site ID / Location ID Sample ID Preparation Method Beg. Depth - End Depth (ft.)							
		OH / 91AUGOH03 91AUGOH03-16		OH / 91AUGOH03 91AUGOH03-17		OH / 91AUGOH03 91AUGOH03-18		OH / 91AUGOH05 91AUGOH05-12	
		ASTM		ASTM		ASTM		ASTM	
		15 - 16		16 - 17		17 - 18		11 - 12	
Anions									
Chloride	mg/L	2.2	(.026)	.99	(.026)	1.9	(.026)	2.3	(.026)
Sulfate	mg/L	520	(.25)	180	(.5)	1200	(5)	18	(.05)
Bulk chemistry									
Total inorganic carbon	mg/g	.047	(.00073)	47	(.00073)	.041	(.00073)	29	(.00073)
Elements by ICPEs or AA									
Aluminum	mg/L	8.6	(.2)	ND	(.2)	23	(.2)	ND	(.2)
Arsenic	mg/L	.0057 @	(.004)	ND	(.004)	.019 @	(.004)	ND	(.004)
Barium	mg/L	ND	(.01)	.019 @	(.01)	ND	(.01)	ND	(.01)
Beryllium	mg/L	.027	(.002)	ND	(.002)	.032	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	.002 @	(.001)	ND	(.001)	.1	(.02)	ND	(.001)
Calcium	mg/L	78	(1)	76	(1)	130	(1)	14	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	.02 @	(.01)	ND	(.01)
Cobalt	mg/L	.59	(.01)	ND	(.01)	1.8	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	.18	(.02)	ND	(.02)
Iron	mg/L	23	(.04)	ND	(.04)	140	(.04)	.062 @	(.04)
Lead	mg/L	ND	(.003)	ND	(.003)	ND	(.003)	.011 @	(.003)
Magnesium	mg/L	30	(1)	16	(1)	50	(1)	2.2 @	(1)
Manganese	mg/L	1.5	(.01)	.064	(.01)	3.2	(.01)	ND	(.01)
Molybdenum	mg/L	ND	(.05)	ND	(.05)	ND	(.05)	ND	(.05)
Nickel	mg/L	2.8	(.02)	ND	(.02)	9.1	(.02)	ND	(.02)
Potassium	mg/L	6.9 @	(3)	6.2 @	(3)	ND	(3)	3.1 @	(3)
Selenium	mg/L	.011 @	(.005)	ND	(.005)	.04	(.005)	ND	(.005)
Silicon	mg/L	7.2	(1)	ND	(1)	9.1	(1)	1.5 @	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)

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

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E-81

Table E-10

(Continued)

		Site ID / Location ID Sample ID Preparation Method Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / 91AUGOH03 91AUGOH03-16		OH / 91AUGOH03 91AUGOH03-17		OH / 91AUGOH03 91AUGOH03-18		OH / 91AUGOH05 91AUGOH05-12	
		ASTM 15 - 16		ASTM 16 - 17		ASTM 17 - 18		ASTM 11 - 12	
Sodium	mg/L	7	(1)	3.4 @	(1)	5.9	(1)	3.6 @	(1)
Strontium	mg/L	.19	(.003)	.32	(.003)	.15	(.003)	.03	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)	.094 @	(.02)	ND	(.02)
Zinc	mg/L	6.9	(.02)	ND	(.02)	26	(.02)	.023 @	(.02)
Field measurements									
Conductivity	umhos/cm	925	(5)	500	(5)	1800	(5)	100	(5)
pH	pH units	3.24	( )	7.46	( )	2.84	( )	7.95	( )

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

Table E-10

(Continued)

		Site ID / Location ID Sample ID Preparation Method Beg. Depth - End Depth (ft.)							
		OH / 91AUGOH05 91AUGOH05-14 ASTM 13 - 14		OH / 91AUGOH05 91AUGOH05-15 ASTM 14 - 15		OH / 91AUGOH05 91AUGOH05-16 ASTM 15 - 16		OH / 91AUGOH05 91AUGOH05-17 ASTM 16 - 17	
Parameter	Units								

Anions									
Chloride	mg/L	.94	(.026)	.74	(.026)	4.4	(.026)	.7	(.026)
Sulfate	mg/L	49	(.05)	190	(.5)	290	(1)	150	(.5)
Bulk chemistry									
Total inorganic carbon	mg/g	36	(.00073)	51	(.00073)	49	(.00073)	58	(.00073)
Elements by ICPES or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.004)	ND	(.004)	ND	(.004)	ND	(.004)
Barium	mg/L	.018 @	(.01)	.015 @	(.01)	.018 @	(.01)	.02 @	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	24	(1)	89	(1)	110	(1)	68	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	.043 @	(.04)	ND	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	ND	(.003)	ND	(.003)	ND	(.003)	.0033 @	(.003)
Magnesium	mg/L	4.4 @	(1)	13	(1)	19	(1)	15	(1)
Manganese	mg/L	ND	(.01)	.098	(.01)	.1	(.01)	.064	(.01)
Molybdenum	mg/L	ND	(.05)	ND	(.05)	ND	(.05)	ND	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	4.2 @	(3)	5.5 @	(3)	8.7 @	(3)	8 @	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	.0061 @	(.005)	.005 @	(.005)
Silicon	mg/L	1.8 @	(1)	ND	(1)	ND	(1)	1 @	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)

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

Table E-10

(Continued)

Parameter	Units	Site ID / Location ID Sample ID			
		Preparation Method			
		Beg. Depth - End Depth (ft.)			
		OH / 91AUGOH05 91AUGOH05-14 ASTM	OH / 91AUGOH05 91AUGOH05-15 ASTM	OH / 91AUGOH05 91AUGOH05-16 ASTM	OH / 91AUGOH05 91AUGOH05-17 ASTM
		13 - 14	14 - 15	15 - 16	16 - 17
Sodium	mg/L	2.8 @ (1)	2.5 @ (1)	3.6 @ (1)	5.1 (1)
Strontium	mg/L	.079 (.003)	.27 (.003)	.4 (.003)	.43 (.003)
Tin	mg/L	ND (.6)	ND (.6)	ND (.6)	ND (.6)
Vanadium	mg/L	ND (.02)	ND (.02)	ND (.02)	ND (.02)
Zinc	mg/L	.14 (.02)	.058 @ (.02)	.021 @ (.02)	ND (.02)
Field measurements					
Conductivity	umhos/cm	180 (5)	540 (5)	725 (5)	500 (5)
pH	pH units	7.94 (1)	7.48 (1)	7.65 (1)	7.74 (1)

Table E-10

(Continued)

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Beg. Depth - End Depth (ft.)							
		OH / 91AUGOH05		OH / 91AUGOH07		OH / 91AUGOH07		OH / 91AUGOH07	
		91AUGOH05-18		91AUGOH07-11		91AUGOH07-12		91AUGOH07-13	
		ASTM		ASTM		ASTM		ASTM	
Parameter		17 - 18		10 - 11		11 - 12		12 - 13	
-----		-----		-----		-----		-----	
Anions									
Chloride	mg/L	.8	(.026)	240	(.52)	230	(.52)	95	(.52)
Sulfate	mg/L	230	(.5)	1100	(1)	1300	(1)	360	(1)
Bulk chemistry									
Total inorganic carbon	mg/g	49	(.00073)	78	(.00073)	81	(.00073)	45	(.00073)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	.22 @	(.2)
Arsenic	mg/L	ND	(.004)	.0057 @	(.004)	ND	(.004)	.004 @	(.004)
Barium	mg/L	.025 @	(.01)	.16	(.01)	.14	(.01)	.092	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	92	(1)	700	(1)	820	(1)	170	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	ND	(.003)	ND	(.003)	ND	(.003)	ND	(.003)
Magnesium	mg/L	16	(1)	ND	(1)	ND	(1)	ND	(1)
Manganese	mg/L	.062	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	ND	(.05)	.27	(.05)	.31	(.05)	.23 @	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	9.1 @	(3)	580	(3)	500	(3)	180	(3)
Selenium	mg/L	.0071 @	(.005)	ND	(.005)	.012 @	(.005)	ND	(.005)
Silicon	mg/L	ND	(1)	ND	(1)	ND	(1)	4.5 @	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)

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

D2-11

Table E-19

(Continued)

		Site ID / Location ID Sample ID Preparation Method Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / 91AUGOH05 91AUGOH05-18 ASTM 17 - 18		OH / 91AUGOH07 91AUGOH07-11 ASTM 10 - 11		OH / 91AUGOH07 91AUGOH07-12 ASTM 11 - 12		OH / 91AUGOH07 91AUGOH07-13 ASTM 12 - 13	
Sodium	mg/L	5	(1)	130	(1)	100	(1)	41	(1)
Strontium	mg/L	.49	(.003)	6.1	(.003)	6	(.003)	1.7	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	.34	(.02)	ND	(.02)	.38	(.02)	.086 @	(.02)
Field measurements									
Conductivity	umhos/cm	600	(5)	7500	(5)	8000	(5)	2400	(5)
pH	pH units	7.52	( )	11.99	( )	12	( )	11.48	( )

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

D2-12

Table E-10

(Continued)

Parameter	Units	Site ID / Location ID Sample ID Preparation Method Beg. Depth - End Depth (ft.)							
		OH / 91AUGOH07 91AUGOH07-14		OH / 91AUGOH07 91AUGOH07-15		OH / 91AUGOH07 91AUGOH07-16		OH / 91AUGOH07 91AUGOH07-17	
		ASTM		ASTM		ASTM		ASTM	
		13 - 14		14 - 15		15 - 16		16 - 17	
Anions									
Chloride	mg/L	6.9	(.052)	.98	(.026)	1.1	(.026)	NA	
Sulfate	mg/L	290	(1)	280	(1)	270	(1)	NA	
Bulk chemistry									
Total inorganic carbon	mg/g	62	(.00073)	46	(.00073)	67	(.00073)	.12	(.00073)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	NA	
Arsenic	mg/L	ND	(.004)	ND	(.004)	ND	(.004)	NA	
Barium	mg/L	.017 @	(.01)	.018 @	(.01)	.018 @	(.01)	NA	
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	NA	
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	NA	
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	NA	
Calcium	mg/L	100	(1)	100	(1)	91	(1)	NA	
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	NA	
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	NA	
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	NA	
Iron	mg/L	ND	(.04)	ND	(.04)	ND	(.04)	NA	
Lead	mg/L	ND	(.003)	ND	(.003)	.0032 @	(.003)	NA	
Magnesium	mg/L	17	(1)	18	(1)	17	(1)	NA	
Manganese	mg/L	.084	(.01)	.088	(.01)	.09	(.01)	NA	
Molybdenum	mg/L	ND	(.05)	ND	(.05)	ND	(.05)	NA	
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	NA	
Potassium	mg/L	7 @	(3)	6.4 @	(3)	7.2 @	(3)	NA	
Selenium	mg/L	.005 @	(.005)	.0053 @	(.005)	ND	(.005)	NA	
Silicon	mg/L	ND	(1)	ND	(1)	ND	(1)	NA	
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	NA	

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

D2-13

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Table E-10

(Continued)

		Site ID / Location ID Sample ID Preparation Method Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / 91AUGOH07 91AUGOH07-14		OH / 91AUGOH07 91AUGOH07-15		OH / 91AUGOH07 91AUGOH07-16		OH / 91AUGOH07 91AUGOH07-17	
		ASTM		ASTM		ASTM		ASTM	
		13 - 14		14 - 15		15 - 16		16 - 17	
Sodium	mg/L	4.4	@ (1)	2.4	@ (1)	3.3	@ (1)	NA	
Strontium	mg/L	.28	(.003)	.3	(.003)	.33	(.003)	NA	
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	NA	
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	NA	
Zinc	mg/L	.027	@ (.02)	ND	(.02)	.2	(.02)	NA	
Field measurements									
Conductivity	umhos/cm	1100	(5)	1100	(5)	NA		NA	
pH	pH units	8.33	()	7.84	()			NA	

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

D2-14

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Table E-10

(Continued)

Site ID / Location ID
Sample ID
Preparation Method
Beg. Depth - End Depth (ft.)

Parameter	Units	OH / 91AUGOH07 91AUGOH07-18 ASTM 17 - 18		OH / 91AUGOH07 91AUGOH07-19 ASTM 18 - 19	
		-----		-----	
Anions					
Chloride	mg/L	.86	(.026)	.97	(.026)
Sulfate	mg/L	260	(1)	300	(1)
Bulk chemistry					
Total inorganic carbon	mg/g	69	(.00073)	64	(.00073)
Elements by ICPEs or AA					
Aluminum	mg/L	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.004)	ND	(.004)
Barium	mg/L	.018 @	(.01)	.021 @	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)
Calcium	mg/L	91	(1)	100	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	.052 @	(.04)
Lead	mg/L	.0052 @	(.003)	ND	(.003)
Magnesium	mg/L	17	(1)	19	(1)
Manganese	mg/L	.077	(.01)	.068	(.01)
Molybdenum	mg/L	ND	(.05)	ND	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)
Potassium	mg/L	7.9 @	(3)	11 @	(3)
Selenium	mg/L	ND	(.005)	.0056 @	(.005)
Silicon	mg/L	ND	(1)	ND	(1)
Silver	mg/L	ND	(.01)	ND	(.01)

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

Table E-10

(Continued)

		Site ID / Location ID Sample ID Preparation Method Beg. Depth - End Depth (ft.)			
Parameter	Units	OH / 91AUG0H07 91AUG0H07-18 ASTM 17 - 18		OH / 91AUG0H07 91AUG0H07-19 ASTM 18 - 19	
		-----		-----	
Sodium	mg/L	3.5	@ (1)	4.2	@ (1)
Strontium	mg/L	.36	(.003)	.4	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)
Zinc	mg/L	.059	@ (.02)	.025	@ (.02)
Field measurements					
pH	pH units		( )		( )

Table E-11

Chemical Characteristics of Deionized Water Leachates of Ohio Ash, Event 12

Parameter	Units	Site ID / Location ID							
		Sample ID		Log Date					
		OH / 92AUGOH02		OH / 92AUGOH02		OH / 92AUGOH02		OH / 92AUGOH02	
		92AUGOH02-2		92AUGOH02-2.5		92AUGOH02-4		92AUGOH02-5	
		8/27/92		8/27/92		8/27/92		8/27/92	
-----	-----	-----		-----		-----		-----	
Anions									
Chloride	mg/L	3.3	(0.052)	5.8	(0.052)	90	(0.26)	46	(0.26)
Sulfate	mg/L	360	(0.50)	110	(0.10)	680	(1.0)	420	(0.50)
Bulk chemistry									
CaCO3 Equivalents	mg CO3/g	121.24	(0.2)	64.35	(0.2)	51.65	(0.2)	43.74	(0.2)
Elements by ICPEs or AA									
Aluminum	mg/L	0.42	a (0.20)	0.96	a (0.20)	0.75	a (0.20)	0.92	a (0.20)
Arsenic	mg/L	0.0078	a (0.0040)	ND	(0.0040)	ND	(0.0040)	ND	(0.0040)
Barium	mg/L	0.028	a (0.010)	0.091	(0.010)	0.060	(0.010)	0.037	a (0.010)
Beryllium	mg/L	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)
Boron	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)
Calcium	mg/L	170	(1.0)	100	(1.0)	220	(1.0)	120	(1.0)
Chromium	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Cobalt	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Copper	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Iron	mg/L	ND	(0.050)	ND	(0.050)	ND	(0.050)	ND	(0.050)
Lead	mg/L	0.015	(0.0030)	0.013	a (0.0030)	0.0082	a (0.0030)	0.014	a (0.0030)
Magnesium	mg/L	ND	(1.0)	ND	(1.0)	ND	(1.0)	ND	(1.0)
Manganese	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Molybdenum	mg/L	ND	(0.050)	0.070	a (0.050)	0.18	a (0.050)	0.088	a (0.050)
Nickel	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Potassium	mg/L	3.4	a (3.0)	6.7	a (3.0)	260	(3.0)	160	(3.0)
Selenium	mg/L	ND	(0.0050)	ND	(0.0050)	ND	(0.0050)	ND	(0.0050)
Silicon	mg/L	4.9	a (1.0)	3.5	a (1.0)	4.1	a (1.0)	3.2	a (1.0)
Silver	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Sodium	mg/L	3.1	a (1.0)	3.3	a (1.0)	50	(1.0)	28	(1.0)
Strontium	mg/L	0.32	(0.0030)	0.98	(0.0030)	1.4	(0.0030)	0.78	(0.0030)
Tin	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)

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

Table E-11

(Continued)

		Site ID / Location ID							
		Sample ID							
		Log Date							
Parameter	Units	OH / 92AUGOH02 92AUGOH02-2 8/27/92		OH / 92AUGOH02 92AUGOH02-2.5 8/27/92		OH / 92AUGOH02 92AUGOH02-4 8/27/92		OH / 92AUGOH02 92AUGOH02-5 8/27/92	
-----	-----	-----		-----		-----		-----	
Elements by ICPES or AA, cont.									
Vanadium	mg/L	0.031	Ⓐ (0.020)	ND	(0.020)	ND	(0.020)	0.022	Ⓐ (0.020)
Zinc	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Field measurements									
Conductivity	umhos/cm	751	(5)	782	(5)	1996	(5)	1103	(5)
pH	pH units	10.32	()	11.38	()	11.34	()	10.7	()

Table E-11

(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID		Log Date					
		OH / 92AUGOH02		OH / 92AUGOH02		OH / 92AUGOH02		OH / 92AUGOH03	
		92AUGOH02-6.5		92AUGOH02-7.5		92AUGOH02-9.5		92AUGOH03-2	
		8/27/92		8/27/92		8/27/92		8/27/92	
-----	-----	-----		-----		-----		-----	
Anions									
Chloride	mg/L	120	(0.26)	150	(0.52)	180	(1.3)	11	(0.026)
Sulfate	mg/L	330	(0.50)	430	(0.50)	460	(0.50)	200	(0.50)
Bulk chemistry									
CaCO3 Equivalents	mg CO3/g	66.96	(0.2)	84.87	(0.2)	83.84	(0.2)	77.81	(0.2)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(0.20)	ND	(0.20)	ND	(0.20)	0.84 a	(0.20)
Arsenic	mg/L	ND	(0.0040)	ND	(0.0040)	ND	(0.0040)	ND	(0.0040)
Barium	mg/L	0.20	(0.010)	0.13	(0.010)	0.087	(0.010)	0.055	(0.010)
Beryllium	mg/L	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)
Boron	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)
Calcium	mg/L	280	(1.0)	440	(1.0)	280	(1.0)	89	(1.0)
Chromium	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Cobalt	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Copper	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Iron	mg/L	ND	(0.050)	ND	(0.050)	ND	(0.050)	ND	(0.050)
Lead	mg/L	0.012 a	(0.0030)	0.0054 a	(0.0030)	0.0049 a	(0.0030)	0.015	(0.0030)
Magnesium	mg/L	ND	(1.0)	ND	(1.0)	ND	(1.0)	ND	(1.0)
Manganese	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Molybdenum	mg/L	0.17 a	(0.050)	0.15 a	(0.050)	0.15 a	(0.050)	0.079 a	(0.050)
Nickel	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Potassium	mg/L	210	(3.0)	260	(3.0)	420	(3.0)	24	(3.0)
Selenium	mg/L	ND	(0.0050)	ND	(0.0050)	ND	(0.0050)	ND	(0.0050)
Silicon	mg/L	1.4 a	(1.0)	ND	(1.0)	1.1 a	(1.0)	5.1	(1.0)
Silver	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Sodium	mg/L	40	(1.0)	49	(1.0)	65	(1.0)	5.3	(1.0)
Strontium	mg/L	3.5	(0.0030)	3.5	(0.0030)	2.9	(0.0030)	0.92	(0.0030)
Tin	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)

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

(Continued)

	ND = Not Detected	NA = Not Analyzed	a = < 5X Det. Limit
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Table E-11

(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID		Log Date					
		OH / 92AUGOH03		OH / 92AUGOH03		OH / 92AUGOH03		OH / 92AUGOH03	
		92AUGOH03-2.5		92AUGOH03-3.5		92AUGOH03-5		92AUGOH03-7	
		8/27/92		8/27/92		8/27/92		8/27/92	
-----	-----	-----		-----		-----		-----	
Anions									
Chloride	mg/L	44	(0.13)	59	(0.26)	54	(0.26)	180	(1.3)
Sulfate	mg/L	340	(0.25)	450	(0.50)	530	(0.50)	400	(2.5)
Bulk chemistry									
CaCO3 Equivalents	mg CO3/g	59.79	(0.2)	50.72	(0.2)	48.75	(0.2)	83.59	(0.2)
Elements by ICPES or AA									
Aluminum	mg/L	0.89	a (0.20)	1.6	(0.20)	1.1	(0.20)	ND	(0.20)
Arsenic	mg/L	0.0070	a (0.0040)	0.0089	a (0.0040)	0.0057	a (0.0040)	ND	(0.0040)
Barium	mg/L	0.045	a (0.010)	0.051	(0.010)	0.058	(0.010)	0.098	(0.010)
Beryllium	mg/L	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)
Boron	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)
Calcium	mg/L	110	(1.0)	130	(1.0)	140	(1.0)	290	(1.0)
Chromium	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Cobalt	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Copper	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Iron	mg/L	ND	(0.050)	ND	(0.050)	ND	(0.050)	ND	(0.050)
Lead	mg/L	0.012	a (0.0030)	0.016	(0.0030)	0.0091	a (0.0030)	0.0070	a (0.0030)
Magnesium	mg/L	ND	(1.0)	ND	(1.0)	ND	(1.0)	ND	(1.0)
Manganese	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Molybdenum	mg/L	0.086	a (0.050)	0.13	a (0.050)	0.15	a (0.050)	0.14	a (0.050)
Nickel	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Potassium	mg/L	86	(3.0)	160	(3.0)	160	(3.0)	380	(3.0)
Selenium	mg/L	ND	(0.0050)	ND	(0.0050)	ND	(0.0050)	ND	(0.0050)
Silicon	mg/L	4.1	a (1.0)	3.5	a (1.0)	3.0	a (1.0)	ND	(1.0)
Silver	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Sodium	mg/L	16	(1.0)	30	(1.0)	30	(1.0)	63	(1.0)
Strontium	mg/L	0.81	(0.0030)	0.85	(0.0030)	0.79	(0.0030)	3.2	(0.0030)
Tin	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)

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

Table E-11

(Continued)

		Site ID / Location ID							
		Sample ID							
		Log Date							
		OH / 92AUGOH03		OH / 92AUGOH03		OH / 92AUGOH03		OH / 92AUGOH03	
		92AUGOH03-2.5		92AUGOH03-3.5		92AUGOH03-5		92AUGOH03-7	
		8/27/92		8/27/92		8/27/92		8/27/92	
Parameter	Units								
-----	-----	-----		-----		-----		-----	
Elements by ICPES or AA, cont.									
Vanadium	mg/L	ND	(0.020)	0.023	a (0.020)	ND	(0.020)	ND	(0.020)
Zinc	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Field measurements									
Conductivity	umhos/cm	948	(5)	1255	(5)	1403	(5)	4900	(5)
pH	pH units	10.65	()	10.65	()	10.73	()	12.34	()

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Table E-11

(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID		Log Date					
		OH / 92AUGOH03		OH / 92AUGOH03		OH / 92AUGOH03		OH / 92AUGOH05	
		92AUGOH03-8		92AUGOH03-9		92AUGOH03-9.5		92AUGOH05-2.5	
		8/27/92		8/27/92		8/27/92		8/29/92	
-----	-----	-----		-----		-----		-----	
Anions									
Chloride	mg/L	160	(1.3)	190	(1.3)	110	(0.52)	7.1	(0.026)
Sulfate	mg/L	340	(2.5)	210	(2.5)	120	(1.0)	170	(0.50)
Bulk chemistry									
CaCO3 Equivalents	mg CO3/g	82.39	(0.2)	95.7	(0.2)	69.21	(0.2)	42.96	(0.2)
Elements by ICPES or AA									
Aluminum	mg/L	ND	(0.20)	ND	(0.20)	0.65 a	(0.20)	0.59 a	(0.20)
Arsenic	mg/L	ND	(0.0040)	ND	(0.0040)	ND	(0.0040)	0.016 a	(0.0040)
Barium	mg/L	0.072	(0.010)	0.17	(0.010)	0.10	(0.010)	0.034 a	(0.010)
Beryllium	mg/L	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)
Boron	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)
Calcium	mg/L	240	(1.0)	200	(1.0)	90	(1.0)	150	(1.0)
Chromium	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Cobalt	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Copper	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Iron	mg/L	ND	(0.050)	ND	(0.050)	ND	(0.050)	ND	(0.050)
Lead	mg/L	0.0065 a	(0.0030)	0.0068 a	(0.0030)	0.0061 a	(0.0030)	0.0052 a	(0.0030)
Magnesium	mg/L	ND	(1.0)	ND	(1.0)	ND	(1.0)	ND	(1.0)
Manganese	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Molybdenum	mg/L	0.10 a	(0.050)	0.13 a	(0.050)	0.13 a	(0.050)	ND	(0.050)
Nickel	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Potassium	mg/L	360	(3.0)	400	(3.0)	220	(3.0)	36	(3.0)
Selenium	mg/L	ND	(0.0050)	ND	(0.0050)	ND	(0.0050)	ND	(0.0050)
Silicon	mg/L	ND	(1.0)	1.2 a	(1.0)	2.4 a	(1.0)	3.9 a	(1.0)
Silver	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Sodium	mg/L	57	(1.0)	70	(1.0)	42	(1.0)	11	(1.0)
Strontium	mg/L	3.0	(0.0030)	3.1	(0.0030)	1.4	(0.0030)	0.64	(0.0030)
Tin	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)

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

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E-97

Table E-11

(Continued)

		Site ID / Location ID							
		Sample ID				Log Date			
		OH / 92AUGOH03		OH / 92AUGOH03		OH / 92AUGOH03		OH / 92AUGOH05	
		92AUGOH03-8		92AUGOH03-9		92AUGOH03-9.5		92AUGOH05-2.5	
		8/27/92		8/27/92		8/27/92		8/29/92	
Parameter	Units	-----		-----		-----		-----	
-----	-----								
Elements by ICPES or AA, cont.									
Vanadium	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	0.025 @	(0.020)
Zinc	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Field measurements									
Conductivity	umhos/cm	3960	(5)	4120	(5)	2180'	(5)	820	(5)
pH	pH units	12.25	( )	12.24	( )	11.92	( )	10.25	( )

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

Table E-11

(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID				Log Date			
		OH / 92AUGOH05 92AUGOH05-3 8/29/92		OH / 92AUGOH05 92AUGOH05-4.5 8/29/92		OH / 92AUGOH05 92AUGOH05-6.5 8/29/92		OH / 92AUGOH05 92AUGOH05-8.5 8/29/92	
Anions									
Chloride	mg/L	15	(0.13)	59	(0.26)	250	(1.3)	370	(2.6)
Sulfate	mg/L	270	(0.25)	160	(0.50)	580	(2.5)	890	(5.0)
Bulk chemistry									
CaCO3 Equivalents	mg CO3/g	68.67	(0.2)	61.21	(0.2)	82.79	(0.2)	75.18	(0.2)
Elements by ICPES or AA									
Aluminum	mg/L	0.97 a	(0.20)	ND	(0.20)	ND	(0.20)	ND	(0.20)
Arsenic	mg/L	ND	(0.0040)	ND	(0.0040)	ND	(0.0040)	ND	(0.0040)
Barium	mg/L	0.066	(0.010)	0.15	(0.010)	0.076	(0.010)	0.055	(0.010)
Beryllium	mg/L	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)
Boron	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)
Calcium	mg/L	130	(1.0)	170	(1.0)	190	(1.0)	200	(1.0)
Chromium	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Cobalt	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Copper	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Iron	mg/L	ND	(0.050)	ND	(0.050)	ND	(0.050)	ND	(0.050)
Lead	mg/L	ND	(0.0030)	ND	(0.0030)	ND	(0.0030)	ND	(0.0030)
Magnesium	mg/L	ND	(1.0)	ND	(1.0)	ND	(1.0)	ND	(1.0)
Manganese	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Molybdenum	mg/L	0.12 a	(0.050)	0.093 a	(0.050)	0.099 a	(0.050)	0.11 a	(0.050)
Nickel	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Potassium	mg/L	50	(3.0)	150	(3.0)	440	(3.0)	750	(3.0)
Selenium	mg/L	ND	(0.0050)	ND	(0.0050)	0.010 a	(0.0050)	0.0067 a	(0.0050)
Silicon	mg/L	4.5 a	(1.0)	1.9 a	(1.0)	2.7 a	(1.0)	2.1 a	(1.0)
Silver	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Sodium	mg/L	13	(1.0)	30	(1.0)	110	(1.0)	170	(1.0)
Strontium	mg/L	1.3	(0.0030)	4.1	(0.0030)	1.7	(0.0030)	2.0	(0.0030)
Tin	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)

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

Table E-11

(Continued)

		Site ID / Location ID							
		Sample ID							
		Log Date							
		OH / 92AUGOH05		OH / 92AUGOH05		OH / 92AUGOH05		OH / 92AUGOH05	
		92AUGOH05-3		92AUGOH05-4.5		92AUGOH05-6.5		92AUGOH05-8.5	
Parameter		8/29/92		8/29/92		8/29/92		8/29/92	
-----		-----		-----		-----		-----	
Elements by ICPEs or AA, cont.									
Vanadium	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Zinc	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Field measurements									
Conductivity	umhos/cm	1003	(5)	2420	(5)	3550	(5)	5370	(5)
pH	pH units	11.27	( )	11.99	( )	11.88	( )	12.14	( )

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

D2-10

Table E-11

(Continued)

		Site ID / Location ID							
		Sample ID				Log Date			
		OH / 92AUGOH06		OH / 92AUGOH06		OH / 92AUGOH06		OH / 92AUGOH06	
		92AUGOH06-2		92AUGOH06-2.5		92AUGOH06-4		92AUGOH06-5.5	
Parameter	Units	8/29/92		8/29/92		8/29/92		8/29/92	

Anions									
Chloride	mg/L	6.9	(0.052)	13	(0.052)	68	(0.26)	130	(0.52)
Sulfate	mg/L	540	(2.5)	190	(0.25)	400	(0.50)	360	(0.50)
Bulk chemistry									
CaCO3 Equivalents	mg CO3/g	46.22	(0.2)	73.79	(0.2)	75.06	(0.2)	60.18	(0.2)
Elements by ICPEs or AA									
Aluminum	mg/L	0.21	a (0.20)	ND	(0.20)	ND	(0.20)	0.47	a (0.20)
Arsenic	mg/L	0.051	(0.0040)	ND	(0.0040)	ND	(0.0040)	ND	(0.0040)
Barium	mg/L	0.036	a (0.010)	0.093	(0.010)	0.11	(0.010)	0.031	a (0.010)
Beryllium	mg/L	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)
Boron	mg/L	0.64	a (0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)
Calcium	mg/L	240	(1.0)	250	(1.0)	270	(1.0)	67	(1.0)
Chromium	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Cobalt	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Copper	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Iron	mg/L	ND	(0.050)	ND	(0.050)	ND	(0.050)	ND	(0.050)
Lead	mg/L	ND	(0.0030)	ND	(0.0030)	ND	(0.0030)	ND	(0.0030)
Magnesium	mg/L	1.4	a (1.0)	ND	(1.0)	ND	(1.0)	ND	(1.0)
Manganese	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Molybdenum	mg/L	ND	(0.050)	0.11	a (0.050)	0.094	a (0.050)	0.094	a (0.050)
Nickel	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Potassium	mg/L	17	(3.0)	22	(3.0)	160	(3.0)	270	(3.0)
Selenium	mg/L	ND	(0.0050)	ND	(0.0050)	ND	(0.0050)	0.0078	a (0.0050)
Silicon	mg/L	4.1	a (1.0)	1.5	a (1.0)	1.5	a (1.0)	2.2	a (1.0)
Silver	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Sodium	mg/L	5.5	(1.0)	4.7	a (1.0)	33	(1.0)	60	(1.0)
Strontium	mg/L	0.56	(0.0030)	1.7	(0.0030)	2.9	(0.0030)	0.59	(0.0030)
Tin	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)

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

(Continued)

		Site ID / Location ID	
		Sample ID	Log Date
Parameter	Units	OH / 92AUGOH06 92AUGOH06-2.5	OH / 92AUGOH06 92AUGOH06-4
		8/29/92	8/29/92

Elements by ICPEs or AA, cont.			
Vanadium	mg/L	0.042 a (0.020)	ND (0.020)
Zinc	mg/L	0.021 a (0.020)	0.020 a (0.020)
Field measurements			
Conductivity	umhos/cm	1038 (5)	2770 (5)
pH	pH units	9.79 (5)	11.87 (5)
			1704 (5)
			11.28 (5)

Table E-11

(Continued)

Parameter	Units	Site ID / Location ID			
		Sample ID		Log Date	
		OH / 92AUGOH06		OH / 92AUGOH06	
		92AUGOH06-7.5		92AUGOH06-9.5	
		8/29/92		8/29/92	
-----	-----	-----	-----	-----	-----
Anions					
Chloride	mg/L	210	(0.52)	150	(0.52)
Sulfate	mg/L	380	(0.50)	380	(0.50)
Bulk chemistry					
CaCO3 Equivalents	mg CO3/g	79.36	(0.2)	71.82	(0.2)
Elements by ICPEs or AA					
Aluminum	mg/L	0.29 a	(0.20)	0.37 a	(0.20)
Arsenic	mg/L	ND	(0.0040)	ND	(0.0040)
Barium	mg/L	0.058	(0.010)	0.072	(0.010)
Beryllium	mg/L	ND	(0.0020)	ND	(0.0020)
Boron	mg/L	ND	(0.60)	ND	(0.60)
Calcium	mg/L	170	(1.0)	150	(1.0)
Chromium	mg/L	ND	(0.010)	ND	(0.010)
Cobalt	mg/L	ND	(0.010)	ND	(0.010)
Copper	mg/L	ND	(0.020)	ND	(0.020)
Iron	mg/L	0.15 a	(0.050)	ND	(0.050)
Lead	mg/L	ND	(0.0030)	ND	(0.0030)
Magnesium	mg/L	ND	(1.0)	ND	(1.0)
Manganese	mg/L	ND	(0.010)	ND	(0.010)
Molybdenum	mg/L	0.084 a	(0.050)	0.14 a	(0.050)
Nickel	mg/L	ND	(0.020)	ND	(0.020)
Potassium	mg/L	360	(3.0)	390	(3.0)
Selenium	mg/L	ND	(0.0050)	ND	(0.0050)
Silicon	mg/L	2.3 a	(1.0)	2.0 a	(1.0)
Silver	mg/L	ND	(0.010)	ND	(0.010)
Sodium	mg/L	78	(1.0)	80	(1.0)
Strontium	mg/L	1.7	(0.0030)	2.1	(0.0030)
Tin	mg/L	ND	(0.60)	ND	(0.60)

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

Table E-11

(Continued)

Parameter	Units	Site ID / Location ID			
		Sample ID		Log Date	
		OH / 92AUGOH06		OH / 92AUGOH06	
		92AUGOH06-7.5		92AUGOH06-9.5	
		8/29/92		8/29/92	
-----	-----	-----		-----	
Elements by ICPES or AA, cont.					
Vanadium	mg/L	ND	(0.020)	ND	(0.020)
Zinc	mg/L	ND	(0.020)	ND	(0.020)
Field measurements					
Conductivity	umhos/cm	3060	(5)	3230	(5)
pH	pH units	11.97	( )	12.1	( )

E-104

Table E-12

Chemical Characteristics of Deionized Water Leachates of Ohio Soils, Event 12

		Site ID / Location ID Sample ID Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / 92AUGOH02 92AUGOH02-.5 0 - .5		OH / 92AUGOH02 92AUGOH02-10 9.75 - 10		OH / 92AUGOH02 92AUGOH02-10.5 10 - 10.5		OH / 92AUGOH02 92AUGOH02-11 10.5 - 11	
-----	-----	-----		-----		-----		-----	
Anions									
Chloride	mg/L	1.3	(0.026)	180	(1.3)	9.6	(0.026)	7.8	(0.13)
Sulfate	mg/L	33	(0.050)	340	(0.50)	37	(0.050)	36	(0.25)
Bulk chemistry									
CaCO3 Equivalents	mg CO3/g	40.12	(0.2)	81.54	(0.2)	0.29 a	(0.2)	0.3 a	(0.2)
Elements by ICPES or AA									
Aluminum	mg/L	ND	(0.20)	ND	(0.20)	1.2	(0.20)	ND	(0.20)
Arsenic	mg/L	ND	(0.0040)	ND	(0.0040)	ND	(0.0040)	ND	(0.0040)
Barium	mg/L	0.017 a	(0.010)	0.090	(0.010)	0.011 a	(0.010)	ND	(0.010)
Beryllium	mg/L	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)
Boron	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)
Calcium	mg/L	27	(1.0)	210	(1.0)	11	(1.0)	9.4	(1.0)
Chromium	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Cobalt	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Copper	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Iron	mg/L	0.23 a	(0.050)	ND	(0.050)	1.4	(0.050)	0.067 a	(0.050)
Lead	mg/L	0.014 a	(0.0030)	0.0051 a	(0.0030)	0.015	(0.0030)	0.016	(0.0030)
Magnesium	mg/L	4.8 a	(1.0)	ND	(1.0)	4.4 a	(1.0)	3.6 a	(1.0)
Manganese	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Molybdenum	mg/L	ND	(0.050)	0.14 a	(0.050)	ND	(0.050)	ND	(0.050)
Nickel	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Potassium	mg/L	ND	(3.0)	390	(3.0)	ND	(3.0)	ND	(3.0)
Selenium	mg/L	ND	(0.0050)	ND	(0.0050)	ND	(0.0050)	ND	(0.0050)
Silicon	mg/L	3.8 a	(1.0)	1.3 a	(1.0)	2.7 a	(1.0)	1.4 a	(1.0)
Silver	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Sodium	mg/L	3.9 a	(1.0)	62	(1.0)	5.5	(1.0)	4.8 a	(1.0)
Strontium	mg/L	0.084	(0.0030)	2.5	(0.0030)	0.039	(0.0030)	0.032	(0.0030)
Tin	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)

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

D2-1

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Table E-12

(Continued)

Parameter	Units	Site ID / Location ID Sample ID Beg. Depth - End Depth (ft.)							
		OH / 92AUGOH02 92AUGOH02-.5 0 - .5		OH / 92AUGOH02 92AUGOH02-10 9.75 - 10		OH / 92AUGOH02 92AUGOH02-10.5 10 - 10.5		OH / 92AUGOH02 92AUGOH02-11 10.5 - 11	
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Elements by ICPEs or AA, cont.									
Vanadium	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Zinc	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Field measurements									
Conductivity	umhos/cm	207	(5)	3550	(5)	132	(5)	110	(5)
pH	pH units	8.16	( )	12.1	( )	9.2	( )	8.81	( )

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Table E-12

(Continued)

		Site ID / Location ID Sample ID Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / 92AUGOH02 92AUGOH02-12.5 12 - 12.5		OH / 92AUGOH02 92AUGOH02-15 14.5 - 15		OH / 92AUGOH02 92AUGOH02-16 15.5 - 16		OH / 92AUGOH02 92AUGOH02-16.5 16 - 16.5	
-----	-----	-----		-----		-----		-----	
Anions									
Chloride	mg/L	2.1	(0.026)	2.1	(0.026)	NA		1.4	(0.026)
Sulfate	mg/L	66	(0.050)	310	(0.50)	NA		240	(0.50)
Bulk chemistry									
CaCO3 Equivalents	mg CO3/g	0.2	a (0.2)	ND	(0.2)	ND	(0.2)	NA	
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(0.20)	ND	(0.20)	NA		0.78	a (0.20)
Arsenic	mg/L	ND	(0.0040)	ND	(0.0040)	NA		0.0044	a (0.0040)
Barium	mg/L	ND	(0.010)	ND	(0.010)	NA		ND	(0.010)
Beryllium	mg/L	ND	(0.0020)	ND	(0.0020)	NA		ND	(0.0020)
Boron	mg/L	ND	(0.60)	ND	(0.60)	NA		ND	(0.60)
Calcium	mg/L	12	(1.0)	72	(1.0)	NA		39	(1.0)
Chromium	mg/L	ND	(0.010)	ND	(0.010)	NA		ND	(0.010)
Cobalt	mg/L	ND	(0.010)	0.042	a (0.010)	NA		0.37	(0.010)
Copper	mg/L	ND	(0.020)	0.20	(0.020)	NA		ND	(0.020)
Iron	mg/L	ND	(0.050)	0.11	a (0.050)	NA		8.6	(0.050)
Lead	mg/L	0.0046	a (0.0030)	0.0043	a (0.0030)	NA		0.018	(0.0030)
Magnesium	mg/L	5.9	(1.0)	25	(1.0)	NA		21	(1.0)
Manganese	mg/L	ND	(0.010)	0.20	(0.010)	NA		0.44	(0.010)
Molybdenum	mg/L	ND	(0.050)	ND	(0.050)	NA		ND	(0.050)
Nickel	mg/L	ND	(0.020)	0.085	a (0.020)	NA		0.55	(0.020)
Potassium	mg/L	ND	(3.0)	6.6	a (3.0)	NA		11	a (3.0)
Selenium	mg/L	ND	(0.0050)	0.0084	a (0.0050)	NA		0.0050	a (0.0050)
Silicon	mg/L	1.4	a (1.0)	1.5	a (1.0)	NA		3.6	a (1.0)
Silver	mg/L	ND	(0.010)	ND	(0.010)	NA		ND	(0.010)
Sodium	mg/L	9.6	(1.0)	10	(1.0)	NA		6.8	(1.0)
Strontium	mg/L	0.039	(0.0030)	0.14	(0.0030)	NA		0.13	(0.0030)
Tin	mg/L	ND	(0.60)	ND	(0.60)	NA		ND	(0.60)

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

Table E-12

(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID							
		Beg. Depth - End Depth (ft.)							
		OH / 92AUGOH02 92AUGOH02-12.5 12 - 12.5		OH / 92AUGOH02 92AUGOH02-15 14.5 - 15		OH / 92AUGOH02 92AUGOH02-16 15.5 - 16		OH / 92AUGOH02 92AUGOH02-16.5 16 - 16.5	
Elements by ICPEs or AA, cont.									
Vanadium	mg/L	ND	(0.020)	ND	(0.020)	NA		ND	(0.020)
Zinc	mg/L	ND	(0.020)	0.071	@ (0.020)	NA		0.97	(0.020)
Field measurements									
Conductivity	umhos/cm	165	(5)	649	(5)	535	(5)	NA	
pH	pH units	8.84	( )	4.76	( )	4.68	( )	NA	

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Table E-12

(Continued)

		Site ID / Location ID Sample ID Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / 92AUGOH02 92AUGOH02-18 17.5 - 18		OH / 92AUGOH03 92AUGOH03-1 .5 - 1		OH / 92AUGOH03 92AUGOH03-10 9.75 - 10		OH / 92AUGOH03 92AUGOH03-10.5 10 - 10.5	
-----	-----	-----		-----		-----		-----	
Anions									
Chloride	mg/L	1.1	(0.026)	0.57	(0.026)	6.5	(0.026)	3.9	(0.026)
Sulfate	mg/L	170	(0.50)	91	(0.25)	73	(0.10)	190	(0.50)
Bulk chemistry									
CaCO3 Equivalents	mg CO3/g	0.24	a (0.2)	45.18	(0.2)	14.2	(0.2)	24.28	(0.2)
Elements by ICPEs or AA									
Aluminum	mg/L	0.23	a (0.20)	ND	(0.20)	ND	(0.20)	ND	(0.20)
Arsenic	mg/L	ND	(0.0040)	ND	(0.0040)	ND	(0.0040)	ND	(0.0040)
Barium	mg/L	0.014	a (0.010)	0.013	a (0.010)	ND	(0.010)	ND	(0.010)
Beryllium	mg/L	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)
Boron	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)
Calcium	mg/L	34	(1.0)	33	(1.0)	22	(1.0)	70	(1.0)
Chromium	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Cobalt	mg/L	0.22	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Copper	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Iron	mg/L	1.8	(0.050)	0.060	a (0.050)	ND	(0.050)	ND	(0.050)
Lead	mg/L	0.0064	a (0.0030)	0.0044	a (0.0030)	0.0075	a (0.0030)	0.0031	a (0.0030)
Magnesium	mg/L	15	(1.0)	6.6	(1.0)	3.8	a (1.0)	10	(1.0)
Manganese	mg/L	0.27	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Molybdenum	mg/L	ND	(0.050)	ND	(0.050)	ND	(0.050)	ND	(0.050)
Nickel	mg/L	0.29	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Potassium	mg/L	10	a (3.0)	ND	(3.0)	17	(3.0)	ND	(3.0)
Selenium	mg/L	0.0059	a (0.0050)	ND	(0.0050)	ND	(0.0050)	ND	(0.0050)
Silicon	mg/L	2.8	a (1.0)	2.9	a (1.0)	ND	(1.0)	ND	(1.0)
Silver	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Sodium	mg/L	6.9	(1.0)	3.6	a (1.0)	6.9	(1.0)	4.8	a (1.0)
Strontium	mg/L	0.11	(0.0030)	0.092	(0.0030)	0.066	(0.0030)	0.13	(0.0030)
Tin	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)

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

Table E-12
(Continued)

		Site ID / Location ID	
		Sample ID	
		Beg. Depth - End Depth (ft.)	
Parameter	Units	OH / 92AUGOH02 92AUGOH02-18 17.5 - 18	OH / 92AUGOH03 92AUGOH03-1 .5 - 1
		OH / 92AUGOH03 92AUGOH03-10 9.75 - 10	OH / 92AUGOH03 92AUGOH03-10.5 10 - 10.5

Elements by ICPEs or AA, cont.			
Vanadium	mg/L	ND	(0.020)
Zinc	mg/L	0.99	(0.020)

Field measurements			
Conductivity	umhos/cm	408	(5)
pH	pH units	5.29	( )
		287	(5)
		8.07	( )
		248	(5)
		7.93	( )
		468	(5)
		8.42	( )

Table E-12

(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID							
		Beg. Depth - End Depth (ft.)							
		OH / 92AUGOH03 92AUGOH03-12 11.5 - 12		OH / 92AUGOH03 92AUGOH03-14 13.5 - 14		OH / 92AUGOH03 92AUGOH03-16.5 16 - 16.5		OH / 92AUGOH03 92AUGOH03-18 17.5 - 18	
Anions									
Chloride	mg/L	2.4	(0.026)	1.5	(0.026)	0.11 a	(0.026)	0.43	(0.026)
Sulfate	mg/L	360	(1.0)	370	(1.0)	280	(0.50)	210	(0.50)
Bulk chemistry									
CaCO ₃ Equivalents	mg CO ₃ /g	5.39	(0.2)	14.14	(0.2)	0.68 a	(0.2)	1.04	(0.2)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(0.20)	ND	(0.20)	0.39 a	(0.20)	ND	(0.20)
Arsenic	mg/L	ND	(0.0040)	ND	(0.0040)	ND	(0.0040)	ND	(0.0040)
Barium	mg/L	ND	(0.010)	ND	(0.010)	0.010 a	(0.010)	0.010 a	(0.010)
Beryllium	mg/L	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)
Boron	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)
Calcium	mg/L	130	(1.0)	140	(1.0)	68	(1.0)	47	(1.0)
Chromium	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Cobalt	mg/L	ND	(0.010)	ND	(0.010)	0.16	(0.010)	0.060	(0.010)
Copper	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Iron	mg/L	ND	(0.050)	ND	(0.050)	5.6	(0.050)	0.17 a	(0.050)
Lead	mg/L	ND	(0.0030)	0.0062 a	(0.0030)	0.028	(0.0030)	0.057	(0.0030)
Magnesium	mg/L	18	(1.0)	21	(1.0)	22	(1.0)	18	(1.0)
Manganese	mg/L	ND	(0.010)	0.097	(0.010)	0.41	(0.010)	0.35	(0.010)
Molybdenum	mg/L	ND	(0.050)	ND	(0.050)	ND	(0.050)	ND	(0.050)
Nickel	mg/L	ND	(0.020)	0.063 a	(0.020)	1.1	(0.020)	0.50	(0.020)
Potassium	mg/L	ND	(3.0)	5.1 a	(3.0)	9.2 a	(3.0)	8.3 a	(3.0)
Selenium	mg/L	ND	(0.0050)	0.031	(0.0050)	0.11	(0.010)	0.054	(0.0050)
Silicon	mg/L	ND	(1.0)	ND	(1.0)	2.9 a	(1.0)	1.8 a	(1.0)
Silver	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Sodium	mg/L	5.0	(1.0)	4.9 a	(1.0)	6.9	(1.0)	6.1	(1.0)
Strontium	mg/L	0.23	(0.0030)	0.27	(0.0030)	0.26	(0.0030)	0.17	(0.0030)
Tin	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)

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

Table E-12

(Continued)

		Site ID / Location ID Sample ID Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / 92AUGOH03 92AUGOH03-12 11.5 - 12		OH / 92AUGOH03 92AUGOH03-14 13.5 - 14		OH / 92AUGOH03 92AUGOH03-16.5 16 - 16.5		OH / 92AUGOH03 92AUGOH03-18 17.5 - 18	
-----	-----	-----		-----		-----		-----	
Elements by ICPEs or AA, cont.									
Vanadium	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Zinc	mg/L	ND	(0.020)	ND	(0.020)	2.7	(0.020)	0.038 @	(0.020)
Field measurements									
Conductivity	umhos/cm	746	(5)	780	(5)	594	(5)	479	(5)
pH	pH units	7.87	( )	7.43	( )	4.76	( )	5.17	( )

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

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Table E-12

(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID							
		Beg. Depth - End Depth (ft.)							
		OH / 92AUGOH05 92AUGOH05-1.5 1 - 1.5		OH / 92AUGOH05 92AUGOH05-10.5 10 - 10.5		OH / 92AUGOH05 92AUGOH05-11.5 11 - 11.5		OH / 92AUGOH05 92AUGOH05-12 11.5 - 12	
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Anions									
Chloride	mg/L	ND	(0.026)	210	(0.52)	150	(0.52)	110	(0.26)
Sulfate	mg/L	10	(0.050)	590	(0.50)	350	(0.50)	230	(0.50)
Bulk chemistry									
CaCO3 Equivalents	mg CO3/g	0.82	a (0.2)	75.99	(0.2)	82.32	(0.2)	79.94	(0.2)
Elements by ICPEs or AA									
Aluminum	mg/L	0.23	a (0.20)	0.23	a (0.20)	ND	(0.20)	0.61	a (0.20)
Arsenic	mg/L	ND	(0.0040)	ND	(0.0040)	ND	(0.0040)	ND	(0.0040)
Barium	mg/L	0.011	a (0.010)	0.040	a (0.010)	0.064	(0.010)	0.069	(0.010)
Beryllium	mg/L	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)
Boron	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)
Calcium	mg/L	17	(1.0)	140	(1.0)	280	(1.0)	360	(1.0)
Chromium	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	0.24	(0.010)
Cobalt	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Copper	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	0.15	(0.020)
Iron	mg/L	0.53	(0.050)	ND	(0.050)	ND	(0.050)	ND	(0.050)
Lead	mg/L	0.0030	a (0.0030)	ND	(0.0030)	ND	(0.0030)	ND	(0.0030)
Magnesium	mg/L	2.6	a (1.0)	ND	(1.0)	ND	(1.0)	ND	(1.0)
Manganese	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Molybdenum	mg/L	ND	(0.050)	0.15	a (0.050)	0.12	a (0.050)	0.11	a (0.050)
Nickel	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Potassium	mg/L	ND	(3.0)	510	(3.0)	340	(3.0)	200	(3.0)
Selenium	mg/L	ND	(0.0050)	ND	(0.0050)	ND	(0.0050)	ND	(0.0050)
Silicon	mg/L	1.7	a (1.0)	1.1	a (1.0)	ND	(1.0)	ND	(1.0)
Silver	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Sodium	mg/L	2.0	a (1.0)	99	(1.0)	76	(1.0)	50	(1.0)
Strontium	mg/L	0.042	(0.0030)	1.8	(0.0030)	3.1	(0.0030)	3.5	(0.0030)
Tin	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)

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

Table E-12
(Continued)

Parameter	Units	Site ID / Location ID			
		Sample ID			
		Beg. Depth - End Depth (ft.)			
OH / 92AUGOH05 92AUGOH05-1.5 1 - 1.5		OH / 92AUGOH05 92AUGOH05-10.5 10 - 10.5	OH / 92AUGOH05 92AUGOH05-11.5 11 - 11.5	OH / 92AUGOH05 92AUGOH05-12 11.5 - 12	

Elements by ICPEs or AA, cont.					
Vanadium	mg/L	ND	(0.020)	ND	(0.020)
Zinc	mg/L	ND	(0.020)	0.022 a	(0.020)
Field measurements					
Conductivity	umhos/cm	112	(5)	3490	(5)
pH	pH units	7.66	( )	11.89	( )

Table E-12

(Continued)

		Site ID / Location ID Sample ID Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / 92AUGOH05 92AUGOH05-12.5 12 - 12.5		OH / 92AUGOH05 92AUGOH05-13 12.5 - 13		OH / 92AUGOH05 92AUGOH05-14.5 14 - 14.5		OH / 92AUGOH05 92AUGOH05-16.5 16 - 16.5	
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Anions									
Chloride	mg/L	8.6	(0.026)	12	(0.026)	2.7	(0.026)	0.48	(0.026)
Sulfate	mg/L	19	(0.050)	40	(0.050)	38	(0.050)	79	(0.10)
Bulk chemistry									
CaCO3 Equivalents	mg CO3/g	3.12	(0.2)	12.98	(0.2)	25.59	(0.2)	47.45	(0.2)
Elements by ICPEs or AA									
Aluminum	mg/L	0.66	a (0.20)	ND	(0.20)	ND	(0.20)	ND	(0.20)
Arsenic	mg/L	ND	(0.0040)	ND	(0.0040)	ND	(0.0040)	ND	(0.0040)
Barium	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	0.021	a (0.010)
Beryllium	mg/L	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)
Boron	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)
Calcium	mg/L	ND	(1.0)	6.5	(1.0)	21	(1.0)	37	(1.0)
Chromium	mg/L	0.016	a (0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Cobalt	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Copper	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Iron	mg/L	0.53	(0.050)	0.15	a (0.050)	ND	(0.050)	ND	(0.050)
Lead	mg/L	0.0042	a (0.0030)	0.0091	a (0.0030)	0.0037	a (0.0030)	0.0055	a (0.0030)
Magnesium	mg/L	ND	(1.0)	1.1	a (1.0)	4.0	a (1.0)	7.7	(1.0)
Manganese	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	0.031	a (0.010)
Molybdenum	mg/L	0.088	a (0.050)	ND	(0.050)	ND	(0.050)	ND	(0.050)
Nickel	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Potassium	mg/L	22	(3.0)	25	(3.0)	ND	(3.0)	4.1	a (3.0)
Selenium	mg/L	ND	(0.0050)	ND	(0.0050)	ND	(0.0050)	ND	(0.0050)
Silicon	mg/L	1.7	a (1.0)	1.2	a (1.0)	1.4	a (1.0)	ND	(1.0)
Silver	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Sodium	mg/L	7.2	(1.0)	11	(1.0)	1.8	a (1.0)	2.0	a (1.0)
Strontium	mg/L	0.0075	a (0.0030)	0.025	(0.0030)	0.065	(0.0030)	0.15	(0.0030)
Tin	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)

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

Table E-12

(Continued)

		Site ID / Location ID							
		Sample ID							
		Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / 92AUGOH05 92AUGOH05-12.5		OH / 92AUGOH05 92AUGOH05-13		OH / 92AUGOH05 92AUGOH05-14.5		OH / 92AUGOH05 92AUGOH05-16.5	
		12 - 12.5		12.5 - 13		14 - 14.5		16 - 16.5	
-----	-----	-----		-----		-----		-----	
Elements by ICPES or AA, cont.									
Vanadium	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Zinc	mg/L	0.80	(0.020)	0.26	(0.020)	0.059	a (0.020)	0.029	a (0.020)
Field measurements									
Conductivity	umhos/cm	888	(5)	200	(5)	224	(5)	320	(5)
pH	pH units	9.39	()	9.09	()	9.04	()	8.43	()

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Table E-12

(Continued)

Parameter	Units	Site ID / Location ID Sample ID Beg. Depth - End Depth (ft.)							
		OH / 92AUGOH05 92AUGOH05-18.5 18 - 18.5		OH / 92AUGOH05 92AUGOH05-20 19.5 - 20		OH / 92AUGOH06 92AUGOH06-.5 0 - .5		OH / 92AUGOH06 92AUGOH06-11 10.5 - 11	
		-----		-----		-----		-----	
Anions									
Chloride	mg/L	0.43	(0.026)	0.39	(0.026)	0.33	(0.052)	110	(0.26)
Sulfate	mg/L	120	(0.10)	48	(0.050)	7.5	(0.10)	260	(0.50)
Bulk chemistry									
CaCO ₃ Equivalents	mg CO ₃ /g	49.05	(0.2)	52.2	(0.2)	9.62	(0.2)	80.44	(0.2)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(0.20)	ND	(0.20)	ND	(0.20)	ND	(0.20)
Arsenic	mg/L	ND	(0.0040)	ND	(0.0040)	ND	(0.0040)	ND	(0.0040)
Barium	mg/L	0.023 a	(0.010)	0.025 a	(0.010)	ND	(0.010)	0.073	(0.010)
Beryllium	mg/L	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)
Boron	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)
Calcium	mg/L	48	(1.0)	23	(1.0)	11	(1.0)	210	(1.0)
Chromium	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Cobalt	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Copper	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Iron	mg/L	ND	(0.050)	ND	(0.050)	0.92	(0.050)	ND	(0.050)
Lead	mg/L	0.0050 a	(0.0030)	0.0091 a	(0.0030)	0.0047 a	(0.0030)	0.0057 a	(0.0030)
Magnesium	mg/L	9.5	(1.0)	5.7	(1.0)	1.8 a	(1.0)	ND	(1.0)
Manganese	mg/L	0.023 a	(0.010)	0.012 a	(0.010)	ND	(0.010)	ND	(0.010)
Molybdenum	mg/L	ND	(0.050)	ND	(0.050)	ND	(0.050)	0.11 a	(0.050)
Nickel	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Potassium	mg/L	5.3 a	(3.0)	3.8 a	(3.0)	ND	(3.0)	280	(3.0)
Selenium	mg/L	ND	(0.0050)	ND	(0.0050)	ND	(0.0050)	ND	(0.0050)
Silicon	mg/L	ND	(1.0)	1.0 a	(1.0)	1.2 a	(1.0)	1.4 a	(1.0)
Silver	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Sodium	mg/L	2.3 a	(1.0)	2.8 a	(1.0)	ND	(1.0)	59	(1.0)
Strontium	mg/L	0.20	(0.0030)	0.15	(0.0030)	0.032	(0.0030)	2.4	(0.0030)
Tin	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)

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

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Table E-12

(Continued)

		Site ID / Location ID Sample ID Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / 92AUGOH05 92AUGOH05-18.5 18 - 18.5		OH / 92AUGOH05 92AUGOH05-20 19.5 - 20		OH / 92AUGOH06 92AUGOH06-.5 0 - .5		OH / 92AUGOH06 92AUGOH06-11 10.5 - 11	
		-----		-----		-----		-----	
Elements by ICPES or AA, cont.									
Vanadium	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Zinc	mg/L	0.041	a (0.020)	ND	(0.020)	0.021	a (0.020)	ND	(0.020)
Field measurements									
Conductivity	umhos/cm	379	(5)	218	(5)	195	(5)	3500	(5)
pH	pH units	8.78	()	8.9	()	7.67	()	12.22	()

Table E-12

(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID							
		Beg. Depth - End Depth (ft.)							
		OH / 92AUGOH06 92AUGOH06-11.5 11 - 11.5		OH / 92AUGOH06 92AUGOH06-12 11.5 - 12		OH / 92AUGOH06 92AUGOH06-12.5 12 - 12.5		OH / 92AUGOH06 92AUGOH06-14 13.5 - 14	
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Anions									
Chloride	mg/L	130	(0.52)	5.2	(0.026)	5.9	(0.026)	1.2	(0.026)
Sulfate	mg/L	190	(1.0)	11	(0.050)	25	(0.050)	68	(0.050)
Bulk chemistry									
CaCO3 Equivalents	mg CO3/g	78.3	(0.2)	0.46 a	(0.2)	0.35 a	(0.2)	6.91	(0.2)
Elements by ICPES or AA									
Aluminum	mg/L	0.74 a	(0.20)	ND	(0.20)	ND	(0.20)	ND	(0.20)
Arsenic	mg/L	ND	(0.0040)	ND	(0.0040)	ND	(0.0040)	ND	(0.0040)
Barium	mg/L	0.061	(0.010)	ND	(0.010)	0.025 a	(0.010)	0.012 a	(0.010)
Beryllium	mg/L	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)
Boron	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)
Calcium	mg/L	68	(1.0)	5.0	(1.0)	11	(1.0)	27	(1.0)
Chromium	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Cobalt	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Copper	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Iron	mg/L	ND	(0.050)	0.37	(0.050)	0.42	(0.050)	ND	(0.050)
Lead	mg/L	0.0051 a	(0.0030)	0.016	(0.0030)	0.014 a	(0.0030)	0.020	(0.0030)
Magnesium	mg/L	ND	(1.0)	ND	(1.0)	1.8 a	(1.0)	5.7	(1.0)
Manganese	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Molybdenum	mg/L	0.16 a	(0.050)	ND	(0.050)	ND	(0.050)	ND	(0.050)
Nickel	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Potassium	mg/L	360	(3.0)	ND	(3.0)	ND	(3.0)	ND	(3.0)
Selenium	mg/L	ND	(0.0050)	ND	(0.0050)	ND	(0.0050)	0.0069 a	(0.0050)
Silicon	mg/L	2.4 a	(1.0)	1.2 a	(1.0)	1.6 a	(1.0)	ND	(1.0)
Silver	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Sodium	mg/L	82	(1.0)	3.7 a	(1.0)	3.9 a	(1.0)	1.9 a	(1.0)
Strontium	mg/L	1.1	(0.0030)	0.012 a	(0.0030)	0.022	(0.0030)	0.067	(0.0030)
Tin	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)

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

Table E-12
(Continued)

		Site ID / Location ID Sample ID Beg. Depth - End Depth (ft.)							
Parameter	Units	OH / 92AUGOH06 92AUGOH06-11.5		OH / 92AUGOH06 92AUGOH06-12		OH / 92AUGOH06 92AUGOH06-12.5		OH / 92AUGOH06 92AUGOH06-14	
		11 - 11.5		11.5 - 12		12 - 12.5		13.5 - 14	
-----	-----	-----		-----		-----		-----	
Elements by ICPES or AA, cont.									
Vanadium	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Zinc	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Field measurements									
Conductivity	umhos/cm	2920	(5)	648	(5)	104	(5)	212	(5)
pH	pH units	12.13	( )	9.03	( )	7.5	( )	8.6	( )

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Table E-12

(Continued)

Parameter -----	Units -----	Site ID / Location ID Sample ID Beg. Depth - End Depth (ft.)					
		OH / 92AUGOH06 92AUGOH06-16 15.5 - 16		OH / 92AUGOH06 92AUGOH06-18 17.5 - 18		OH / 92AUGOH06 92AUGOH06-20 19.5 - 20	
		-----	-----	-----	-----	-----	-----
Anions							
Chloride	mg/L	0.64	(0.026)	0.54	(0.026)	0.67	(0.026)
Sulfate	mg/L	110	(0.10)	100	(0.25)	130	(0.25)
Bulk chemistry							
CaCO ₃ Equivalents	mg CO ₃ /g	36.39	(0.2)	37.35	(0.2)	49.42	(0.2)
Elements by ICPEs or AA							
Aluminum	mg/L	ND	(0.20)	ND	(0.20)	ND	(0.20)
Arsenic	mg/L	ND	(0.0040)	ND	(0.0040)	ND	(0.0040)
Barium	mg/L	0.014 a	(0.010)	0.016 a	(0.010)	0.022 a	(0.010)
Beryllium	mg/L	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)
Boron	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)
Calcium	mg/L	41	(1.0)	46	(1.0)	60	(1.0)
Chromium	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)
Cobalt	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)
Copper	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)
Iron	mg/L	ND	(0.050)	ND	(0.050)	ND	(0.050)
Lead	mg/L	0.013 a	(0.0030)	0.0077 a	(0.0030)	0.0098 a	(0.0030)
Magnesium	mg/L	7.9	(1.0)	8.2	(1.0)	10	(1.0)
Manganese	mg/L	0.024 a	(0.010)	0.038 a	(0.010)	0.057	(0.010)
Molybdenum	mg/L	ND	(0.050)	ND	(0.050)	ND	(0.050)
Nickel	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)
Potassium	mg/L	ND	(3.0)	6.6 a	(3.0)	13 a	(3.0)
Selenium	mg/L	ND	(0.0050)	ND	(0.0050)	ND	(0.0050)
Silicon	mg/L	ND	(1.0)	ND	(1.0)	ND	(1.0)
Silver	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)
Sodium	mg/L	1.2 a	(1.0)	1.6 a	(1.0)	2.6 a	(1.0)
Strontium	mg/L	0.096	(0.0030)	0.12	(0.0030)	0.16	(0.0030)
Tin	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)

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

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Table E-12

(Continued)

		Site ID / Location ID					
		Sample ID					
		Beg. Depth - End Depth (ft.)					
		OH / 92AUGOH06		OH / 92AUGOH06		OH / 92AUGOH06	
		92AUGOH06-16		92AUGOH06-18		92AUGOH06-20	
Parameter	Units	15.5 - 16		17.5 - 18		19.5 - 20	
-----	-----	-----		-----		-----	
Elements by ICPES or AA, cont.							
Vanadium	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)
Zinc	mg/L	ND	(0.020)	ND	(0.020)	0.020 @	(0.020)
Field measurements							
Conductivity	umhos/cm	286	(5)	327	(5)	389	(5)
pH	pH units	8.17	( )	8.14	( )	7.97	( )

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APPENDIX F

METEOROLOGICAL DATA
(Daily Average Values)

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Table F-1

Ohio Meteorological Data

Date	Location	Average Temperature (°C)	Relative Humidity (%)	Wind Speed (mph)	Wind Direction (deg. azimuth)	Precipitation (inches)	Solar Radiation
10/15/89	Test Cell	23.4	53.9	2.0	141	0.00	334 $\mu\text{mol/s}\cdot\text{m}^2$
10/16/89	Test Cell	19.2	73.5	2.3	193	0.88	311 $\mu\text{mol/s}\cdot\text{m}^2$
10/17/89	Test Cell	9.9	86.0	3.8	44	0.44	33 $\mu\text{mol/s}\cdot\text{m}^2$
10/18/89	Test Cell	6.1	74.8	4.6	47	0.09	61 $\mu\text{mol/s}\cdot\text{m}^2$
10/19/89	Test Cell	5.4	88.1	4.9	93	0.74	43 $\mu\text{mol/s}\cdot\text{m}^2$
10/20/89	Test Cell	2.8	79.4	2.9	202	0.09	49 $\mu\text{mol/s}\cdot\text{m}^2$
10/21/89	Test Cell	3.9	83.7	3.7	247	0.12	69 $\mu\text{mol/s}\cdot\text{m}^2$
10/22/89	Test Cell	7.5	76.7	1.9	224	0.00	306 $\mu\text{mol/s}\cdot\text{m}^2$
10/23/89	Test Cell	10.6	63.5	1.4	167	0.00	276 $\mu\text{mol/s}\cdot\text{m}^2$
10/24/89	Test Cell	15.1	77.2	0.9	188	0.00	206 $\mu\text{mol/s}\cdot\text{m}^2$
10/25/89	Test Cell	14.3	76.7	0.6	173	0.00	221 $\mu\text{mol/s}\cdot\text{m}^2$
10/26/89	Test Cell	13.6	78.2	0.6	187	0.00	243 $\mu\text{mol/s}\cdot\text{m}^2$
10/27/89	Test Cell	13.5	76.3	0.8	152	0.00	255 $\mu\text{mol/s}\cdot\text{m}^2$
10/28/89	Test Cell	13.4	69.2	0.7	215	0.00	265 $\mu\text{mol/s}\cdot\text{m}^2$
10/29/89	Test Cell	13.0	60.1	0.7	165	0.00	233 $\mu\text{mol/s}\cdot\text{m}^2$
10/30/89	Test Cell	13.2	61.3	1.0	144	0.00	261 $\mu\text{mol/s}\cdot\text{m}^2$
10/31/89	Test Cell	10.7	84.7	2.5	195	0.24	57 $\mu\text{mol/s}\cdot\text{m}^2$
11/01/89	Test Cell	6.4	69.4	2.1	228	0.00	249 $\mu\text{mol/s}\cdot\text{m}^2$
11/02/89	Test Cell	5.1	76.6	1.3	216	0.02	96 $\mu\text{mol/s}\cdot\text{m}^2$
11/03/89	Test Cell	2.3	69.7	1.8	252	0.02	178 $\mu\text{mol/s}\cdot\text{m}^2$
11/04/89	Test Cell	1.2	66.8	1.0	160	0.00	120 $\mu\text{mol/s}\cdot\text{m}^2$
11/05/89	Test Cell	9.2	53.1	3.2	142	0.00	170 $\mu\text{mol/s}\cdot\text{m}^2$
11/06/89	Test Cell	10.2	78.1	2.2	211	0.13	92 $\mu\text{mol/s}\cdot\text{m}^2$
11/07/89	Test Cell	5.8	89.2	1.6	127	0.27	27 $\mu\text{mol/s}\cdot\text{m}^2$
11/08/89	Test Cell	8.2	96.8	2.1	103	0.00	43 $\mu\text{mol/s}\cdot\text{m}^2$
11/09/89	Test Cell	6.9	69.0	3.6	228	0.12	151 $\mu\text{mol/s}\cdot\text{m}^2$
11/10/89	Test Cell	5.0	71.0	3.0	216	0.02	61 $\mu\text{mol/s}\cdot\text{m}^2$
11/11/89	Test Cell	5.7	65.0	2.0	225	0.01	70 $\mu\text{mol/s}\cdot\text{m}^2$
11/12/89	Test Cell	4.0	56.6	1.7	177	0.00	195 $\mu\text{mol/s}\cdot\text{m}^2$
11/13/89	Test Cell	10.8	53.9	2.7	161	0.00	217 $\mu\text{mol/s}\cdot\text{m}^2$
11/14/89	Test Cell	15.1	66.4	2.3	200	0.11	76 $\mu\text{mol/s}\cdot\text{m}^2$
11/15/89	Cleveland	16.1		14.5	180	1.41	41 min/day
11/16/89	Cleveland	6.1		16.8	270	0.46	102 min/day

Table F-1
(Continued)

Date	Location	Average Temperature (°C)	Relative Humidity (%)	Wind Speed (mph)	Wind Direction (deg. azimuth)	Precipitation (inches)	Solar Radiation	
11/17/89	Cleveland	-1.7		16.0	225	0.01	335	min/day
11/18/89	Cleveland	-1.7		12.6	225	0.00	163	min/day
11/19/89	Cleveland	1.1		12.5	180	0.00	0	min/day
11/20/89	Cleveland	7.8		18.0	315	0.00	412	min/day
11/21/89	Cleveland	0.0		12.9	315	0.00	36	min/day
11/22/89	Cleveland	-2.8		5.3	0	0.08	0	min/day
11/23/89	Cleveland	-2.8		8.2	225	0.14	140	min/day
11/24/89	Cleveland	-2.2		10.6	180	0.01	482	min/day
11/25/89	Cleveland	4.4		13.6	180	0.04	98	min/day
11/26/89	Cleveland	5.6		6.7	270	0.16	373	min/day
11/27/89	Cleveland	8.9		14.9	225	0.03	37	min/day
11/28/89	Cleveland	8.3		12.4	225	0.23	0	min/day
11/29/89	Cleveland	-2.8		10.9	225	0.01	61	min/day
11/30/89	Cleveland	0.6		10.5	225	0.00	49	min/day
12/01/89	Cleveland	0.6			180	0.00		
12/02/89	Cleveland	1.1				0.04		
12/03/89	Cleveland	-3.9				0.11		
12/04/89	Cleveland	-4.4				0.00		
12/05/89	Cleveland	-2.8				0.00		
12/06/89	Cleveland	1.1				0.18		
12/07/89	Cleveland	-5.0				0.00		
12/08/89	Cleveland	-4.4				0.00		
12/09/89	Cleveland	-4.4				0.00		
12/10/89	Cleveland	-2.2				0.13		
12/11/89	Cleveland	-1.7				0.00		
12/12/89	Cleveland	-5.6				0.01		
12/13/89	Cleveland	-7.2				0.03		
12/14/89	Cleveland	-9.4				0.32		
12/15/89	Cleveland	-11.7				0.01		
12/16/89	Cleveland	-13.3				0.00		
12/17/89	Cleveland	-17.2				0.00		
12/18/89	Cleveland	-13.9				0.09		
12/19/89	Cleveland	-10.6				0.01		

Table F-1

(Continued)

Date	Location	Average Temperature (°C)	Relative Humidity (%)	Wind Speed (mph)	Wind Direction (deg. azimuth)	Precipitation (inches)	Solar Radiation	
12/20/89	Cleveland	-12.8				0.04		
12/21/89	Cleveland	-16.7				0.00		
12/22/89	Cleveland	-20.6				0.00		
12/23/89	Cleveland	-15.0				0.00		
12/24/89	Cleveland	-15.0				0.05		
12/25/89	Cleveland	-7.2				0.12		
12/26/89	Cleveland	-9.4						
12/27/89	Cleveland	-17.8						
12/28/89	Cleveland	-17.8						
12/29/89	Cleveland	-17.8						
12/30/89	Cleveland	-17.8						
12/31/89	Cleveland	-17.8						
01/01/90	Cleveland	-0.6	76.2	12.7	315	0.01	0	min/day
01/02/90	Cleveland	0.6	79.6	15.4	225	0.00	526	min/day
01/03/90	Cleveland	3.3	69.6	15.0	225	0.00	139	min/day
01/04/90	Cleveland	7.2	69.6	15.0	225	0.00	75	min/day
01/05/90	Cleveland	-1.1	77.6	6.3	270	0.20	321	min/day
01/06/90	Cleveland	-2.2	85.7	7.0	270	0.00	25	min/day
01/07/90	Cleveland	2.2	80.4	11.8	225	0.00	549	min/day
01/08/90	Cleveland	1.7	74.4	10.1	225	0.00	561	min/day
01/09/90	Cleveland	5.0	76.9	15.2	225	0.19	281	min/day
01/10/90	Cleveland	2.2	87.5	14.2	270	0.20	0	min/day
01/11/90	Cleveland	3.9	64.5	17.6	270	0.00	337	min/day
01/12/90	Cleveland	-1.7	69.2	15.6	315	0.19	331	min/day
01/13/90	Cleveland	-5.0	69.0	10.4	0	0.00	368	min/day
01/14/90	Cleveland	-2.2	62.8	14.4	225	0.00	79	min/day
01/15/90	Cleveland	6.1	75.0	11.4	270	0.00	55	min/day
01/16/90	Cleveland	6.7	92.9	10.1	225	0.01	42	min/day
01/17/90	Cleveland	12.2	87.5	16.3	225	0.10	0	min/day
01/18/90	Cleveland	6.1	84.6	11.2	315	0.15	0	min/day
01/19/90	Cleveland	-1.7	65.4	6.9	0	0.00	221	min/day
01/20/90	Cleveland	1.7	88.4	7.1	45	0.50	0	min/day
01/21/90	Cleveland	3.3	82.6	13.8	270	0.10	0	min/day

Table F-1

(Continued)

Date	Location	Average Temperature (°C)	Relative Humidity (%)	Wind Speed (mph)	Wind Direction (deg. azimuth)	Precipitation (inches)	Solar Radiation
01/22/90	Cleveland	2.8	76.4	13.4	225	0.05	0 min/day
01/23/90	Cleveland	2.2	83.4	13.2	225	0.04	188 min/day
01/24/90	Cleveland	7.8	58.0	16.8	225	0.00	587 min/day
01/25/90	Cleveland	6.7	72.9	19.6	225	0.14	41 min/day
01/26/90	Cleveland	-2.8	73.6	12.0	270	0.01	194 min/day
01/27/90	Cleveland	4.4	52.5	19.1	225	0.00	527 min/day
01/28/90	Cleveland	3.3	60.2	6.8	270	0.00	345 min/day
01/29/90	Cleveland	0.0	88.6	9.7	0	0.46	0 min/day
01/30/90	Cleveland	-2.2	80.0	9.9	180	0.00	562 min/day
01/31/90	Cleveland	-0.6	74.3	6.5	180	0.00	602 min/day
02/01/90	Cleveland	4.4	70.4	12.4	225	0.37	8 min/day
02/02/90	Cleveland	2.2	96.2	8.9	45	0.75	0 min/day
02/03/90	Cleveland	1.1	90.7	3.4	135	0.08	97 min/day
02/04/90	Cleveland	-1.7	91.5	8.6	0	0.33	0 min/day
02/05/90	Cleveland	-0.6	81.2	15.4	180	0.00	387 min/day
02/06/90	Cleveland	3.9	65.7	8.4	225	0.00	488 min/day
02/07/90	Cleveland	6.1	73.6	3.9	225	0.02	224 min/day
02/08/90	Cleveland	8.3	70.6	16.2	225	0.00	621 min/day
02/09/90	Cleveland	10.0	78.5	12.7	225	0.25	0 min/day
02/10/90	Cleveland	2.8	46.6	7.9	315	0.00	547 min/day
02/11/90	Cleveland	2.2	66.6	2.0	45	0.00	326 min/day
02/12/90	Cleveland	0.6	68.3	8.3	180	0.00	355 min/day
02/13/90	Cleveland	9.4	49.3	13.7	225	0.02	246 min/day
02/14/90	Cleveland	-0.6	86.8	13.8	45	0.27	0 min/day
02/15/90	Cleveland	0.6	90.3	4.4	90	1.22	0 min/day
02/16/90	Cleveland	7.2	86.5	10.0	270	0.24	38 min/day
02/17/90	Cleveland	-5.6	75.4	4.6	270	0.04	343 min/day
02/18/90	Cleveland	-1.7	67.1	12.2	180	0.00	528 min/day
02/19/90	Cleveland	1.1	56.3	9.8	315	0.00	628 min/day
02/20/90	Cleveland	-3.3	56.0	4.8	315	0.00	651 min/day
02/21/90	Cleveland	2.2	49.5	10.2	225	0.00	631 min/day
02/22/90	Cleveland	10.0	65.6	13.7	180	0.59	0 min/day
02/23/90	Cleveland	3.3	89.6	5.2	0	0.35	0 min/day

Table F-1

(Continued)

Date	Location	Average Temperature (°C)	Relative Humidity (%)	Wind Speed (mph)	Wind Direction (deg. azimuth)	Precipitation (inches)	Solar Radiation	
02/24/90	Cleveland	-3.9	87.9	5.2	315	0.17	102	min/day
02/25/90	Cleveland	-11.1	53.1	12.3	315	0.00	390	min/day
02/26/90	Cleveland	-9.4	54.4	10.8	180	0.00	401	min/day
02/27/90	Cleveland	2.2	64.6	7.7	180	0.00	366	min/day
02/28/90	Cleveland	-3.3	56.8	6.7	45	0.00	657	min/day
03/01/90	Cleveland	-1.1	65.8	10.6	225	0.00	676	min/day
03/02/90	Cleveland	5.0	55.0	12.3	225	0.00	678	min/day
03/03/90	Cleveland	-1.1	72.4	9.2	0	0.00	152	min/day
03/04/90	Cleveland	-3.9	77.6	8.0	0	0.04	58	min/day
03/05/90	Cleveland	-2.2	82.6	10.6	45	0.01	35	min/day
03/06/90	Cleveland	-4.4	71.4	0.0	45	0.01	511	min/day
03/07/90	Cleveland	-3.9	59.4	9.4	90	0.00	660	min/day
03/08/90	Cleveland	3.3	46.8	8.9	180	0.01	585	min/day
03/09/90	Cleveland	10.0	83.5	10.1	225	0.18	80	min/day
03/10/90	Cleveland	10.0	90.1	9.1	180	0.04	70	min/day
03/11/90	Cleveland	15.6	90.0	8.8	180	0.00	75	min/day
03/12/90	Cleveland	18.9	70.5	14.7	225	0.00	613	min/day
03/13/90	Cleveland	19.4	80.6	10.0	225	0.00	337	min/day
03/14/90	Cleveland	19.4	64.9	10.5	225	0.00	530	min/day
03/15/90	Cleveland	21.1	50.3	13.5	225	0.00	457	min/day
03/16/90	Cleveland	12.2	91.3	6.0	315	0.19	68	min/day
03/17/90	Cleveland	9.4	69.4	14.3	225	0.01	221	min/day
03/18/90	Cleveland	4.4	60.3	13.5	270	0.03	122	min/day
03/19/90	Cleveland	1.1	84.9	8.8	0	0.16	13	min/day
03/20/90	Cleveland	-1.7	62.0	9.3	0	0.00	390	min/day
03/21/90	Cleveland	2.8	58.8	9.2	180	0.00	395	min/day
03/22/90	Cleveland	12.8	44.5	19.3	225	0.08	243	min/day
03/23/90	Cleveland	3.3	68.1	9.8	315	0.02	24	min/day
03/24/90	Cleveland	-1.1	61.1	6.9	0	0.00	250	min/day
03/25/90	Cleveland	0.0	53.4	9.4	270	0.00	737	min/day
03/26/90	Cleveland	-0.6	62.0	8.9	0	0.00	395	min/day
03/27/90	Cleveland	-1.1	58.0	6.3	180	0.00	717	min/day
03/28/90	Cleveland	2.8	50.6	6.8	0	0.00	438	min/day

Table F-1

(Continued)

Date	Location	Average Temperature (°C)	Relative Humidity (%)	Wind Speed (mph)	Wind Direction (deg. azimuth)	Precipitation (inches)	Solar Radiation
03/29/90	Cleveland	7.2	48.5	11.9	135	0.02	34 min/day
03/30/90	Cleveland	11.1	82.1	9.9	180	0.01	0 min/day
03/31/90	Cleveland	6.1	95.5	4.3	0	0.05	0 min/day
04/01/90	Cleveland	9.4	92.9	2.4	0	0.30	24 min/day
04/02/90	Cleveland	6.7	87.1	11.1	270	0.10	2 min/day
04/03/90	Cleveland	1.7	93.1	11.4	315	0.32	0 min/day
04/04/90	Cleveland	5.6	77.3	12.8	270	0.08	375 min/day
04/05/90	Cleveland	6.1	63.6	10.3	315	0.10	386 min/day
04/06/90	Cleveland	1.7	61.5	2.0	315	0.00	285 min/day
04/07/90	Cleveland	0.0	62.6	9.4	270	0.09	255 min/day
04/08/90	Cleveland	3.9	49.8	6.5	270	0.00	636 min/day
04/09/90	Cleveland	11.7	36.3	14.9	270	0.01	248 min/day
04/10/90	Cleveland	7.8	94.4	3.6	0	2.10	0 min/day
04/11/90	Cleveland	4.4	73.1	11.2	315	0.06	541 min/day
04/12/90	Cleveland	1.1	69.4	7.0	315	0.03	317 min/day
04/13/90	Cleveland	3.3	61.3	8.2	225	0.00	123 min/day
04/14/90	Cleveland	8.3	73.5	10.0	225	0.14	5 min/day
04/15/90	Cleveland	7.2	70.8	9.1	270	0.00	369 min/day
04/16/90	Cleveland	7.2	66.4	8.4	225	0.00	536 min/day
04/17/90	Cleveland	7.2	56.9	11.9	315	0.22	253 min/day
04/18/90	Cleveland	3.3	46.8	3.7	225	0.00	805 min/day
04/19/90	Cleveland	8.9	45.1	11.1	180	0.00	520 min/day
04/20/90	Cleveland	13.9	77.3	11.1	225	0.73	0 min/day
04/21/90	Cleveland	10.0	91.5	6.2	45	0.29	237 min/day
04/22/90	Cleveland	10.6	55.3	1.3	45	0.00	571 min/day
04/23/90	Cleveland	12.8	58.3	1.3	45	0.00	469 min/day
04/24/90	Cleveland	18.9	55.6	7.7	225	0.00	688 min/day
04/25/90	Cleveland	22.8	55.3	7.5	315	0.00	737 min/day
04/26/90	Cleveland	22.8	59.4	4.5	270	0.00	516 min/day
04/27/90	Cleveland	22.2	50.9	3.6	180	0.00	748 min/day
04/28/90	Cleveland	22.2	42.3	18.3	180	0.00	427 min/day
04/29/90	Cleveland	16.7	77.5	5.3	180	0.00	302 min/day
04/30/90	Cleveland	15.6	69.5	3.5	270	0.00	690 min/day

Table F-1

(Continued)

Date	Location	Average Temperature (°C)	Relative Humidity (%)	Wind Speed (mph)	Wind Direction (deg. azimuth)	Precipitation (inches)	Solar Radiation
05/01/90	Cleveland	13.9	56.1	6.3	270	0.00	114 min/day
05/02/90	Cleveland	9.4	53.0	2.4	0	0.00	615 min/day
05/03/90	Test Cell	9.8	74.5	4.5	15	0.07	128 $\mu\text{mol/s}\cdot\text{m}^2$
05/04/90	Test Cell	10.8	88.2	7.4	60	1.30	102 $\mu\text{mol/s}\cdot\text{m}^2$
05/05/90	Test Cell	9.1	80.3	6.9	89	0.46	114 $\mu\text{mol/s}\cdot\text{m}^2$
05/06/90	Test Cell	10.9	71.6	7.1	105	0.02	630 $\mu\text{mol/s}\cdot\text{m}^2$
05/07/90	Test Cell	15.2	69.3	10.3	109	0.00	612 $\mu\text{mol/s}\cdot\text{m}^2$
05/08/90	Test Cell	19.5	74.8	12.4	118	0.00	581 $\mu\text{mol/s}\cdot\text{m}^2$
05/09/90	Test Cell	20.1	75.9	13.0	119	0.00	399 $\mu\text{mol/s}\cdot\text{m}^2$
05/10/90	Test Cell	13.0	75.5	16.0	105	0.13	256 $\mu\text{mol/s}\cdot\text{m}^2$
05/11/90	Test Cell	9.0	62.4	10.1	104	0.00	655 $\mu\text{mol/s}\cdot\text{m}^2$
05/12/90	Test Cell	9.0	78.6	9.6	94	0.30	93 $\mu\text{mol/s}\cdot\text{m}^2$
05/13/90	Test Cell	11.3	81.7	9.6	95	0.96	92 $\mu\text{mol/s}\cdot\text{m}^2$
05/14/90	Test Cell	12.1	80.5	5.5	98	0.00	507 $\mu\text{mol/s}\cdot\text{m}^2$
05/15/90	Test Cell	17.6	78.4	6.5	109	0.26	258 $\mu\text{mol/s}\cdot\text{m}^2$
05/16/90	Test Cell	19.2	87.0	12.9	103	1.07	297 $\mu\text{mol/s}\cdot\text{m}^2$
05/17/90	Test Cell	16.0	77.1	12.6	104	0.46	306 $\mu\text{mol/s}\cdot\text{m}^2$
05/18/90	Test Cell	13.1	81.9	10.9	102	0.24	545 $\mu\text{mol/s}\cdot\text{m}^2$
05/19/90	Test Cell	13.2	74.5	6.8	106	0.00	390 $\mu\text{mol/s}\cdot\text{m}^2$
05/20/90	Test Cell	19.0	79.9	11.0	111	0.09	422 $\mu\text{mol/s}\cdot\text{m}^2$
05/21/90	Test Cell	9.9	79.6	11.8	97	0.00	221 $\mu\text{mol/s}\cdot\text{m}^2$
05/22/90	Test Cell	11.3	67.9	11.4	105	0.00	625 $\mu\text{mol/s}\cdot\text{m}^2$
05/23/90	Test Cell	12.4	69.6	5.4	104	0.00	616 $\mu\text{mol/s}\cdot\text{m}^2$
05/24/90	Test Cell	14.1	71.1	5.0	108	0.00	479 $\mu\text{mol/s}\cdot\text{m}^2$
05/25/90	Test Cell	16.1	76.5	7.8	109	0.41	332 $\mu\text{mol/s}\cdot\text{m}^2$
05/26/90	Test Cell	16.1	78.9	6.4	105	0.24	452 $\mu\text{mol/s}\cdot\text{m}^2$
05/27/90	Test Cell	15.9	81.8	5.8	106	0.00	630 $\mu\text{mol/s}\cdot\text{m}^2$
05/28/90	Test Cell	15.3	81.5	8.1	105	0.02	356 $\mu\text{mol/s}\cdot\text{m}^2$
05/29/90	Test Cell	12.2	80.2	9.8	76	0.45	124 $\mu\text{mol/s}\cdot\text{m}^2$
05/30/90	Cleveland	13.5	63.5	8.0	35	0.00	894 min/day
05/31/90	Test Cell	9.5	88.4	6.0	55	0.00	150 $\mu\text{mol/s}\cdot\text{m}^2$
06/01/90	Test Cell	24.1	53.0	1.8	195	0.00	700 $\mu\text{mol/s}\cdot\text{m}^2$
06/02/90	Test Cell	21.5	95.6	1.9	144	0.05	300 $\mu\text{mol/s}\cdot\text{m}^2$

Table F-1

(Continued)

Date	Location	Average Temperature (°C)	Relative Humidity (%)	Wind Speed (mph)	Wind Direction (deg. azimuth)	Precipitation (inches)	Solar Radiation
06/03/90	Test Cell	21.2	78.0	4.3	247	0.33	626 $\mu\text{mol/s}\cdot\text{m}^2$
06/04/90	Test Cell	10.6	93.3	2.2	217	0.00	154 $\mu\text{mol/s}\cdot\text{m}^2$
06/05/90	Test Cell	12.7	70.8	1.1	252	0.00	535 $\mu\text{mol/s}\cdot\text{m}^2$
06/06/90	Test Cell	18.8	86.6	2.0	256	0.04	371 $\mu\text{mol/s}\cdot\text{m}^2$
06/07/90	Test Cell	19.7	77.2	1.4	176	0.00	616 $\mu\text{mol/s}\cdot\text{m}^2$
06/08/90	Test Cell	20.9	86.9	2.3	176	0.55	314 $\mu\text{mol/s}\cdot\text{m}^2$
06/09/90	Test Cell	23.1	86.2	2.0	259	0.02	561 $\mu\text{mol/s}\cdot\text{m}^2$
06/10/90	Test Cell	17.5	93.4	2.2	194	0.00	262 $\mu\text{mol/s}\cdot\text{m}^2$
06/11/90	Test Cell	17.7	82.6	1.2	117	0.00	650 $\mu\text{mol/s}\cdot\text{m}^2$
06/12/90	Test Cell	16.4	78.0	1.5	137	0.00	248 $\mu\text{mol/s}\cdot\text{m}^2$
06/13/90	Test Cell	23.0	75.0	1.6	177	0.00	613 $\mu\text{mol/s}\cdot\text{m}^2$
06/14/90	Test Cell	22.0	95.2	1.0	181	0.06	262 $\mu\text{mol/s}\cdot\text{m}^2$
06/15/90	Test Cell	21.3	71.1	1.3	120	0.00	673 $\mu\text{mol/s}\cdot\text{m}^2$
06/16/90	Test Cell	20.6	79.1	0.9	146	0.00	661 $\mu\text{mol/s}\cdot\text{m}^2$
06/17/90	Test Cell	26.3	88.1	1.5	193	0.00	461 $\mu\text{mol/s}\cdot\text{m}^2$
06/18/90	Test Cell	26.5	78.4	3.0	258	0.00	665 $\mu\text{mol/s}\cdot\text{m}^2$
06/19/90	Test Cell	17.4	90.4	2.0	159	0.00	288 $\mu\text{mol/s}\cdot\text{m}^2$
06/20/90	Test Cell	16.4	97.3	1.1	121	0.09	150 $\mu\text{mol/s}\cdot\text{m}^2$
06/21/90	Test Cell	22.7	75.4	1.8	253	0.01	646 $\mu\text{mol/s}\cdot\text{m}^2$
06/22/90	Test Cell	21.0	91.7	2.1	189	0.12	251 $\mu\text{mol/s}\cdot\text{m}^2$
06/23/90	Test Cell	16.0	96.5	3.5	273	0.54	89 $\mu\text{mol/s}\cdot\text{m}^2$
06/24/90	Test Cell	14.6	94.8	1.6	267	0.55	139 $\mu\text{mol/s}\cdot\text{m}^2$
06/25/90	Test Cell	18.2	77.8	0.9	226	0.00	665 $\mu\text{mol/s}\cdot\text{m}^2$
06/26/90	Test Cell	20.6	75.5	1.2	251	0.01	547 $\mu\text{mol/s}\cdot\text{m}^2$
06/27/90	Test Cell	21.3	93.2	0.8	215	0.00	435 $\mu\text{mol/s}\cdot\text{m}^2$
06/28/90	Test Cell	19.9	97.4	0.4	166	0.07	212 $\mu\text{mol/s}\cdot\text{m}^2$
06/29/90	Test Cell	24.3	92.7	1.9	214	0.07	412 $\mu\text{mol/s}\cdot\text{m}^2$
06/30/90	Test Cell	24.7	92.9	1.6	272	0.00	522 $\mu\text{mol/s}\cdot\text{m}^2$
07/01/90	Test Cell	19.8	94.4	1.6	156	0.00	463 $\mu\text{mol/s}\cdot\text{m}^2$
07/02/90	Test Cell	19.8	80.3	0.9	174	0.00	625 $\mu\text{mol/s}\cdot\text{m}^2$
07/03/90	Test Cell	23.1	71.5	1.2	228	0.00	581 $\mu\text{mol/s}\cdot\text{m}^2$
07/04/90	Test Cell	29.7	65.7	2.7	249	0.00	576 $\mu\text{mol/s}\cdot\text{m}^2$
07/05/90	Test Cell	24.2	83.8	1.2	157	0.00	375 $\mu\text{mol/s}\cdot\text{m}^2$

Table F-1
(Continued)

Date	Location	Average Temperature (°C)	Relative Humidity (%)	Wind Speed (mph)	Wind Direction (deg. azimuth)	Precipitation (inches)	Solar Radiation
07/06/90	Test Cell	18.5	81.0	2.6	127	0.00	631 $\mu\text{mol/s}\cdot\text{m}^2$
07/07/90	Test Cell	17.3	80.3	2.3	157	0.00	549 $\mu\text{mol/s}\cdot\text{m}^2$
07/08/90	Test Cell	24.7	75.3	1.5	175	0.00	575 $\mu\text{mol/s}\cdot\text{m}^2$
07/09/90	Test Cell	26.7	94.5	1.7	243	0.15	432 $\mu\text{mol/s}\cdot\text{m}^2$
07/10/90	Test Cell	23.2	86.1	0.8	138	0.00	360 $\mu\text{mol/s}\cdot\text{m}^2$
07/11/90	Test Cell	18.6	94.2	2.5	106	0.33	119 $\mu\text{mol/s}\cdot\text{m}^2$
07/12/90	Test Cell	17.7	95.8	5.6	84	0.56	122 $\mu\text{mol/s}\cdot\text{m}^2$
07/13/90	Test Cell	17.5	93.1	4.4	98	0.27	130 $\mu\text{mol/s}\cdot\text{m}^2$
07/14/90	Test Cell	19.5	98.4	1.7	131	1.00	151 $\mu\text{mol/s}\cdot\text{m}^2$
07/15/90	Test Cell	21.1	89.9	1.0	252	0.02	471 $\mu\text{mol/s}\cdot\text{m}^2$
07/16/90	Test Cell	21.9	83.5	1.5	257	0.00	567 $\mu\text{mol/s}\cdot\text{m}^2$
07/17/90	Test Cell	24.7	79.9	1.5	268	0.03	580 $\mu\text{mol/s}\cdot\text{m}^2$
07/18/90	Test Cell	24.3	83.5	0.9	236	0.00	564 $\mu\text{mol/s}\cdot\text{m}^2$
07/19/90	Test Cell	24.9	89.9	0.9	228	0.05	461 $\mu\text{mol/s}\cdot\text{m}^2$
07/20/90	Test Cell	22.9	97.0	1.1	268	1.17	232 $\mu\text{mol/s}\cdot\text{m}^2$
07/21/90	Test Cell	21.1	90.4	1.1	143	1.64	492 $\mu\text{mol/s}\cdot\text{m}^2$
07/22/90	Test Cell	18.1	95.7	2.0	129	1.00	64 $\mu\text{mol/s}\cdot\text{m}^2$
07/23/90	Test Cell	19.6	86.8	1.3	161	0.19	577 $\mu\text{mol/s}\cdot\text{m}^2$
07/24/90	Test Cell	19.8	84.8	1.1	277	0.00	596 $\mu\text{mol/s}\cdot\text{m}^2$
07/25/90	Test Cell	21.0	83.5	0.3	210	0.00	594 $\mu\text{mol/s}\cdot\text{m}^2$
07/26/90	Test Cell	20.8	82.2	1.6	151	0.00	551 $\mu\text{mol/s}\cdot\text{m}^2$
07/27/90	Test Cell	21.9	83.4	1.3	160	0.00	480 $\mu\text{mol/s}\cdot\text{m}^2$
07/28/90	Test Cell	22.8	84.5	0.5	158	0.00	420 $\mu\text{mol/s}\cdot\text{m}^2$
07/29/90	Test Cell	24.4	80.3	1.0	183	0.00	579 $\mu\text{mol/s}\cdot\text{m}^2$
07/30/90	Test Cell	22.9	96.2	1.3	187	0.21	297 $\mu\text{mol/s}\cdot\text{m}^2$
07/31/90	Test Cell	19.0	91.9	1.8	98	0.00	376 $\mu\text{mol/s}\cdot\text{m}^2$
08/01/90	Test Cell	17.9	77.5	0.9	166	0.00	594 $\mu\text{mol/s}\cdot\text{m}^2$
08/02/90	Test Cell	19.1	84.7	1.0	160	0.00	563 $\mu\text{mol/s}\cdot\text{m}^2$
08/03/90	Test Cell	21.3	83.5	14.7	204	0.00	500 $\mu\text{mol/s}\cdot\text{m}^2$
08/04/90	Test Cell	20.7	94.9	0.8	182	0.75	186 $\mu\text{mol/s}\cdot\text{m}^2$
08/05/90	Test Cell	21.3	96.4	0.7	191	0.03	172 $\mu\text{mol/s}\cdot\text{m}^2$
08/06/90	Test Cell	18.3	96.6	1.3	183	0.36	88 $\mu\text{mol/s}\cdot\text{m}^2$
08/07/90	Test Cell	18.3	86.6	1.1	165	0.00	439 $\mu\text{mol/s}\cdot\text{m}^2$

Table F-1

(Continued)

Date	Location	Average Temperature (°C)	Relative Humidity (%)	Wind Speed (mph)	Wind Direction (deg. azimuth)	Precipitation (inches)	Solar Radiation
08/08/90	Test Cell	18.3	83.9	0.5	190	0.00	582 $\mu\text{mol/s}\cdot\text{m}^2$
08/09/90	Test Cell	19.0	78.4	2.0	160	0.00	523 $\mu\text{mol/s}\cdot\text{m}^2$
08/10/90	Test Cell	21.0	80.7	0.4	236	0.00	519 $\mu\text{mol/s}\cdot\text{m}^2$
08/11/90	Test Cell	21.2	75.1	1.0	245	0.00	503 $\mu\text{mol/s}\cdot\text{m}^2$
08/12/90	Test Cell	21.8	81.5	1.5	193	0.00	417 $\mu\text{mol/s}\cdot\text{m}^2$
08/13/90	Test Cell	20.1	88.0	1.1	137	1.33	275 $\mu\text{mol/s}\cdot\text{m}^2$
08/14/90	Test Cell	19.8	78.9	0.7	173	0.00	522 $\mu\text{mol/s}\cdot\text{m}^2$
08/15/90	Test Cell	20.4	75.8	0.8	258	0.00	516 $\mu\text{mol/s}\cdot\text{m}^2$
08/16/90	Test Cell	22.9	84.4	0.7	251	0.00	376 $\mu\text{mol/s}\cdot\text{m}^2$
08/17/90	Test Cell	23.1	77.6	0.6	194	0.00	467 $\mu\text{mol/s}\cdot\text{m}^2$
08/18/90	Test Cell	23.0	88.8	0.7	235	0.02	235 $\mu\text{mol/s}\cdot\text{m}^2$
08/19/90	Test Cell	21.7	90.9	2.1	123	1.37	172 $\mu\text{mol/s}\cdot\text{m}^2$
08/20/90	Test Cell	20.8	90.4	0.8	75	0.00	154 $\mu\text{mol/s}\cdot\text{m}^2$
08/21/90	Test Cell	19.8	90.6	2.6	110	0.01	103 $\mu\text{mol/s}\cdot\text{m}^2$
08/22/90	Test Cell	19.6	89.2	1.8	100	0.00	123 $\mu\text{mol/s}\cdot\text{m}^2$
08/23/90	Test Cell	20.8	88.2	1.5	90	0.00	281 $\mu\text{mol/s}\cdot\text{m}^2$
08/24/90	Test Cell	19.9	89.7	0.4	170	0.00	171 $\mu\text{mol/s}\cdot\text{m}^2$
08/25/90	Test Cell	20.9	86.4	0.7	184	0.00	415 $\mu\text{mol/s}\cdot\text{m}^2$
08/26/90	Test Cell	23.7	84.8	0.6	247	0.00	456 $\mu\text{mol/s}\cdot\text{m}^2$
08/27/90	Test Cell	25.3	87.6	0.9	224	0.00	410 $\mu\text{mol/s}\cdot\text{m}^2$
08/28/90	Test Cell	26.6	81.9	2.9	222	0.00	442 $\mu\text{mol/s}\cdot\text{m}^2$
08/29/90	Test Cell	22.1	79.3	1.3	164	0.00	457 $\mu\text{mol/s}\cdot\text{m}^2$
08/30/90	Test Cell	19.4	76.2	1.5	153	0.00	425 $\mu\text{mol/s}\cdot\text{m}^2$
08/31/90	Test Cell	20.3	70.1	1.8	138	0.00	507 $\mu\text{mol/s}\cdot\text{m}^2$
09/01/90	Test Cell	22.7	80.3	0.5	197	0.00	370 $\mu\text{mol/s}\cdot\text{m}^2$
09/02/90	Test Cell	23.4	85.3	1.0	202	0.00	417 $\mu\text{mol/s}\cdot\text{m}^2$
09/03/90	Test Cell	20.4	85.3	2.2	81	0.00	406 $\mu\text{mol/s}\cdot\text{m}^2$
09/04/90	Test Cell	20.0	77.0	0.7	230	0.00	413 $\mu\text{mol/s}\cdot\text{m}^2$
09/05/90	Test Cell	21.8	91.0	0.9	220	0.00	103 $\mu\text{mol/s}\cdot\text{m}^2$
09/06/90	Test Cell	22.9	86.0	1.4	191	0.64	329 $\mu\text{mol/s}\cdot\text{m}^2$
09/07/90	Test Cell	20.4	88.9	1.6	132	2.70	214 $\mu\text{mol/s}\cdot\text{m}^2$
09/08/90	Test Cell	19.6	82.5	1.8	119	0.00	423 $\mu\text{mol/s}\cdot\text{m}^2$
09/09/90	Test Cell	18.6	87.6	1.0	122	3.19	258 $\mu\text{mol/s}\cdot\text{m}^2$

Table F-1

(Continued)

Date	Location	Average Temperature (°C)	Relative Humidity (%)	Wind Speed (mph)	Wind Direction (deg. azimuth)	Precipitation (inches)	Solar Radiation
09/10/90	Test Cell	20.5	82.8	0.7	265	0.00	378 $\mu\text{mol/s}\cdot\text{m}^2$
09/11/90	Test Cell	20.7	88.9	0.9	140	0.00	348 $\mu\text{mol/s}\cdot\text{m}^2$
09/12/90	Test Cell	20.4	88.1	0.6	175	0.00	239 $\mu\text{mol/s}\cdot\text{m}^2$
09/13/90	Test Cell	21.2	84.7	0.8	179	0.00	384 $\mu\text{mol/s}\cdot\text{m}^2$
09/14/90	Test Cell	20.8	89.2	2.0	185	1.16	190 $\mu\text{mol/s}\cdot\text{m}^2$
09/15/90	Test Cell	15.2	87.3	2.0	304	0.08	89 $\mu\text{mol/s}\cdot\text{m}^2$
09/16/90	Test Cell	13.2	81.8	1.7	150	2.10	141 $\mu\text{mol/s}\cdot\text{m}^2$
09/17/90	Test Cell	11.9	65.5	1.1	195	0.00	306 $\mu\text{mol/s}\cdot\text{m}^2$
09/18/90	Test Cell	10.9	78.1	0.6	180	0.00	340 $\mu\text{mol/s}\cdot\text{m}^2$
09/19/90	Test Cell	13.9	88.8	1.5	202	0.33	67 $\mu\text{mol/s}\cdot\text{m}^2$
09/20/90	Test Cell	15.7	71.0	0.8	216	0.00	470 $\mu\text{mol/s}\cdot\text{m}^2$
09/21/90	Test Cell	14.6	80.9	0.6	165	0.29	288 $\mu\text{mol/s}\cdot\text{m}^2$
09/22/90	Test Cell	15.7	75.4	2.6	290	0.13	326 $\mu\text{mol/s}\cdot\text{m}^2$
09/23/90	Test Cell	9.9	81.9	2.6	255	0.41	61 $\mu\text{mol/s}\cdot\text{m}^2$
09/24/90	Test Cell	11.2	67.5	2.3	289	0.00	408 $\mu\text{mol/s}\cdot\text{m}^2$
09/25/90	Test Cell	14.5	70.3	2.4	227	0.00	382 $\mu\text{mol/s}\cdot\text{m}^2$
09/26/90	Test Cell	15.8	87.1	0.9	198	0.00	365 $\mu\text{mol/s}\cdot\text{m}^2$
09/27/90	Test Cell	16.6	80.2	0.3	210	0.00	403 $\mu\text{mol/s}\cdot\text{m}^2$
09/28/90	Test Cell	18.4	84.6	0.5	181	0.00	236 $\mu\text{mol/s}\cdot\text{m}^2$
09/29/90	Test Cell	17.3	93.3	0.2	166	0.18	63 $\mu\text{mol/s}\cdot\text{m}^2$
09/30/90	Test Cell	14.1	85.3	1.4	233	0.24	258 $\mu\text{mol/s}\cdot\text{m}^2$
10/01/90	Test Cell	13.0	70.7	1.9	259	0.00	376 $\mu\text{mol/s}\cdot\text{m}^2$
10/02/90	Test Cell	13.9	62.4	0.9	280	0.00	403 $\mu\text{mol/s}\cdot\text{m}^2$
10/03/90	Test Cell	16.3	75.3	2.4	108	0.00	280 $\mu\text{mol/s}\cdot\text{m}^2$
10/04/90	Test Cell	17.2	74.2	2.7	245	1.08	299 $\mu\text{mol/s}\cdot\text{m}^2$
10/05/90	Test Cell	18.2	61.7	2.3	228	0.01	399 $\mu\text{mol/s}\cdot\text{m}^2$
10/06/90	Test Cell	21.9	49.1	2.8	215	0.00	399 $\mu\text{mol/s}\cdot\text{m}^2$
10/07/90	Test Cell	17.7	85.5	0.6	186	0.02	179 $\mu\text{mol/s}\cdot\text{m}^2$
10/08/90	Test Cell	15.1	91.7	0.9	115	0.14	63 $\mu\text{mol/s}\cdot\text{m}^2$
10/09/90	Test Cell	14.8	90.1	2.8	110	0.84	35 $\mu\text{mol/s}\cdot\text{m}^2$
10/10/90	Test Cell	15.6	85.7	2.8	182	0.11	156 $\mu\text{mol/s}\cdot\text{m}^2$
10/11/90	Test Cell	8.1	85.1	1.0	255	0.23	141 $\mu\text{mol/s}\cdot\text{m}^2$
10/12/90	Test Cell	9.7	90.4	1.1	122	0.67	53 $\mu\text{mol/s}\cdot\text{m}^2$

Table F-1

(Continued)

Date	Location	Average Temperature (°C)	Relative Humidity (%)	Wind Speed (mph)	Wind Direction (deg. azimuth)	Precipitation (inches)	Solar Radiation
10/13/90	Test Cell	12.4	86.8	0.9	112	0.00	66 $\mu\text{mol/s}\cdot\text{m}^2$
10/14/90	Test Cell	12.8	78.9	1.1	206	0.00	293 $\mu\text{mol/s}\cdot\text{m}^2$
10/15/90	Test Cell	13.3	62.7	2.7	232	0.00	357 $\mu\text{mol/s}\cdot\text{m}^2$
10/16/90	Test Cell	11.2	66.9	1.0	173	0.00	239 $\mu\text{mol/s}\cdot\text{m}^2$
10/17/90	Test Cell	18.5	57.1	2.6	134	0.00	265 $\mu\text{mol/s}\cdot\text{m}^2$
10/18/90	Test Cell	11.3	79.1	4.7	222	0.80	82 $\mu\text{mol/s}\cdot\text{m}^2$
10/19/90	Test Cell	6.0	68.6	2.9	277	0.02	176 $\mu\text{mol/s}\cdot\text{m}^2$
10/20/90	Test Cell	7.4	71.0	1.3	164	0.00	299 $\mu\text{mol/s}\cdot\text{m}^2$
10/21/90	Test Cell	14.1	63.7	1.4	206	0.00	298 $\mu\text{mol/s}\cdot\text{m}^2$
10/22/90	Test Cell	11.8	88.6	1.6	181	0.80	35 $\mu\text{mol/s}\cdot\text{m}^2$
10/23/90	Test Cell	10.5	79.9	2.3	116	0.00	162 $\mu\text{mol/s}\cdot\text{m}^2$
10/24/90	Test Cell	9.8	77.8	0.8	247	0.06	191 $\mu\text{mol/s}\cdot\text{m}^2$
10/25/90	Test Cell	8.4	68.5	3.4	57	0.00	140 $\mu\text{mol/s}\cdot\text{m}^2$
10/26/90	Test Cell	5.4	63.1	2.6	115	0.00	168 $\mu\text{mol/s}\cdot\text{m}^2$
10/27/90	Test Cell	7.5	55.2	1.8	233	0.00	258 $\mu\text{mol/s}\cdot\text{m}^2$
10/28/90	Test Cell	7.2	51.1	4.1	263	0.00	88 $\mu\text{mol/s}\cdot\text{m}^2$
10/29/90	Test Cell	5.6	55.7	0.7	177	0.00	258 $\mu\text{mol/s}\cdot\text{m}^2$
10/30/90	Test Cell	10.9	61.9	1.2	249	0.00	265 $\mu\text{mol/s}\cdot\text{m}^2$
10/31/90	Test Cell	13.0	69.2	0.6	195	0.00	246 $\mu\text{mol/s}\cdot\text{m}^2$
11/01/90	Test Cell	16.1	53.8	0.9	250	0.00	254 $\mu\text{mol/s}\cdot\text{m}^2$
11/02/90	Test Cell	16.0	44.8	1.8	219	0.00	214 $\mu\text{mol/s}\cdot\text{m}^2$
11/03/90	Test Cell	17.4	47.3	1.5	248	0.00	237 $\mu\text{mol/s}\cdot\text{m}^2$
11/04/90	Test Cell	13.2	72.8	2.9	186	0.00	166 $\mu\text{mol/s}\cdot\text{m}^2$
11/05/90	Test Cell	10.6	88.4	3.9	145	0.87	42 $\mu\text{mol/s}\cdot\text{m}^2$
11/06/90	Test Cell	4.7	73.5	4.1	276	0.00	56 $\mu\text{mol/s}\cdot\text{m}^2$
11/07/90	Test Cell	4.9	77.3	1.9	264	0.08	46 $\mu\text{mol/s}\cdot\text{m}^2$
11/08/90	Test Cell	3.4	55.6	2.9	135	0.00	236 $\mu\text{mol/s}\cdot\text{m}^2$
11/09/90	Test Cell	4.5	67.1	1.9	195	0.34	65 $\mu\text{mol/s}\cdot\text{m}^2$
11/10/90	Test Cell	6.0	72.6	2.9	163	0.01	148 $\mu\text{mol/s}\cdot\text{m}^2$
11/11/90	Test Cell	3.4	55.1	4.5	231	0.05	139 $\mu\text{mol/s}\cdot\text{m}^2$
11/12/90	Test Cell	3.5	48.8	4.0	240	0.00	237 $\mu\text{mol/s}\cdot\text{m}^2$
11/13/90	Test Cell	1.3	56.7	2.5	188	0.00	103 $\mu\text{mol/s}\cdot\text{m}^2$
11/14/90	Test Cell	3.7	58.3	1.1	200	0.00	241 $\mu\text{mol/s}\cdot\text{m}^2$

Table F-1
(Continued)

Date	Location	Average Temperature (°C)	Relative Humidity (%)	Wind Speed (mph)	Wind Direction (deg. azimuth)	Precipitation (inches)	Solar Radiation
11/15/90	Test Cell	13.4	52.9	2.2	228	0.00	232 $\mu\text{mol/s}\cdot\text{m}^2$
11/16/90	Test Cell	13.6	61.5	3.6	250	0.13	125 $\mu\text{mol/s}\cdot\text{m}^2$
11/17/90	Test Cell	5.3	74.8	3.7	109	0.09	127 $\mu\text{mol/s}\cdot\text{m}^2$
11/18/90	Test Cell	1.7	71.8	1.5	161	0.00	192 $\mu\text{mol/s}\cdot\text{m}^2$
11/19/90	Test Cell	1.8	73.6	0.5	223	0.00	121 $\mu\text{mol/s}\cdot\text{m}^2$
11/20/90	Test Cell	3.8	75.9	0.7	222	0.00	208 $\mu\text{mol/s}\cdot\text{m}^2$
11/21/90	Test Cell	7.9	65.6	1.8	156	0.00	96 $\mu\text{mol/s}\cdot\text{m}^2$
11/22/90	Test Cell	11.2	84.1	1.0	230	0.80	19 $\mu\text{mol/s}\cdot\text{m}^2$
11/23/90	Test Cell	5.7	69.7	2.4	241	0.08	153 $\mu\text{mol/s}\cdot\text{m}^2$
11/24/90	Test Cell	4.2	55.6	3.1	232	0.02	117 $\mu\text{mol/s}\cdot\text{m}^2$
11/25/90	Test Cell	8.5	60.3	2.6	248	0.00	89 $\mu\text{mol/s}\cdot\text{m}^2$
11/26/90	Test Cell	8.7	70.0	2.2	143	0.00	183 $\mu\text{mol/s}\cdot\text{m}^2$
11/27/90	Test Cell	19.1	75.5	2.7	212	0.28	112 $\mu\text{mol/s}\cdot\text{m}^2$
11/28/90	Test Cell	12.1	82.3	4.7	242	0.05	32 $\mu\text{mol/s}\cdot\text{m}^2$
11/29/90	Test Cell	1.1	68.8	3.9	266	0.00	88 $\mu\text{mol/s}\cdot\text{m}^2$
11/30/90	Test Cell	1.4	65.6	2.0	227	0.00	192 $\mu\text{mol/s}\cdot\text{m}^2$
12/01/90	Test Cell	6.5	42.7	3.4	240	0.00	112 $\mu\text{mol/s}\cdot\text{m}^2$
12/02/90	Test Cell	4.5	69.4	4.5	143	0.00	157 $\mu\text{mol/s}\cdot\text{m}^2$
12/03/90	Test Cell	6.0	86.9	6.8	162	3.08	25 $\mu\text{mol/s}\cdot\text{m}^2$
12/04/90	Test Cell	-0.3	58.7	6.8	270	0.00	76 $\mu\text{mol/s}\cdot\text{m}^2$
12/05/90	Test Cell	-1.3	48.9	4.2	252	0.03	119 $\mu\text{mol/s}\cdot\text{m}^2$
12/06/90	Test Cell	2.7	53.5	2.8	269	0.03	50 $\mu\text{mol/s}\cdot\text{m}^2$
12/07/90	Test Cell	0.9	56.7	1.0	248	0.00	158 $\mu\text{mol/s}\cdot\text{m}^2$
12/08/90	Test Cell	1.5	58.6	1.7	265	0.00	176 $\mu\text{mol/s}\cdot\text{m}^2$
12/09/90	Test Cell	4.0	68.0	1.7	231	0.01	189 $\mu\text{mol/s}\cdot\text{m}^2$
12/10/90	Test Cell	5.3	53.8	3.5	176	0.00	188 $\mu\text{mol/s}\cdot\text{m}^2$
12/11/90	Test Cell	3.1	52.0	1.6	182	0.00	166 $\mu\text{mol/s}\cdot\text{m}^2$
12/12/90	Test Cell	9.4	53.0	1.6	235	0.00	142 $\mu\text{mol/s}\cdot\text{m}^2$
12/13/90	Test Cell	5.3	56.9	4.8	244	0.02	54 $\mu\text{mol/s}\cdot\text{m}^2$
12/14/90	Test Cell	0.3	55.1	1.2	133	0.04	48 $\mu\text{mol/s}\cdot\text{m}^2$
12/15/90	Test Cell	4.2	74.8	2.1	178	0.71	35 $\mu\text{mol/s}\cdot\text{m}^2$
12/16/90	Test Cell	3.2	65.4	4.1	285	0.02	65 $\mu\text{mol/s}\cdot\text{m}^2$
12/17/90	Test Cell	2.5	75.5	1.4	178	0.07	94 $\mu\text{mol/s}\cdot\text{m}^2$

Table F-1

(Continued)

Date	Location	Average Temperature (°C)	Relative Humidity (%)	Wind Speed (mph)	Wind Direction (deg. azimuth)	Precipitation (inches)	Solar Radiation
12/18/90	Test Cell	6.3	88.5	2.4	258	0.95	15 $\mu\text{mol/s}\cdot\text{m}^2$
12/19/90	Test Cell	1.5	77.4	1.5	238	0.00	102 $\mu\text{mol/s}\cdot\text{m}^2$
12/20/90	Test Cell	2.6	59.9	3.9	140	0.00	96 $\mu\text{mol/s}\cdot\text{m}^2$
12/21/90	Test Cell	10.1	82.7	1.9	163	0.77	27 $\mu\text{mol/s}\cdot\text{m}^2$
12/22/90	Test Cell	10.2	89.2	1.2	255	0.27	28 $\mu\text{mol/s}\cdot\text{m}^2$
12/23/90	Test Cell	-0.8	85.6	1.3	20	1.43	18 $\mu\text{mol/s}\cdot\text{m}^2$
12/24/90	Test Cell	-9.7	71.5	0.0	126	0.00	165 $\mu\text{mol/s}\cdot\text{m}^2$
12/25/90	Test Cell	-9.9	59.1	1.3	225	0.00	145 $\mu\text{mol/s}\cdot\text{m}^2$
12/26/90	Test Cell	-8.8	49.3	2.6	261	0.00	155 $\mu\text{mol/s}\cdot\text{m}^2$
12/27/90	Test Cell	-8.6	54.1	3.2	155	0.00	69 $\mu\text{mol/s}\cdot\text{m}^2$
12/28/90	Test Cell	-0.3	87.7	1.9	174	0.37	77 $\mu\text{mol/s}\cdot\text{m}^2$
12/29/90	Test Cell	11.4	88.5	3.5	209	0.66	46 $\mu\text{mol/s}\cdot\text{m}^2$
12/30/90	Test Cell	4.5	89.4	2.6	116	2.10	16 $\mu\text{mol/s}\cdot\text{m}^2$
12/31/90	Test Cell	-5.4	69.4	2.8	254	0.00	76 $\mu\text{mol/s}\cdot\text{m}^2$
01/01/91	Test Cell	-3.8	64.7	0.7	191	0.02	181 $\mu\text{mol/s}\cdot\text{m}^2$
01/02/91	Test Cell	-1.5	65.4	1.2	172	0.00	68 $\mu\text{mol/s}\cdot\text{m}^2$
01/03/91	Test Cell	-4.1	58.5	3.3	228	0.00	115 $\mu\text{mol/s}\cdot\text{m}^2$
01/04/91	Test Cell	-6.3	48.7	1.7	249	0.00	189 $\mu\text{mol/s}\cdot\text{m}^2$
01/05/91	Test Cell	-2.7	72.0	1.3	194	0.19	37 $\mu\text{mol/s}\cdot\text{m}^2$
01/06/91	Test Cell	-0.3	83.2	1.0	205	0.02	38 $\mu\text{mol/s}\cdot\text{m}^2$
01/07/91	Test Cell	-1.5	62.3	7.2	76	0.01	66 $\mu\text{mol/s}\cdot\text{m}^2$
01/08/91	Test Cell	-2.8	54.9	4.2	127	0.00	173 $\mu\text{mol/s}\cdot\text{m}^2$
01/09/91	Test Cell	1.2	83.1	1.9	244	0.00	43 $\mu\text{mol/s}\cdot\text{m}^2$
01/10/91	Test Cell	-1.2	69.5	4.3	143	0.01	47 $\mu\text{mol/s}\cdot\text{m}^2$
01/11/91	Test Cell	2.0	84.3	5.8	139	0.38	31 $\mu\text{mol/s}\cdot\text{m}^2$
01/12/91	Test Cell	-0.5	83.8	3.5	252	0.00	25 $\mu\text{mol/s}\cdot\text{m}^2$
01/13/91	Test Cell	-1.7	61.4	2.1	250	0.03	152 $\mu\text{mol/s}\cdot\text{m}^2$
01/14/91	Test Cell	1.1	70.3	2.6	235	0.01	67 $\mu\text{mol/s}\cdot\text{m}^2$
01/15/91	Test Cell	4.6	75.4	0.8	188	0.00	190 $\mu\text{mol/s}\cdot\text{m}^2$
01/16/91	Test Cell	5.4	90.0	2.0	190	0.48	66 $\mu\text{mol/s}\cdot\text{m}^2$
01/17/91	Test Cell	-0.4	80.3	4.0	286	0.01	32 $\mu\text{mol/s}\cdot\text{m}^2$
01/18/91	Test Cell	-0.7	53.5	4.6	264	0.00	149 $\mu\text{mol/s}\cdot\text{m}^2$
01/19/91	Test Cell	3.8	57.6	3.4	241	0.06	154 $\mu\text{mol/s}\cdot\text{m}^2$

Table F-1

(Continued)

Date	Location	Average Temperature (°C)	Relative Humidity (%)	Wind Speed (mph)	Wind Direction (deg. azimuth)	Precipitation (inches)	Solar Radiation
01/20/91	Test Cell	2.8	75.7	2.4	231	0.10	33 $\mu\text{mol/s}\cdot\text{m}^2$
01/21/91	Test Cell	-7.4	68.6	3.7	165	0.01	96 $\mu\text{mol/s}\cdot\text{m}^2$
01/22/91	Test Cell	-10.8	45.8	2.0	253	0.00	227 $\mu\text{mol/s}\cdot\text{m}^2$
01/23/91	Test Cell	-3.6	49.8	4.8	250	0.00	92 $\mu\text{mol/s}\cdot\text{m}^2$
01/24/91	Test Cell	-7.1	46.4	3.8	267	0.00	158 $\mu\text{mol/s}\cdot\text{m}^2$
01/25/91	Test Cell	-10.4	45.3	1.5	249	0.00	213 $\mu\text{mol/s}\cdot\text{m}^2$
01/26/91	Test Cell	-8.2	62.1	1.5	226	0.01	99 $\mu\text{mol/s}\cdot\text{m}^2$
01/27/91	Test Cell	-4.4	58.7	2.9	217	0.01	167 $\mu\text{mol/s}\cdot\text{m}^2$
01/28/91	Test Cell	-2.1	62.6	2.0	236	0.25	236 $\mu\text{mol/s}\cdot\text{m}^2$
01/29/91	Test Cell	-3.4	70.8	1.3	180	0.01	163 $\mu\text{mol/s}\cdot\text{m}^2$
01/30/91	Test Cell	-2.0	88.2	2.7	94	0.00	18 $\mu\text{mol/s}\cdot\text{m}^2$
01/31/91	Test Cell	-7.6	62.2	4.7	265	0.04	71 $\mu\text{mol/s}\cdot\text{m}^2$
02/01/91	Test Cell	-5.6	51.7	0.8	209	0.21	171 $\mu\text{mol/s}\cdot\text{m}^2$
02/02/91	Test Cell	4.7	37.3	2.5	231	0.10	252 $\mu\text{mol/s}\cdot\text{m}^2$
02/03/91	Test Cell	6.7	43.5	1.5	222	0.00	263 $\mu\text{mol/s}\cdot\text{m}^2$
02/04/91	Test Cell	8.3	46.1	1.3	216	0.00	244 $\mu\text{mol/s}\cdot\text{m}^2$
02/05/91	Test Cell	7.1	89.8	1.4	183	0.00	77 $\mu\text{mol/s}\cdot\text{m}^2$
02/06/91	Test Cell	1.5	97.5	5.5	82	0.07	38 $\mu\text{mol/s}\cdot\text{m}^2$
02/07/91	Test Cell	1.6	86.6	3.6	72	0.01	68 $\mu\text{mol/s}\cdot\text{m}^2$
02/08/91	Test Cell	2.9	72.0	2.2	249	0.00	256 $\mu\text{mol/s}\cdot\text{m}^2$
02/09/91	Test Cell	1.3	81.9	2.4	266	0.00	45 $\mu\text{mol/s}\cdot\text{m}^2$
02/10/91	Test Cell	1.2	62.5	2.8	294	0.00	280 $\mu\text{mol/s}\cdot\text{m}^2$
02/11/91	Test Cell	-4.0	34.6	4.1	241	0.00	196 $\mu\text{mol/s}\cdot\text{m}^2$
02/12/91	Test Cell	-3.5	32.2	1.8	240	0.00	273 $\mu\text{mol/s}\cdot\text{m}^2$
02/13/91	Test Cell	-0.1	57.0	2.3	130	0.65	45 $\mu\text{mol/s}\cdot\text{m}^2$
02/14/91	Test Cell	-0.2	91.8	2.0	233	0.16	89 $\mu\text{mol/s}\cdot\text{m}^2$
02/15/91	Test Cell	-8.7	74.9	4.7	293	0.00	163 $\mu\text{mol/s}\cdot\text{m}^2$
02/16/91	Test Cell	-9.5	52.5	3.8	258	0.00	318 $\mu\text{mol/s}\cdot\text{m}^2$
02/17/91	Test Cell	-0.9	72.3	1.9	219	0.31	158 $\mu\text{mol/s}\cdot\text{m}^2$
02/18/91	Test Cell	2.0	85.9	3.1	140	0.25	71 $\mu\text{mol/s}\cdot\text{m}^2$
02/19/91	Test Cell	7.4	91.2	2.0	214	0.33	49 $\mu\text{mol/s}\cdot\text{m}^2$
02/20/91	Test Cell	1.4	70.3	2.3	260	0.08	147 $\mu\text{mol/s}\cdot\text{m}^2$
02/21/91	Test Cell	6.0	56.7	2.1	235	0.00	166 $\mu\text{mol/s}\cdot\text{m}^2$

Table F-1

(Continued)

Date	Location	Average Temperature (°C)	Relative Humidity (%)	Wind Speed (mph)	Wind Direction (deg. azimuth)	Precipitation (inches)	Solar Radiation
02/22/91	Test Cell	5.2	58.4	4.6	239	0.00	216 $\mu\text{mol/s}\cdot\text{m}^2$
02/23/91	Test Cell	-4.4	51.4	5.5	82	0.00	304 $\mu\text{mol/s}\cdot\text{m}^2$
02/24/91	Test Cell	2.1	44.2	1.8	226	0.00	287 $\mu\text{mol/s}\cdot\text{m}^2$
02/25/91	Test Cell	-1.7	57.6	2.2	304	0.00	113 $\mu\text{mol/s}\cdot\text{m}^2$
02/26/91	Test Cell	-4.0	63.1	2.2	269	0.05	101 $\mu\text{mol/s}\cdot\text{m}^2$
02/27/91	Test Cell	-4.1	69.0	2.7	246	0.04	202 $\mu\text{mol/s}\cdot\text{m}^2$
02/28/91	Test Cell	0.7	74.7	1.5	212	0.35	208 $\mu\text{mol/s}\cdot\text{m}^2$
03/01/91	Test Cell	10.5	41.5	2.4	174	0.04	204 $\mu\text{mol/s}\cdot\text{m}^2$
03/02/91	Test Cell	14.0	79.9	3.6	172	0.08	169 $\mu\text{mol/s}\cdot\text{m}^2$
03/03/91	Cleveland	0.1	94.2	10.7	0	0.31	0 min/day
03/04/91	Cleveland	-2.7	86.5	10.5	225	0.39	186 min/day
03/05/91	Cleveland	0.1	74.1	12.7	180	0.00	596 min/day
03/06/91	Cleveland	6.2	80.6	19.3	270	0.83	0 min/day
03/07/91	Cleveland	0.1	64.5	11.1	270	0.00	206 min/day
03/08/91	Cleveland	-0.4	59.1	8.7	315	0.00	554 min/day
03/09/91	Cleveland	3.5	72.1	11.2	225	0.07	218 min/day
03/10/91	Cleveland	0.7	88.1	7.5	45	0.08	49 min/day
03/11/91	Cleveland	-1.5	69.2	7.6	45	0.00	510 min/day
03/12/91	Cleveland	-3.8	68.2	7.9	45	0.00	541 min/day
03/13/91	Cleveland	0.7	67.2	10.8	45	0.00	0 min/day
03/14/91	Cleveland	1.8	76.5	12.4	45	0.00	700 min/day
03/15/91	Cleveland	2.3	74.5	6.4	0	0.00	713 min/day
03/16/91	Cleveland	0.7	61.0	6.0	0	0.00	693 min/day
03/17/91	Cleveland	6.8	50.2	7.7	180	0.14	327 min/day
03/18/91	Cleveland	6.8	91.5	12.1	315	0.30	1 min/day
03/19/91	Cleveland	7.3	65.1	11.1	270	0.06	374 min/day
03/20/91	Cleveland	6.2	67.4	6.2	45	0.00	626 min/day
03/21/91	Cleveland	15.7	58.2	14.3	225	0.00	65 min/day
03/22/91	Cleveland	11.8	85.2	8.2	180	0.33	73 min/day
03/23/91	Cleveland	15.1	62.0	18.4	225	0.15	324 min/day
03/24/91	Cleveland	6.8	74.5	13.6	270	0.21	38 min/day
03/25/91	Cleveland	7.9	67.2	8.0	315	0.00	630 min/day
03/26/91	Cleveland	9.0	76.0	11.5	180	0.02	0 min/day

Table F-1

(Continued)

Date	Location	Average Temperature (°C)	Relative Humidity (%)	Wind Speed (mph)	Wind Direction (deg. azimuth)	Precipitation (inches)	Solar Radiation
03/27/91	Cleveland	19.0	67.4	22.7	225	0.62	152 min/day
03/28/91	Cleveland	10.7	56.6	18.6	225	0.00	601 min/day
03/29/91	Cleveland	2.9	60.0	11.2	315	0.00	70 min/day
03/30/91	Cleveland	-1.0	54.0	10.1	0	0.00	580 min/day
03/31/91	Cleveland	2.9	60.2	9.3	225	0.07	558 min/day
04/01/91	Cleveland	4.4	76.1	8.9	315	0.03	131 min/day
04/02/91	Cleveland	1.1	59.4	6.5	12	0.00	656 min/day
04/03/91	Cleveland	3.9	60.7	6.4	135	0.00	733 min/day
04/04/91	Cleveland	12.2	38.0	8.4	225	0.01	308 min/day
04/05/91	Cleveland	15.0	81.7	9.8	315	0.18	356 min/day
04/06/91	Cleveland	18.3	58.4	11.3	225	0.00	665 min/day
04/07/91	Cleveland	20.0	56.0	11.0	225	0.00	716 min/day
04/08/91	Cleveland	20.6	68.0	11.5	180	0.14	104 min/day
04/09/91	Cleveland	18.3	79.7	15.5	270	0.11	370 min/day
04/10/91	Cleveland	7.2	66.2	13.8	225	0.02	3 min/day
04/11/91	Cleveland	2.8	62.4	6.9	0	0.00	620 min/day
04/12/91	Cleveland	6.1	54.9	9.6	90	0.00	685 min/day
04/13/91	Cleveland	10.0	74.1	8.1	180	0.29	0 min/day
04/14/91	Cleveland	11.1	88.5	9.5	180	0.12	39 min/day
04/15/91	Cleveland	14.4	72.2	16.1	225	0.14	327 min/day
04/16/91	Cleveland	13.3	59.0	8.4	270	0.04	230 min/day
04/17/91	Cleveland	9.4	72.0	6.9	45	0.45	628 min/day
04/18/91	Cleveland	6.1	72.6	7.6	45	0.00	538 min/day
04/19/91	Cleveland	9.4	86.2	7.0	90	1.16	0 min/day
04/20/91	Cleveland	7.2	96.7	8.6	0	0.60	0 min/day
04/21/91	Cleveland	4.4	97.0	5.7	0	0.50	0 min/day
04/22/91	Cleveland	9.4	74.1	9.2	270	0.02	308 min/day
04/23/91	Cleveland	10.0	60.0	8.6	225	0.29	234 min/day
04/24/91	Cleveland	8.9	78.5	7.6	45	0.08	169 min/day
04/25/91	Cleveland	10.6	70.0	6.2	45	0.00	467 min/day
04/26/91	Cleveland	15.6	60.0	7.2	135	0.00	69 min/day
04/27/91	Cleveland	18.3	65.0	4.6	180	0.00	517 min/day
04/28/91	Cleveland	19.4	79.0	5.6	0	0.04	164 min/day

Table F-1

(Continued)

Date	Location	Average Temperature (°C)	Relative Humidity (%)	Wind Speed (mph)	Wind Direction (deg. azimuth)	Precipitation (inches)	Solar Radiation	
04/29/91	Cleveland	19.4	74.5	12.0	180	0.00	91	min/day
04/30/91	Cleveland	20.0	48.9	16.9	225	0.00	727	min/day
05/01/91	Cleveland	16.1	71.5	12.2	225	0.02	400	min/day
05/02/91	Cleveland	12.2	53.9	10.8	315	0.00	667	min/day
05/03/91	Cleveland	8.9	67.5	8.2	315	0.00	782	min/day
05/04/91	Cleveland	11.1	64.4	8.5	45	0.00	643	min/day
05/05/91	Cleveland	16.7	69.0	8.0	135	0.99	438	min/day
05/06/91	Cleveland	12.8	74.0	13.2	225	0.00	6	min/day
05/07/91	Cleveland	12.2	55.5	12.5	225	0.00	653	min/day
05/08/91	Cleveland	11.7	67.4	5.8	45	0.00	640	min/day
05/09/91	Cleveland	16.7	68.2	7.0	315	0.00	350	min/day
05/10/91	Cleveland	15.6	72.1	6.7	45	0.00	859	min/day
05/11/91	Cleveland	18.9	57.4	5.8	315	0.00	847	min/day
05/12/91	Cleveland	23.9	63.6	7.6	0	0.00	719	min/day
05/13/91	Cleveland	23.9	71.6	7.4	315	0.44	581	min/day
05/14/91	Cleveland	23.9	66.9	7.1	315	0.00	747	min/day
05/15/91	Cleveland	22.8	58.9	7.2	0	0.00	795	min/day
05/16/91	Cleveland	25.6	53.2	10.9	225	0.00	636	min/day
05/17/91	Cleveland	20.0	81.1	11.4	45	0.02	406	min/day
05/18/91	Cleveland	12.2	73.7	13.0	45	0.00	151	min/day
05/19/91	Cleveland	15.0	70.2	8.1	45	0.00	754	min/day
05/20/91	Cleveland	15.6	70.0	6.6	45	0.00	726	min/day
05/21/91	Cleveland	19.4	71.6	6.3	315	0.00	698	min/day
05/22/91	Cleveland	22.8	61.2	5.3	45	0.00	870	min/day
05/23/91	Cleveland	24.4	53.9	6.1	45	0.00	650	min/day
05/24/91	Cleveland	24.4	76.5	9.2	225	0.55	289	min/day
05/25/91	Cleveland	25.0	80.0	7.9	225	0.01	290	min/day
05/26/91	Cleveland	24.4	84.5	9.5	225	0.56	67	min/day
05/27/91	Cleveland	23.9	85.2	8.7	225	0.08	160	min/day
05/28/91	Cleveland	25.6	76.7	6.6	225	0.00	628	min/day
05/29/91	Test Cell	28.0	69.6	0.8	272	0.00	509	μmol/s•m²
05/30/91	Test Cell	25.4	78.2	5.0	253	0.53	522	μmol/s•m²
05/31/91	Test Cell	24.2	75.5	7.3	276	0.44	633	μmol/s•m²

Table F-1

(Continued)

Date	Location	Average Temperature (°C)	Relative Humidity (%)	Wind Speed (mph)	Wind Direction (deg. azimuth)	Precipitation (inches)	Solar Radiation
06/01/91	Test Cell	21.6	81.8	4.5	160	0.07	619 $\mu\text{mol/s}\cdot\text{m}^2$
06/02/91	Test Cell	18.3	79.1	3.9	169	0.60	261 $\mu\text{mol/s}\cdot\text{m}^2$
06/03/91	Test Cell	20.0	80.0	7.1	142	0.01	681 $\mu\text{mol/s}\cdot\text{m}^2$
06/04/91	Test Cell	16.5	69.4	10.8	67	0.00	655 $\mu\text{mol/s}\cdot\text{m}^2$
06/05/91	Test Cell	16.7	68.1	9.4	152	0.00	687 $\mu\text{mol/s}\cdot\text{m}^2$
06/06/91	Test Cell	18.1	67.3	4.3	166	0.00	655 $\mu\text{mol/s}\cdot\text{m}^2$
06/07/91	Test Cell	17.9	63.9	5.5	182	0.00	574 $\mu\text{mol/s}\cdot\text{m}^2$
06/08/91	Test Cell	19.4	68.4	4.0	237	0.00	658 $\mu\text{mol/s}\cdot\text{m}^2$
06/09/91	Test Cell	22.1	64.2	3.8	222	0.00	650 $\mu\text{mol/s}\cdot\text{m}^2$
06/10/91	Test Cell	23.7	65.3	6.6	274	0.00	524 $\mu\text{mol/s}\cdot\text{m}^2$
06/11/91	Test Cell	22.1	71.7	4.5	259	0.28	321 $\mu\text{mol/s}\cdot\text{m}^2$
06/12/91	Test Cell	21.5	76.7	6.0	182	0.00	663 $\mu\text{mol/s}\cdot\text{m}^2$
06/13/91	Test Cell	16.9	66.9	10.9	136	0.00	685 $\mu\text{mol/s}\cdot\text{m}^2$
06/14/91	Test Cell	21.3	66.1	5.5	161	0.00	643 $\mu\text{mol/s}\cdot\text{m}^2$
06/15/91	Test Cell	27.2	70.4	9.0	249	0.39	579 $\mu\text{mol/s}\cdot\text{m}^2$
06/16/91	Test Cell	23.4	77.4	5.9	245	0.02	485 $\mu\text{mol/s}\cdot\text{m}^2$
06/17/91	Test Cell	21.9	73.2	8.7	101	0.00	633 $\mu\text{mol/s}\cdot\text{m}^2$
06/18/91	Test Cell	21.4	77.1	12.9	79	0.00	623 $\mu\text{mol/s}\cdot\text{m}^2$
06/19/91	Test Cell	22.8	78.7	4.0	141	0.00	541 $\mu\text{mol/s}\cdot\text{m}^2$
06/20/91	Test Cell	23.8	78.6	6.8	169	0.00	657 $\mu\text{mol/s}\cdot\text{m}^2$
06/21/91	Test Cell	24.1	71.1	8.3	166	0.00	601 $\mu\text{mol/s}\cdot\text{m}^2$
06/22/91	Test Cell	20.3	72.9	16.5	90	0.00	526 $\mu\text{mol/s}\cdot\text{m}^2$
06/23/91	Test Cell	18.6	64.0	20.7	81	0.00	555 $\mu\text{mol/s}\cdot\text{m}^2$
06/24/91	Test Cell	19.4	61.9	7.0	139	0.00	586 $\mu\text{mol/s}\cdot\text{m}^2$
06/25/91	Test Cell	21.3	61.2	5.8	161	0.00	370 $\mu\text{mol/s}\cdot\text{m}^2$
06/26/91	Test Cell	24.6	60.7	8.0	209	0.00	529 $\mu\text{mol/s}\cdot\text{m}^2$
06/27/91	Test Cell	25.2	59.6	3.4	276	0.00	611 $\mu\text{mol/s}\cdot\text{m}^2$
06/28/91	Test Cell	26.0	62.0	5.3	265	0.00	457 $\mu\text{mol/s}\cdot\text{m}^2$
06/29/91	Test Cell	26.6	62.3	7.3	258	0.00	487 $\mu\text{mol/s}\cdot\text{m}^2$
06/30/91	Test Cell	24.0	63.3	5.0	165	0.33	469 $\mu\text{mol/s}\cdot\text{m}^2$
07/01/91	Test Cell	21.3	61.7	7.5	115	0.00	486 $\mu\text{mol/s}\cdot\text{m}^2$
07/02/91	Test Cell	23.4	68.2	5.8	279	0.02	525 $\mu\text{mol/s}\cdot\text{m}^2$
07/03/91	Test Cell	25.6	62.7	6.2	209	0.00	602 $\mu\text{mol/s}\cdot\text{m}^2$

Table F-1

(Continued)

Date	Location	Average Temperature (°C)	Relative Humidity (%)	Wind Speed (mph)	Wind Direction (deg. azimuth)	Precipitation (inches)	Solar Radiation
07/04/91	Test Cell	23.8	68.5	4.3	246	0.13	415 $\mu\text{mol/s}\cdot\text{m}^2$
07/05/91	Test Cell	25.0	62.3	8.0	259	0.00	482 $\mu\text{mol/s}\cdot\text{m}^2$
07/06/91	Test Cell	27.0	61.8	8.8	241	0.00	430 $\mu\text{mol/s}\cdot\text{m}^2$
07/07/91	Test Cell	29.3	61.7	12.3	273	0.22	596 $\mu\text{mol/s}\cdot\text{m}^2$
07/08/91	Test Cell	24.3	63.1	3.9	194	0.00	555 $\mu\text{mol/s}\cdot\text{m}^2$
07/09/91	Test Cell	20.9	60.7	13.4	110	0.00	470 $\mu\text{mol/s}\cdot\text{m}^2$
07/10/91	Test Cell	20.8	62.1	3.6	158	0.00	539 $\mu\text{mol/s}\cdot\text{m}^2$
07/11/91	Test Cell	21.9	59.9	4.1	183	0.00	616 $\mu\text{mol/s}\cdot\text{m}^2$
07/12/91	Test Cell	20.2	61.7	3.9	140	0.15	134 $\mu\text{mol/s}\cdot\text{m}^2$
07/13/91	Test Cell	21.7	67.8	4.3	193	0.33	246 $\mu\text{mol/s}\cdot\text{m}^2$
07/14/91	Test Cell	21.6	62.2	4.4	114	0.01	638 $\mu\text{mol/s}\cdot\text{m}^2$
07/15/91	Test Cell	20.3	59.6	7.4	155	0.00	645 $\mu\text{mol/s}\cdot\text{m}^2$
07/16/91	Test Cell	22.4	58.5	4.1	175	0.00	616 $\mu\text{mol/s}\cdot\text{m}^2$
07/17/91	Test Cell	24.7	58.6	5.9	264	0.00	610 $\mu\text{mol/s}\cdot\text{m}^2$
07/18/91	Test Cell	26.6	60.2	5.3	241	0.00	532 $\mu\text{mol/s}\cdot\text{m}^2$
07/19/91	Test Cell	27.4	60.2	5.6	247	0.00	537 $\mu\text{mol/s}\cdot\text{m}^2$
07/20/91	Test Cell	27.8	63.0	5.0	232	0.13	466 $\mu\text{mol/s}\cdot\text{m}^2$
07/21/91	Test Cell	27.1	64.5	5.1	231	0.84	434 $\mu\text{mol/s}\cdot\text{m}^2$
07/22/91	Test Cell	26.9	81.7	3.0	243	0.01	387 $\mu\text{mol/s}\cdot\text{m}^2$
07/23/91	Test Cell	26.4	70.2	6.9	259	0.38	382 $\mu\text{mol/s}\cdot\text{m}^2$
07/24/91	Test Cell	22.9	57.2	6.9	275	0.00	611 $\mu\text{mol/s}\cdot\text{m}^2$
07/25/91	Test Cell	22.6	56.7	9.7	196	0.00	594 $\mu\text{mol/s}\cdot\text{m}^2$
07/26/91	Test Cell	21.1	55.7	10.8	96	0.00	421 $\mu\text{mol/s}\cdot\text{m}^2$
07/27/91	Test Cell	18.4	56.0	5.1	156	0.00	604 $\mu\text{mol/s}\cdot\text{m}^2$
07/28/91	Test Cell	20.1	55.2	5.9	133	0.00	542 $\mu\text{mol/s}\cdot\text{m}^2$
07/29/91	Test Cell	22.2	57.1	3.9	158	0.02	308 $\mu\text{mol/s}\cdot\text{m}^2$
07/30/91	Test Cell	21.3	58.7	6.5	265	0.00	474 $\mu\text{mol/s}\cdot\text{m}^2$
07/31/91	Test Cell	21.8	56.1	3.8	238	0.00	581 $\mu\text{mol/s}\cdot\text{m}^2$
08/01/91	Test Cell	25.0	54.4	5.1	266	0.00	604 $\mu\text{mol/s}\cdot\text{m}^2$
08/02/91	Test Cell	25.4	53.3	6.2	166	0.00	541 $\mu\text{mol/s}\cdot\text{m}^2$
08/03/91	Test Cell	24.5	57.1	10.0	212	0.01	267 $\mu\text{mol/s}\cdot\text{m}^2$
08/04/91	Test Cell	21.8	60.0	6.9	169	0.83	553 $\mu\text{mol/s}\cdot\text{m}^2$
08/05/91	Test Cell	19.5	56.1	8.2	141	0.00	492 $\mu\text{mol/s}\cdot\text{m}^2$

Table F-1

(Continued)

Date	Location	Average Temperature (°C)	Relative Humidity (%)	Wind Speed (mph)	Wind Direction (deg. azimuth)	Precipitation (inches)	Solar Radiation
08/06/91	Test Cell	18.7	55.3	3.7	166	0.01	469 $\mu\text{mol/s}\cdot\text{m}^2$
08/07/91	Test Cell	19.8	55.7	6.2	158	0.00	572 $\mu\text{mol/s}\cdot\text{m}^2$
08/08/91	Test Cell	18.9	61.2	4.9	149	0.48	125 $\mu\text{mol/s}\cdot\text{m}^2$
08/09/91	Test Cell	19.9	65.2	5.0	154	0.20	320 $\mu\text{mol/s}\cdot\text{m}^2$
08/10/91	Test Cell	20.6	58.5	7.7	208	0.00	572 $\mu\text{mol/s}\cdot\text{m}^2$
08/11/91	Test Cell	21.4	55.9	10.8	270	0.00	595 $\mu\text{mol/s}\cdot\text{m}^2$
08/12/91	Test Cell	21.0	57.5	5.9	173	0.00	584 $\mu\text{mol/s}\cdot\text{m}^2$
08/13/91	Test Cell	21.1	60.4	6.1	184	0.00	472 $\mu\text{mol/s}\cdot\text{m}^2$
08/14/91	Test Cell	21.5	56.2	4.3	239	0.00	449 $\mu\text{mol/s}\cdot\text{m}^2$
08/15/91	Test Cell	23.3	54.9	6.6	252	0.00	456 $\mu\text{mol/s}\cdot\text{m}^2$
08/16/91	Test Cell	25.4	53.1	5.7	259	0.00	476 $\mu\text{mol/s}\cdot\text{m}^2$
08/17/91	Test Cell	23.3	55.5	8.7	225	0.16	271 $\mu\text{mol/s}\cdot\text{m}^2$
08/18/91	Test Cell	21.0	62.6	6.1	151	0.01	553 $\mu\text{mol/s}\cdot\text{m}^2$
08/19/91	Test Cell	19.9	59.9	9.7	158	0.01	273 $\mu\text{mol/s}\cdot\text{m}^2$
08/20/91	Test Cell	17.4	64.4	4.8	124	3.13	115 $\mu\text{mol/s}\cdot\text{m}^2$
08/21/91	Test Cell	19.9	57.1	8.9	282	0.00	508 $\mu\text{mol/s}\cdot\text{m}^2$
08/22/91	Test Cell	22.7	56.6	5.3	248	0.12	460 $\mu\text{mol/s}\cdot\text{m}^2$
08/23/91	Test Cell	21.6	59.3	0.0	113	0.00	559 $\mu\text{mol/s}\cdot\text{m}^2$
08/24/91	Test Cell	20.4	60.0	0.5	133	0.00	545 $\mu\text{mol/s}\cdot\text{m}^2$
08/25/91	Test Cell	22.6	59.1	0.8	130	0.00	489 $\mu\text{mol/s}\cdot\text{m}^2$
08/26/91	Test Cell	20.7	59.5	2.2	228	0.00	139 $\mu\text{mol/s}\cdot\text{m}^2$
08/27/91	Test Cell	27.1	71.3	1.4	140	0.00	581 $\mu\text{mol/s}\cdot\text{m}^2$
08/28/91	Test Cell	28.5	68.6	1.1	151	0.00	726 $\mu\text{mol/s}\cdot\text{m}^2$
08/29/91	Test Cell	25.8	73.4	1.2	164	0.00	477 $\mu\text{mol/s}\cdot\text{m}^2$
08/30/91	Test Cell	26.1	73.0	0.6	197	0.00	324 $\mu\text{mol/s}\cdot\text{m}^2$
08/31/91	Test Cell	22.7	79.2	2.9	127	0.00	467 $\mu\text{mol/s}\cdot\text{m}^2$
09/01/91	Test Cell	18.2	87.3	4.9	97	0.00	541 $\mu\text{mol/s}\cdot\text{m}^2$
09/02/91	Test Cell	18.0	87.6	1.7	126	0.00	504 $\mu\text{mol/s}\cdot\text{m}^2$
09/03/91	Test Cell	22.2	80.0	1.4	189	0.42	362 $\mu\text{mol/s}\cdot\text{m}^2$
09/04/91	Test Cell	20.0	84.0	1.4	164	0.45	393 $\mu\text{mol/s}\cdot\text{m}^2$
09/05/91	Test Cell	17.8	88.0	0.9	178	0.00	488 $\mu\text{mol/s}\cdot\text{m}^2$
09/06/91	Test Cell	19.0	85.8	0.8	188	0.00	502 $\mu\text{mol/s}\cdot\text{m}^2$
09/07/91	Test Cell	20.4	83.2	0.6	177	0.00	482 $\mu\text{mol/s}\cdot\text{m}^2$

Table F-1
(Continued)

Date	Location	Average Temperature (°C)	Relative Humidity (%)	Wind Speed (mph)	Wind Direction (deg. azimuth)	Precipitation (inches)	Solar Radiation
09/08/91	Test Cell	23.0	78.6	0.3	128	0.00	486 $\mu\text{mol/s}\cdot\text{m}^2$
09/09/91	Test Cell	23.0	78.5	1.0	179	0.08	248 $\mu\text{mol/s}\cdot\text{m}^2$
09/10/91	Test Cell	24.1	76.6	1.9	265	0.02	247 $\mu\text{mol/s}\cdot\text{m}^2$
09/11/91	Test Cell	19.5	84.8	1.4	139	0.00	382 $\mu\text{mol/s}\cdot\text{m}^2$
09/12/91	Test Cell	18.9	85.9	0.8	188	0.00	220 $\mu\text{mol/s}\cdot\text{m}^2$
09/13/91	Test Cell	21.8	80.8	0.8	136	0.00	353 $\mu\text{mol/s}\cdot\text{m}^2$
09/14/91	Test Cell	22.7	79.2	1.2	183	0.00	314 $\mu\text{mol/s}\cdot\text{m}^2$
09/15/91	Test Cell	27.5	70.5	1.4	252	0.00	367 $\mu\text{mol/s}\cdot\text{m}^2$
09/16/91	Test Cell	27.3	70.8	1.9	245	0.45	353 $\mu\text{mol/s}\cdot\text{m}^2$
09/17/91	Test Cell	19.9	84.1	1.2	240	0.01	439 $\mu\text{mol/s}\cdot\text{m}^2$
09/18/91	Test Cell	18.2	86.0	1.9	218	0.00	152 $\mu\text{mol/s}\cdot\text{m}^2$
09/19/91	Test Cell	13.9	84.9	1.7	228	0.00	315 $\mu\text{mol/s}\cdot\text{m}^2$
09/20/91	Test Cell	10.9	90.4	1.5	157	1.15	157 $\mu\text{mol/s}\cdot\text{m}^2$
09/21/91	Test Cell	11.7	88.9	1.0	191	0.00	361 $\mu\text{mol/s}\cdot\text{m}^2$
09/22/91	Test Cell	14.3	84.3	1.5	192	0.05	334 $\mu\text{mol/s}\cdot\text{m}^2$
09/23/91	Test Cell	15.1	82.8	2.6	239	0.38	446 $\mu\text{mol/s}\cdot\text{m}^2$
09/24/91	Test Cell	12.0	88.5	1.2	183	0.15	248 $\mu\text{mol/s}\cdot\text{m}^2$
09/25/91	Test Cell	13.9	85.0	0.6	259	0.15	371 $\mu\text{mol/s}\cdot\text{m}^2$
09/26/91	Test Cell	11.5	89.4	2.9	276	0.09	233 $\mu\text{mol/s}\cdot\text{m}^2$
09/27/91	Test Cell	8.9	94.0	1.6	234	0.00	391 $\mu\text{mol/s}\cdot\text{m}^2$
09/28/91	Test Cell	8.5	85.1	1.2	185	0.00	433 $\mu\text{mol/s}\cdot\text{m}^2$
09/29/91	Test Cell	11.9	78.6	1.8	156	0.00	419 $\mu\text{mol/s}\cdot\text{m}^2$
09/30/91	Test Cell	15.9	71.3	1.5	188	0.00	294 $\mu\text{mol/s}\cdot\text{m}^2$
10/01/91	Test Cell	19.0	65.8	1.0	223	0.00	282 $\mu\text{mol/s}\cdot\text{m}^2$
10/02/91	Test Cell	20.5	63.0	2.2	273	0.00	325 $\mu\text{mol/s}\cdot\text{m}^2$
10/03/91	Test Cell	17.3	68.9	0.7	202	0.03	258 $\mu\text{mol/s}\cdot\text{m}^2$
10/04/91	Test Cell	18.8	66.2	1.3	153	0.99	230 $\mu\text{mol/s}\cdot\text{m}^2$
10/05/91	Test Cell	15.6	71.9	3.2	208	0.23	80 $\mu\text{mol/s}\cdot\text{m}^2$
10/06/91	Test Cell	7.0	87.4	2.5	240	0.01	239 $\mu\text{mol/s}\cdot\text{m}^2$
10/07/91	Test Cell	7.5	76.5	1.8	265	0.00	343 $\mu\text{mol/s}\cdot\text{m}^2$
10/08/91	Test Cell	10.9	64.6	2.1	221	0.00	373 $\mu\text{mol/s}\cdot\text{m}^2$
10/09/91	Test Cell	16.7	47.8	1.9	225	0.00	288 $\mu\text{mol/s}\cdot\text{m}^2$
10/10/91	Test Cell	12.8	59.0	1.1	214	0.19	236 $\mu\text{mol/s}\cdot\text{m}^2$

Table F-1
(Continued)

Date	Location	Average Temperature (°C)	Relative Humidity (%)	Wind Speed (mph)	Wind Direction (deg. azimuth)	Precipitation (inches)	Solar Radiation
10/11/91	Test Cell	9.4	68.8	0.7	236	0.02	85 $\mu\text{mol/s}\cdot\text{m}^2$
10/12/91	Test Cell	7.7	73.9	0.6	201	0.80	66 $\mu\text{mol/s}\cdot\text{m}^2$
10/13/91	Test Cell	8.2	72.4	1.2	127	0.05	150 $\mu\text{mol/s}\cdot\text{m}^2$
10/14/91	Test Cell	9.9	67.5	2.5	173	0.20	181 $\mu\text{mol/s}\cdot\text{m}^2$
10/15/91	Test Cell	8.4	71.9	1.8	266	0.01	237 $\mu\text{mol/s}\cdot\text{m}^2$
10/16/91	Test Cell	7.0	76.0	1.5	184	0.00	346 $\mu\text{mol/s}\cdot\text{m}^2$
10/17/91	Test Cell	9.8	73.8	0.8	230	0.00	349 $\mu\text{mol/s}\cdot\text{m}^2$
10/18/91	Test Cell	12.1	68.7	1.4	204	0.00	315 $\mu\text{mol/s}\cdot\text{m}^2$
10/19/91	Test Cell	7.6	83.5	2.6	159	0.18	68 $\mu\text{mol/s}\cdot\text{m}^2$
10/20/91	Test Cell	6.5	86.8	0.6	237	0.00	326 $\mu\text{mol/s}\cdot\text{m}^2$
10/21/91	Test Cell	8.6	79.9	1.0	205	0.00	314 $\mu\text{mol/s}\cdot\text{m}^2$
10/22/91	Test Cell	13.4	64.5	0.9	204	0.00	237 $\mu\text{mol/s}\cdot\text{m}^2$
10/23/91	Test Cell	18.5	48.2	1.2	178	0.00	253 $\mu\text{mol/s}\cdot\text{m}^2$
10/24/91	Test Cell	20.5	41.4	1.8	201	0.00	252 $\mu\text{mol/s}\cdot\text{m}^2$
10/25/91	Test Cell	18.8	47.0	1.4	198	1.21	74 $\mu\text{mol/s}\cdot\text{m}^2$
10/26/91	Test Cell	19.1	46.1	1.1	183	0.03	177 $\mu\text{mol/s}\cdot\text{m}^2$
10/27/91	Test Cell	15.2	58.5	2.8	147	0.32	42 $\mu\text{mol/s}\cdot\text{m}^2$
10/28/91	Test Cell	12.1	68.9	7.1	86	0.00	254 $\mu\text{mol/s}\cdot\text{m}^2$
10/29/91	Test Cell	14.6	60.5	4.8	149	0.00	190 $\mu\text{mol/s}\cdot\text{m}^2$
10/30/91	Test Cell	14.7	60.3	2.5	127	0.00	142 $\mu\text{mol/s}\cdot\text{m}^2$
10/31/91	Test Cell	11.7	70.1	4.4	71	0.00	118 $\mu\text{mol/s}\cdot\text{m}^2$
11/01/91	Test Cell	12.1	68.8	3.1	150	0.08	138 $\mu\text{mol/s}\cdot\text{m}^2$
11/02/91	Test Cell	3.2	81.4	4.8	262	0.00	84 $\mu\text{mol/s}\cdot\text{m}^2$
11/03/91	Test Cell	-2.3	89.8	4.2	263	0.00	246 $\mu\text{mol/s}\cdot\text{m}^2$
11/04/91	Test Cell	-4.6	72.9	2.7	248	0.00	177 $\mu\text{mol/s}\cdot\text{m}^2$
11/05/91	Test Cell	-3.7	66.7	1.4	220	0.00	242 $\mu\text{mol/s}\cdot\text{m}^2$
11/06/91	Test Cell	3.1	61.0	3.1	236	0.00	71 $\mu\text{mol/s}\cdot\text{m}^2$
11/07/91	Test Cell	-1.2	87.0	2.4	166	0.00	36 $\mu\text{mol/s}\cdot\text{m}^2$
11/08/91	Test Cell	-2.0	89.0	1.7	193	0.14	170 $\mu\text{mol/s}\cdot\text{m}^2$
11/09/91	Test Cell	-1.1	86.6	0.8	232	0.04	52 $\mu\text{mol/s}\cdot\text{m}^2$
11/10/91	Test Cell	0.7	82.3	3.8	136	0.00	234 $\mu\text{mol/s}\cdot\text{m}^2$
11/11/91	Test Cell	4.8	72.0	4.0	98	0.04	144 $\mu\text{mol/s}\cdot\text{m}^2$
11/12/91	Test Cell	1.5	80.3	1.2	247	0.24	43 $\mu\text{mol/s}\cdot\text{m}^2$

Table F-1

(Continued)

Date	Location	Average Temperature (°C)	Relative Humidity (%)	Wind Speed (mph)	Wind Direction (deg. azimuth)	Precipitation (inches)	Solar Radiation
11/13/91	Test Cell	4.0	73.8	2.5	246	0.01	99 $\mu\text{mol/s}\cdot\text{m}^2$
11/14/91	Test Cell	8.4	62.9	1.4	194	0.00	160 $\mu\text{mol/s}\cdot\text{m}^2$
11/15/91	Test Cell	10.8	56.7	1.7	225	0.61	49 $\mu\text{mol/s}\cdot\text{m}^2$
11/16/91	Test Cell	6.4	68.0	4.1	92	0.15	122 $\mu\text{mol/s}\cdot\text{m}^2$
11/17/91	Test Cell	2.9	76.8	1.9	158	0.00	215 $\mu\text{mol/s}\cdot\text{m}^2$
11/18/91	Test Cell	9.5	60.1	2.4	149	0.37	61 $\mu\text{mol/s}\cdot\text{m}^2$
11/19/91	Test Cell	15.3	42.9	4.8	210	0.00	82 $\mu\text{mol/s}\cdot\text{m}^2$
11/20/91	Test Cell	14.7	42.0	5.7	150	0.30	47 $\mu\text{mol/s}\cdot\text{m}^2$
11/21/91	Test Cell	7.7	54.6	9.6	136	0.03	33 $\mu\text{mol/s}\cdot\text{m}^2$
11/22/91	Test Cell	7.5	55.1	10.8	118	0.00	46 $\mu\text{mol/s}\cdot\text{m}^2$
11/23/91	Test Cell	8.1	53.9	3.9	173	0.14	123 $\mu\text{mol/s}\cdot\text{m}^2$
11/24/91	Test Cell	-3.2	74.2	0.6	259	0.00	36 $\mu\text{mol/s}\cdot\text{m}^2$
11/25/91	Test Cell	-3.5	74.8	0.1	264	0.02	151 $\mu\text{mol/s}\cdot\text{m}^2$
11/26/91	Test Cell	-3.5	74.8	0.0	231	0.00	176 $\mu\text{mol/s}\cdot\text{m}^2$
11/27/91	Test Cell	2.0	64.9	0.9	198	0.01	63 $\mu\text{mol/s}\cdot\text{m}^2$
11/28/91	Test Cell	6.4	56.9	5.5	189	0.15	29 $\mu\text{mol/s}\cdot\text{m}^2$
11/29/91	Test Cell	13.5	44.2	0.8	200	0.01	60 $\mu\text{mol/s}\cdot\text{m}^2$
11/30/91	Test Cell	13.4	44.4	2.4	243	0.05	104 $\mu\text{mol/s}\cdot\text{m}^2$
12/01/91	Test Cell	3.6	62.0	5.2	271	0.00	57 $\mu\text{mol/s}\cdot\text{m}^2$
12/02/91	Test Cell	2.6	63.8	1.9	117	0.81	71 $\mu\text{mol/s}\cdot\text{m}^2$
12/03/91	Test Cell	2.5	64.0	4.7	237	0.15	27 $\mu\text{mol/s}\cdot\text{m}^2$
12/04/91	Test Cell	-7.7	82.4	0.2	266	0.00	120 $\mu\text{mol/s}\cdot\text{m}^2$
12/05/91	Test Cell	-7.3	81.7	0.0	232	0.01	74 $\mu\text{mol/s}\cdot\text{m}^2$
12/06/91	Test Cell	-1.1	70.6	0.0	241	0.04	126 $\mu\text{mol/s}\cdot\text{m}^2$
12/07/91	Test Cell	8.7	52.9	1.0	234	0.00	119 $\mu\text{mol/s}\cdot\text{m}^2$
12/08/91	Test Cell	13.0	45.0	2.2	218	0.03	62 $\mu\text{mol/s}\cdot\text{m}^2$
12/09/91	Test Cell	6.8	56.2	1.9	143	0.00	55 $\mu\text{mol/s}\cdot\text{m}^2$
12/10/91	Test Cell	2.4	64.3	4.2	237	0.00	152 $\mu\text{mol/s}\cdot\text{m}^2$
12/11/91	Test Cell	4.9	59.7	1.9	243	0.00	77 $\mu\text{mol/s}\cdot\text{m}^2$
12/12/91	Test Cell	7.4	55.3	6.4	168	0.11	37 $\mu\text{mol/s}\cdot\text{m}^2$
12/13/91	Test Cell	9.6	51.1	4.8	196	0.05	31 $\mu\text{mol/s}\cdot\text{m}^2$
12/14/91	Test Cell	2.8	63.4	5.6	266	0.07	53 $\mu\text{mol/s}\cdot\text{m}^2$
12/15/91	Test Cell	-3.3	74.3	0.2	268	0.00	97 $\mu\text{mol/s}\cdot\text{m}^2$

Table F-1

(Continued)

Date	Location	Average Temperature (°C)	Relative Humidity (%)	Wind Speed (mph)	Wind Direction (deg. azimuth)	Precipitation (inches)	Solar Radiation
12/16/91	Test Cell	-7.1	81.3	0.8	252	0.00	104 $\mu\text{mol/s}\cdot\text{m}^2$
12/17/91	Test Cell	0.5	67.5	2.6	233	0.05	111 $\mu\text{mol/s}\cdot\text{m}^2$
12/18/91	Test Cell	-3.9	75.5	0.0	183	0.00	54 $\mu\text{mol/s}\cdot\text{m}^2$
12/19/91	Test Cell	-4.6	76.9	0.0	184	0.01	130 $\mu\text{mol/s}\cdot\text{m}^2$
12/20/91	Test Cell	-1.7	71.5	0.1	194	0.08	106 $\mu\text{mol/s}\cdot\text{m}^2$
12/21/91	Test Cell	2.1	64.7	3.5	270	0.23	172 $\mu\text{mol/s}\cdot\text{m}^2$
12/22/91	Test Cell	0.7	67.1	2.6	238	0.00	177 $\mu\text{mol/s}\cdot\text{m}^2$
12/23/91	Test Cell	3.1	63.0	6.7	188	0.08	43 $\mu\text{mol/s}\cdot\text{m}^2$
12/24/91	Test Cell	0.4	67.8	0.8	225	0.00	173 $\mu\text{mol/s}\cdot\text{m}^2$
12/25/91	Test Cell	-0.2	68.9	4.2	217	0.00	141 $\mu\text{mol/s}\cdot\text{m}^2$
12/26/91	Test Cell	-0.6	69.6	3.6	226	0.00	121 $\mu\text{mol/s}\cdot\text{m}^2$
12/27/91	Test Cell	2.0	64.9	4.1	163	0.00	83 $\mu\text{mol/s}\cdot\text{m}^2$
12/28/91	Test Cell	0.2	68.2	5.3	120	0.09	74 $\mu\text{mol/s}\cdot\text{m}^2$
12/29/91	Test Cell	1.0	66.8	16.9	252	0.15	20 $\mu\text{mol/s}\cdot\text{m}^2$
12/30/91	Test Cell	0.2	68.1	9.6	95	0.22	30 $\mu\text{mol/s}\cdot\text{m}^2$
12/31/91	Test Cell	-2.0	72.0	2.8	121	0.00	88 $\mu\text{mol/s}\cdot\text{m}^2$
01/01/92	Test Cell	0.0	68.4	3.0	76	0.00	47 $\mu\text{mol/s}\cdot\text{m}^2$
01/02/92	Test Cell	4.5	60.4	2.9	137	0.00	105 $\mu\text{mol/s}\cdot\text{m}^2$
01/03/92	Test Cell	8.1	54.0	4.6	157	0.06	137 $\mu\text{mol/s}\cdot\text{m}^2$
01/04/92	Test Cell	4.1	61.2	16.5	120	0.05	23 $\mu\text{mol/s}\cdot\text{m}^2$
01/05/92	Test Cell	2.4	64.1	7.0	69	0.00	29 $\mu\text{mol/s}\cdot\text{m}^2$
01/06/92	Test Cell	1.5	65.8	2.3	259	0.00	32 $\mu\text{mol/s}\cdot\text{m}^2$
01/07/92	Test Cell	1.8	65.3	2.8	260	0.00	41 $\mu\text{mol/s}\cdot\text{m}^2$
01/08/92	Test Cell	1.1	66.6	4.1	177	0.00	124 $\mu\text{mol/s}\cdot\text{m}^2$
01/09/92	Test Cell	5.5	58.7	7.1	235	0.09	38 $\mu\text{mol/s}\cdot\text{m}^2$
01/10/92	Test Cell	1.7	65.5	6.8	294	0.09	53 $\mu\text{mol/s}\cdot\text{m}^2$
01/11/92	Test Cell	-0.5	69.5	2.3	238	0.00	48 $\mu\text{mol/s}\cdot\text{m}^2$
01/12/92	Test Cell	2.6	63.8	2.9	210	0.09	121 $\mu\text{mol/s}\cdot\text{m}^2$
01/13/92	Test Cell	5.1	59.3	10.9	196	0.29	36 $\mu\text{mol/s}\cdot\text{m}^2$
01/14/92	Test Cell	-2.6	73.3	10.9	225	1.38	64 $\mu\text{mol/s}\cdot\text{m}^2$
01/15/92	Test Cell	-7.3	81.7	0.5	246	0.00	141 $\mu\text{mol/s}\cdot\text{m}^2$
01/16/92	Test Cell	-13.7	93.1	0.0	249	0.00	55 $\mu\text{mol/s}\cdot\text{m}^2$
01/17/92	Test Cell	-4.4	76.5	0.3	267	0.03	75 $\mu\text{mol/s}\cdot\text{m}^2$

Table F-1

(Continued)

Date	Location	Average Temperature (°C)	Relative Humidity (%)	Wind Speed (mph)	Wind Direction (deg. azimuth)	Precipitation (inches)	Solar Radiation
01/18/92	Test Cell	-10.4	87.3	0.0	279	0.00	129 $\mu\text{mol/s}\cdot\text{m}^2$
01/19/92	Test Cell	-12.3	90.7	0.0	233	0.00	188 $\mu\text{mol/s}\cdot\text{m}^2$
01/20/92	Test Cell	-6.5	80.1	1.8	253	0.00	148 $\mu\text{mol/s}\cdot\text{m}^2$
01/21/92	Test Cell	-1.2	70.7	3.6	217	0.32	152 $\mu\text{mol/s}\cdot\text{m}^2$
01/22/92	Test Cell	-0.3	69.1	3.7	155	0.02	122 $\mu\text{mol/s}\cdot\text{m}^2$
01/23/92	Test Cell	3.8	61.6	5.1	211	0.30	33 $\mu\text{mol/s}\cdot\text{m}^2$
01/24/92	Test Cell	-4.9	77.4	0.1	259	0.00	94 $\mu\text{mol/s}\cdot\text{m}^2$
01/25/92	Test Cell	-7.4	81.9	1.2	166	0.00	99 $\mu\text{mol/s}\cdot\text{m}^2$
01/26/92	Test Cell	-5.0	77.5	0.8	231	0.11	200 $\mu\text{mol/s}\cdot\text{m}^2$
01/27/92	Test Cell	-2.3	72.7	2.3	205	0.00	216 $\mu\text{mol/s}\cdot\text{m}^2$
01/28/92	Test Cell	-0.7	69.8	2.2	129	0.00	128 $\mu\text{mol/s}\cdot\text{m}^2$
01/29/92	Test Cell	-0.5	69.4	2.7	245	0.00	100 $\mu\text{mol/s}\cdot\text{m}^2$
01/30/92	Test Cell	1.3	66.1	1.5	252	0.00	138 $\mu\text{mol/s}\cdot\text{m}^2$
01/31/92	Test Cell	0.1	68.3	5.6	242	0.00	50 $\mu\text{mol/s}\cdot\text{m}^2$
02/01/92	Test Cell	-4.4	76.4	0.5	134	0.00	61 $\mu\text{mol/s}\cdot\text{m}^2$
02/02/92	Test Cell	-2.6	73.2	0.6	240	0.10	249 $\mu\text{mol/s}\cdot\text{m}^2$
02/03/92	Test Cell	-0.7	69.8	3.8	153	0.00	220 $\mu\text{mol/s}\cdot\text{m}^2$
02/04/92	Test Cell	1.9	65.1	3.5	224	0.00	90 $\mu\text{mol/s}\cdot\text{m}^2$
02/05/92	Test Cell	-3.4	74.6	0.1	104	0.00	290 $\mu\text{mol/s}\cdot\text{m}^2$
02/06/92	Test Cell	-0.7	69.8	1.5	198	0.00	264 $\mu\text{mol/s}\cdot\text{m}^2$
02/07/92	Test Cell	0.0	68.5	2.0	274	0.01	95 $\mu\text{mol/s}\cdot\text{m}^2$
02/08/92	Test Cell	-4.4	76.5	2.5	167	0.00	100 $\mu\text{mol/s}\cdot\text{m}^2$
02/09/92	Test Cell	-8.5	83.9	0.0	237	0.00	211 $\mu\text{mol/s}\cdot\text{m}^2$
02/10/92	Test Cell	-4.5	76.7	0.0	170	0.07	233 $\mu\text{mol/s}\cdot\text{m}^2$
02/11/92	Test Cell	-0.6	69.7	1.8	168	0.00	49 $\mu\text{mol/s}\cdot\text{m}^2$
02/12/92	Test Cell	-7.7	82.2	0.0	104	0.03	269 $\mu\text{mol/s}\cdot\text{m}^2$
02/13/92	Test Cell	-1.7	71.6	5.1	197	0.06	56 $\mu\text{mol/s}\cdot\text{m}^2$
02/14/92	Test Cell	0.9	67.0	5.1	204	0.05	89 $\mu\text{mol/s}\cdot\text{m}^2$
02/15/92	Test Cell	6.7	56.4	10.6	174	0.77	78 $\mu\text{mol/s}\cdot\text{m}^2$
02/16/92	Test Cell	2.0	65.0	5.1	288	0.09	163 $\mu\text{mol/s}\cdot\text{m}^2$
02/17/92	Test Cell	2.1	64.7	2.2	152	0.00	162 $\mu\text{mol/s}\cdot\text{m}^2$
02/18/92	Test Cell	6.1	57.4	6.8	169	0.43	106 $\mu\text{mol/s}\cdot\text{m}^2$
02/19/92	Test Cell	5.5	58.5	10.6	258	0.42	58 $\mu\text{mol/s}\cdot\text{m}^2$

Table F-1

(Continued)

Date	Location	Average Temperature (°C)	Relative Humidity (%)	Wind Speed (mph)	Wind Direction (deg. azimuth)	Precipitation (inches)	Solar Radiation
02/20/92	Test Cell	1.9	65.0	7.5	248	0.09	74 $\mu\text{mol/s}\cdot\text{m}^2$
02/21/92	Test Cell	2.1	64.8	2.4	165	0.01	280 $\mu\text{mol/s}\cdot\text{m}^2$
02/22/92	Test Cell	5.7	58.2	2.8	158	0.03	136 $\mu\text{mol/s}\cdot\text{m}^2$
02/23/92	Test Cell	1.9	65.1	9.9	81	0.01	115 $\mu\text{mol/s}\cdot\text{m}^2$
02/24/92	Test Cell	0.4	67.9	7.7	80	0.00	76 $\mu\text{mol/s}\cdot\text{m}^2$
02/25/92	Test Cell	2.8	63.6	8.6	240	0.00	39 $\mu\text{mol/s}\cdot\text{m}^2$
02/26/92	Test Cell	0.7	67.2	4.5	180	0.02	123 $\mu\text{mol/s}\cdot\text{m}^2$
02/27/92	Test Cell	4.7	61.7	2.6	284	0.00	107 $\mu\text{mol/s}\cdot\text{m}^2$
02/28/92	Test Cell	1.3	83.4	14.1	230	0.00	73 $\mu\text{mol/s}\cdot\text{m}^2$
02/29/92	Test Cell	-4.1	62.4	12.2	315	0.01	310 $\mu\text{mol/s}\cdot\text{m}^2$
03/01/92	Test Cell	6.1	43.4	15.8	225	0.00	668 $\mu\text{mol/s}\cdot\text{m}^2$
03/02/92	Test Cell	11.9	69.8	6.8	236	0.00	11 $\mu\text{mol/s}\cdot\text{m}^2$
03/03/92	Test Cell	5.9	72.6	8.5	122	0.00	360 $\mu\text{mol/s}\cdot\text{m}^2$
03/04/92	Test Cell	1.9	65.3	5.1	89	0.00	363 $\mu\text{mol/s}\cdot\text{m}^2$
03/05/92	Test Cell	4.7	65.8	4.2	97	0.00	342 $\mu\text{mol/s}\cdot\text{m}^2$
03/06/92	Test Cell	8.9	87.3	8.5	128	0.00	159 $\mu\text{mol/s}\cdot\text{m}^2$
03/07/92	Test Cell	8.9	90.5	5.8	131	0.58	66 $\mu\text{mol/s}\cdot\text{m}^2$
03/08/92	Test Cell	11.7	91.5	5.2	154	0.63	82 $\mu\text{mol/s}\cdot\text{m}^2$
03/09/92	Test Cell	9.1	70.4	10.7	276	0.13	83 $\mu\text{mol/s}\cdot\text{m}^2$
03/10/92	Test Cell	11.6	67.6	12.6	186	0.00	253 $\mu\text{mol/s}\cdot\text{m}^2$
03/11/92	Test Cell	5.3	74.5	14.9	170	0.27	53 $\mu\text{mol/s}\cdot\text{m}^2$
03/12/92	Test Cell	-6.8	57.1	10.3	249	0.03	162 $\mu\text{mol/s}\cdot\text{m}^2$
03/13/92	Test Cell	-5.6	61.5	9.8	284	0.04	324 $\mu\text{mol/s}\cdot\text{m}^2$
03/14/92	Test Cell	-4.9	61.9	7.9	281	0.00	228 $\mu\text{mol/s}\cdot\text{m}^2$
03/15/92	Test Cell	-2.7	53.1	10.3	228	0.00	390 $\mu\text{mol/s}\cdot\text{m}^2$
03/16/92	Test Cell	-4.7	58.9	10.2	170	0.00	337 $\mu\text{mol/s}\cdot\text{m}^2$
03/17/92	Test Cell	-2.2	72.6	8.6	228	0.00	426 $\mu\text{mol/s}\cdot\text{m}^2$
03/18/92	Test Cell	3.2	66.0	8.7	220	0.34	115 $\mu\text{mol/s}\cdot\text{m}^2$
03/19/92	Test Cell	-1.5	78.3	10.0	93	0.00	180 $\mu\text{mol/s}\cdot\text{m}^2$
03/20/92	Test Cell	-0.3	76.9	7.1	51	0.15	273 $\mu\text{mol/s}\cdot\text{m}^2$
03/21/92	Test Cell	-0.4	65.9	5.9	229	0.00	366 $\mu\text{mol/s}\cdot\text{m}^2$
03/22/92	Test Cell	-1.6	85.0	9.4	145	0.04	267 $\mu\text{mol/s}\cdot\text{m}^2$
03/23/92	Test Cell	-2.1	64.8	6.2	98	0.02	109 $\mu\text{mol/s}\cdot\text{m}^2$

Table F-1
(Continued)

Date	Location	Average Temperature (°C)	Relative Humidity (%)	Wind Speed (mph)	Wind Direction (deg. azimuth)	Precipitation (inches)	Solar Radiation
03/24/92	Test Cell	-1.8	65.4	8.1	227	0.22	374 $\mu\text{mol/s}\cdot\text{m}^2$
03/25/92	Test Cell	2.2	69.0	10.7	218	0.00	441 $\mu\text{mol/s}\cdot\text{m}^2$
03/26/92	Test Cell	5.4	87.3	6.2	200	0.13	157 $\mu\text{mol/s}\cdot\text{m}^2$
03/27/92	Test Cell	7.1	82.5	7.8	173	0.01	186 $\mu\text{mol/s}\cdot\text{m}^2$
03/28/92	Test Cell	3.1	63.1	5.8	222	0.33	158 $\mu\text{mol/s}\cdot\text{m}^2$
03/29/92	Test Cell	0.7	61.6	5.5	221	0.00	485 $\mu\text{mol/s}\cdot\text{m}^2$
03/30/92	Test Cell	2.4	89.6	4.8	200	0.00	193 $\mu\text{mol/s}\cdot\text{m}^2$
03/31/92	Test Cell	1.6	68.5	7.1	111	0.14	84 $\mu\text{mol/s}\cdot\text{m}^2$
04/01/92	Test Cell	6.5	82.5	6.9	248	0.03	471 $\mu\text{mol/s}\cdot\text{m}^2$
04/02/92	Test Cell	0.2	65.0	9.3	166	0.42	138 $\mu\text{mol/s}\cdot\text{m}^2$
04/03/92	Test Cell	-1.9	64.0	6.2	228	0.01	244 $\mu\text{mol/s}\cdot\text{m}^2$
04/04/92	Test Cell	1.8	68.8	6.0	261	0.01	355 $\mu\text{mol/s}\cdot\text{m}^2$
04/05/92	Test Cell	2.5	53.6	5.6	156	0.02	335 $\mu\text{mol/s}\cdot\text{m}^2$
04/06/92	Test Cell	3.2	52.9	5.9	185	0.00	523 $\mu\text{mol/s}\cdot\text{m}^2$
04/07/92	Test Cell	7.3	56.5	7.4	190	0.00	470 $\mu\text{mol/s}\cdot\text{m}^2$
04/08/92	Test Cell	12.2	62.9	5.0	244	0.09	442 $\mu\text{mol/s}\cdot\text{m}^2$
04/09/92	Test Cell	7.6	65.5	6.5	129	0.00	469 $\mu\text{mol/s}\cdot\text{m}^2$
04/10/92	Test Cell	8.4	82.5	4.6	111	0.00	404 $\mu\text{mol/s}\cdot\text{m}^2$
04/11/92	Test Cell	6.5	71.1	9.9	146	0.23	155 $\mu\text{mol/s}\cdot\text{m}^2$
04/12/92	Test Cell	16.1	64.6	7.3	205	0.00	318 $\mu\text{mol/s}\cdot\text{m}^2$
04/13/92	Test Cell	4.5	61.4	5.6	74	0.00	387 $\mu\text{mol/s}\cdot\text{m}^2$
04/14/92	Test Cell	1.1	49.1	2.5	81	0.00	353 $\mu\text{mol/s}\cdot\text{m}^2$
04/15/92	Test Cell	3.7	54.4	4.5	74	0.00	309 $\mu\text{mol/s}\cdot\text{m}^2$
04/16/92	Test Cell	5.3	68.9	10.3	93	0.00	360 $\mu\text{mol/s}\cdot\text{m}^2$
04/17/92	Test Cell	15.2	92.3	4.8	204	0.58	227 $\mu\text{mol/s}\cdot\text{m}^2$
04/18/92	Test Cell	6.7	91.5	4.8	63	0.75	121 $\mu\text{mol/s}\cdot\text{m}^2$
04/19/92	Test Cell	8.2	74.3	6.9	101	0.53	173 $\mu\text{mol/s}\cdot\text{m}^2$
04/20/92	Test Cell	17.8	59.4	11.8	154	0.00	417 $\mu\text{mol/s}\cdot\text{m}^2$
04/21/92	Test Cell	21.7	76.1	10.0	162	0.11	437 $\mu\text{mol/s}\cdot\text{m}^2$
04/22/92	Test Cell	18.9	76.6	8.4	184	0.47	221 $\mu\text{mol/s}\cdot\text{m}^2$
04/23/92	Test Cell	10.8	77.8	6.7	233	0.05	235 $\mu\text{mol/s}\cdot\text{m}^2$
04/24/92	Test Cell	11.9	92.6	4.3	196	0.30	334 $\mu\text{mol/s}\cdot\text{m}^2$
04/25/92	Test Cell	9.0	91.4	4.0	145	0.44	96 $\mu\text{mol/s}\cdot\text{m}^2$

Table F-1

(Continued)

Date	Location	Average Temperature (°C)	Relative Humidity (%)	Wind Speed (mph)	Wind Direction (deg. azimuth)	Precipitation (inches)	Solar Radiation
04/26/92	Test Cell	5.0	86.0	4.0	230	0.21	182 $\mu\text{mol/s}\cdot\text{m}^2$
04/27/92	Test Cell	7.1	72.0	5.2	93	0.01	314 $\mu\text{mol/s}\cdot\text{m}^2$
04/28/92	Test Cell	6.6	55.8	4.8	68	0.00	550 $\mu\text{mol/s}\cdot\text{m}^2$
04/29/92	Test Cell	6.4	58.6	5.1	207	0.00	600 $\mu\text{mol/s}\cdot\text{m}^2$
04/30/92	Test Cell	9.5	87.8	4.0	238	0.03	266 $\mu\text{mol/s}\cdot\text{m}^2$
05/01/92	Test Cell	9.2	71.5	9.8	131	0.26	224 $\mu\text{mol/s}\cdot\text{m}^2$
05/02/92	Test Cell	14.7	57.1	11.4	180	0.00	468 $\mu\text{mol/s}\cdot\text{m}^2$
05/03/92	Test Cell	20.9	68.1	7.6	254	0.22	383 $\mu\text{mol/s}\cdot\text{m}^2$
05/04/92	Test Cell	11.1	70.1	5.1	238	0.01	416 $\mu\text{mol/s}\cdot\text{m}^2$
05/05/92	Test Cell	7.8	55.9	4.6	88	0.00	394 $\mu\text{mol/s}\cdot\text{m}^2$
05/06/92	Test Cell	7.1	63.1	7.0	55	0.01	477 $\mu\text{mol/s}\cdot\text{m}^2$
05/07/92	Test Cell	8.9	59.9	4.1	72	0.00	614 $\mu\text{mol/s}\cdot\text{m}^2$
05/08/92	Test Cell	9.9	61.3	9.8	122	0.00	604 $\mu\text{mol/s}\cdot\text{m}^2$
05/09/92	Test Cell	11.3	77.9	7.2	106	0.15	383 $\mu\text{mol/s}\cdot\text{m}^2$
05/10/92	Test Cell	12.6	77.5	5.9	157	0.02	402 $\mu\text{mol/s}\cdot\text{m}^2$
05/11/92	Test Cell	14.2	60.4	7.4	145	0.00	613 $\mu\text{mol/s}\cdot\text{m}^2$
05/12/92	Test Cell	19.7	52.8	8.7	181	0.00	610 $\mu\text{mol/s}\cdot\text{m}^2$
05/13/92	Test Cell	22.0	76.3	7.6	214	0.00	579 $\mu\text{mol/s}\cdot\text{m}^2$
05/14/92	Test Cell	16.2	56.4	7.0	157	0.01	309 $\mu\text{mol/s}\cdot\text{m}^2$
05/15/92	Test Cell	10.6	50.8	6.3	99	0.00	275 $\mu\text{mol/s}\cdot\text{m}^2$
05/16/92	Test Cell	13.5	65.4	5.0	122	0.00	446 $\mu\text{mol/s}\cdot\text{m}^2$
05/17/92	Test Cell	17.4	70.1	9.1	157	0.00	568 $\mu\text{mol/s}\cdot\text{m}^2$
05/18/92	Test Cell	20.9	88.6	8.3	216	0.78	430 $\mu\text{mol/s}\cdot\text{m}^2$
05/19/92	Test Cell	12.4	69.0	5.8	90	0.00	187 $\mu\text{mol/s}\cdot\text{m}^2$
05/20/92	Test Cell	13.7	69.6	5.5	106	0.00	620 $\mu\text{mol/s}\cdot\text{m}^2$
05/21/92	Test Cell	18.6	41.5	4.8	149	0.00	599 $\mu\text{mol/s}\cdot\text{m}^2$
05/22/92	Test Cell	18.6	55.8	5.7	138	0.00	610 $\mu\text{mol/s}\cdot\text{m}^2$
05/23/92	Test Cell	21.3	72.3	7.3	186	0.00	506 $\mu\text{mol/s}\cdot\text{m}^2$
05/24/92	Test Cell	19.4	81.4	10.2	195	0.89	530 $\mu\text{mol/s}\cdot\text{m}^2$
05/25/92	Test Cell	8.0	66.1	7.2	61	0.56	185 $\mu\text{mol/s}\cdot\text{m}^2$
05/26/92	Test Cell	7.4	64.1	5.3	177	0.01	395 $\mu\text{mol/s}\cdot\text{m}^2$
05/27/92	Test Cell	10.4	58.1	5.6	142	0.06	589 $\mu\text{mol/s}\cdot\text{m}^2$
05/28/92	Test Cell	11.7	52.9	5.6	194	0.00	643 $\mu\text{mol/s}\cdot\text{m}^2$

Table F-1

(Continued)

Date	Location	Average Temperature (°C)	Relative Humidity (%)	Wind Speed (mph)	Wind Direction (deg. azimuth)	Precipitation (inches)	Solar Radiation	
05/29/92	Test Cell	12.9	57.4	6.0	192	0.00	632	$\mu\text{mol/s}\cdot\text{m}^2$
05/30/92	Test Cell	13.6	92.1	7.5	164	0.07	509	$\mu\text{mol/s}\cdot\text{m}^2$
05/31/92	Test Cell	13.2	90.9	4.6	137	0.51	123	$\mu\text{mol/s}\cdot\text{m}^2$
06/01/92	Test Cell	12.5	68.8	5.2	155	0.05	126	$\mu\text{mol/s}\cdot\text{m}^2$
06/02/92	Test Cell	16.2	65.4	4.1	193	0.00	597	$\mu\text{mol/s}\cdot\text{m}^2$
06/03/92	Test Cell	15.8	61.1	4.3	221	0.00	616	$\mu\text{mol/s}\cdot\text{m}^2$
06/04/92	Test Cell	17.1	77.3	6.5	138	0.00	606	$\mu\text{mol/s}\cdot\text{m}^2$
06/05/92	Test Cell	18.1	77.3	8.2	139	0.10	281	$\mu\text{mol/s}\cdot\text{m}^2$
06/06/92	Test Cell	19.3	86.3	5.9	147	0.30	355	$\mu\text{mol/s}\cdot\text{m}^2$
06/07/92	Test Cell	18.9	81.0	7.0	222	0.00	448	$\mu\text{mol/s}\cdot\text{m}^2$
06/08/92	Test Cell	19.4	75.0	6.6	203	0.29	191	$\mu\text{mol/s}\cdot\text{m}^2$
06/09/92	Test Cell	16.3	64.1	6.3	161	0.00	395	$\mu\text{mol/s}\cdot\text{m}^2$
06/10/92	Test Cell	14.8	65.0	7.3	159	0.00	587	$\mu\text{mol/s}\cdot\text{m}^2$
06/11/92	Test Cell	15.3	59.0	7.0	160	0.00	570	$\mu\text{mol/s}\cdot\text{m}^2$
06/12/92	Test Cell	16.5	57.9	5.5	152	0.00	647	$\mu\text{mol/s}\cdot\text{m}^2$
06/13/92	Test Cell	19.1	58.0	7.2	150	0.00	609	$\mu\text{mol/s}\cdot\text{m}^2$
06/14/92	Test Cell	22.5	67.1	8.0	218	0.00	539	$\mu\text{mol/s}\cdot\text{m}^2$
06/15/92	Test Cell	21.7	56.0	11.4	217	0.00	574	$\mu\text{mol/s}\cdot\text{m}^2$
06/16/92	Test Cell	18.0	53.6	7.4	82	0.00	518	$\mu\text{mol/s}\cdot\text{m}^2$
06/17/92	Test Cell	17.6	64.8	18.9	97	0.00	629	$\mu\text{mol/s}\cdot\text{m}^2$
06/18/92	Test Cell	24.7	76.6	15.5	139	0.00	560	$\mu\text{mol/s}\cdot\text{m}^2$
06/19/92	Test Cell	20.8	40.9	8.8	204	1.86	538	$\mu\text{mol/s}\cdot\text{m}^2$
06/20/92	Test Cell	15.3	82.3	9.3	145	0.13	83	$\mu\text{mol/s}\cdot\text{m}^2$
06/21/92	Test Cell	10.3	73.0	9.0	61	0.07	122	$\mu\text{mol/s}\cdot\text{m}^2$
06/22/92	Test Cell	9.9	65.9	6.5	125	0.00	204	$\mu\text{mol/s}\cdot\text{m}^2$
06/23/92	Test Cell	12.6	70.8	10.8	171	0.00	562	$\mu\text{mol/s}\cdot\text{m}^2$
06/24/92	Test Cell	14.2	82.0	6.7	148	0.32	180	$\mu\text{mol/s}\cdot\text{m}^2$
06/25/92	Test Cell	15.4	72.1	4.0	253	0.03	334	$\mu\text{mol/s}\cdot\text{m}^2$
06/26/92	Test Cell	16.8	72.4	8.0	171	0.00	478	$\mu\text{mol/s}\cdot\text{m}^2$
06/27/92	Test Cell	19.3	70.6	6.9	180	0.00	574	$\mu\text{mol/s}\cdot\text{m}^2$
06/28/92	Test Cell	17.3	63.0	5.5	201	0.00	628	$\mu\text{mol/s}\cdot\text{m}^2$
06/29/92	Test Cell	17.4	62.3	6.1	179	0.00	516	$\mu\text{mol/s}\cdot\text{m}^2$
06/30/92	Test Cell	20.8	70.3	5.9	256	0.00	611	$\mu\text{mol/s}\cdot\text{m}^2$

Table F-1

(Continued)

Date	Location	Average Temperature (°C)	Relative Humidity (%)	Wind Speed (mph)	Wind Direction (deg. azimuth)	Precipitation (inches)	Solar Radiation
07/01/92	Test Cell	21.7	66.4	6.3	205	0.00	592 $\mu\text{mol/s}\cdot\text{m}^2$
07/02/92	Test Cell	20.6	65.0	6.1	124	0.00	531 $\mu\text{mol/s}\cdot\text{m}^2$
07/03/92	Test Cell	22.1	66.9	11.8	125	0.00	367 $\mu\text{mol/s}\cdot\text{m}^2$
07/04/92	Test Cell	24.6	56.0	10.2	259	0.00	397 $\mu\text{mol/s}\cdot\text{m}^2$
07/05/92	Test Cell	21.8	74.6	8.3	234	0.00	614 $\mu\text{mol/s}\cdot\text{m}^2$
07/06/92	Test Cell	20.5	63.9	8.1	237	0.07	380 $\mu\text{mol/s}\cdot\text{m}^2$
07/07/92	Test Cell	18.0	64.8	7.0	206	0.00	596 $\mu\text{mol/s}\cdot\text{m}^2$
07/08/92	Test Cell	19.5	76.1	13.4	251	0.00	471 $\mu\text{mol/s}\cdot\text{m}^2$
07/09/92	Test Cell	21.6	69.9	8.6	203	0.10	220 $\mu\text{mol/s}\cdot\text{m}^2$
07/10/92	Test Cell	24.7	81.6	9.1	256	0.00	428 $\mu\text{mol/s}\cdot\text{m}^2$
07/11/92	Test Cell	22.3	74.8	6.3	227	0.99	395 $\mu\text{mol/s}\cdot\text{m}^2$
07/12/92	Test Cell	22.0	85.5	11.4	211	0.00	533 $\mu\text{mol/s}\cdot\text{m}^2$
07/13/92	Test Cell	22.6	88.0	8.1	264	2.28	255 $\mu\text{mol/s}\cdot\text{m}^2$
07/14/92	Test Cell	20.1	75.6	12.4	164	0.10	215 $\mu\text{mol/s}\cdot\text{m}^2$
07/15/92	Test Cell	24.3	66.1	7.6	258	0.73	546 $\mu\text{mol/s}\cdot\text{m}^2$
07/16/92	Test Cell	18.6	77.5	9.2	121	1.02	154 $\mu\text{mol/s}\cdot\text{m}^2$
07/17/92	Test Cell	21.0	94.1	7.9	218	0.39	539 $\mu\text{mol/s}\cdot\text{m}^2$
07/18/92	Test Cell	18.9	77.6	8.4	235	1.87	146 $\mu\text{mol/s}\cdot\text{m}^2$
07/19/92	Test Cell	20.8	74.6	6.2	288	0.00	425 $\mu\text{mol/s}\cdot\text{m}^2$
07/20/92	Test Cell	21.2	80.8	9.1	255	0.00	530 $\mu\text{mol/s}\cdot\text{m}^2$
07/21/92	Test Cell	21.4	72.5	9.2	265	0.05	325 $\mu\text{mol/s}\cdot\text{m}^2$
07/22/92	Test Cell	18.0	72.9	8.9	91	0.00	474 $\mu\text{mol/s}\cdot\text{m}^2$
07/23/92	Test Cell	17.0	85.6	7.3	138	0.00	453 $\mu\text{mol/s}\cdot\text{m}^2$
07/24/92	Test Cell	19.2	89.8	7.0	117	0.31	224 $\mu\text{mol/s}\cdot\text{m}^2$
07/25/92	Test Cell	18.2	75.9	6.3	106	0.63	118 $\mu\text{mol/s}\cdot\text{m}^2$
07/26/92	Test Cell	20.7	88.3	8.4	135	0.00	517 $\mu\text{mol/s}\cdot\text{m}^2$
07/27/92	Test Cell	22.0	75.8	6.7	269	0.78	272 $\mu\text{mol/s}\cdot\text{m}^2$
07/28/92	Test Cell	21.0	68.5	8.1	182	0.00	437 $\mu\text{mol/s}\cdot\text{m}^2$
07/29/92	Test Cell	20.2	83.0	8.2	257	0.00	613 $\mu\text{mol/s}\cdot\text{m}^2$
07/30/92	Test Cell	21.5	61.9	9.2	254	0.39	301 $\mu\text{mol/s}\cdot\text{m}^2$
07/31/92	Test Cell	16.7	87.8	8.8	101	2.34	106 $\mu\text{mol/s}\cdot\text{m}^2$
08/01/92	Test Cell	16.0	67.8	8.8	141	0.44	87 $\mu\text{mol/s}\cdot\text{m}^2$
08/02/92	Test Cell	18.0	67.0	10.1	273	0.00	562 $\mu\text{mol/s}\cdot\text{m}^2$

Table F-1

(Continued)

Date	Location	Average Temperature (°C)	Relative Humidity (%)	Wind Speed (mph)	Wind Direction (deg. azimuth)	Precipitation (inches)	Solar Radiation
08/03/92	Test Cell	19.6	77.6	7.3	276	0.00	541 $\mu\text{mol/s}\cdot\text{m}^2$
08/04/92	Test Cell	19.5	75.8	8.3	238	0.09	277 $\mu\text{mol/s}\cdot\text{m}^2$
08/05/92	Test Cell	17.7	66.0	5.0	239	0.59	456 $\mu\text{mol/s}\cdot\text{m}^2$
08/06/92	Test Cell	16.7	70.1	7.3	150	0.00	491 $\mu\text{mol/s}\cdot\text{m}^2$
08/07/92	Test Cell	17.0	72.6	9.3	169	0.00	580 $\mu\text{mol/s}\cdot\text{m}^2$
08/08/92	Test Cell	21.2	75.5	14.9	126	0.00	488 $\mu\text{mol/s}\cdot\text{m}^2$
08/09/92	Test Cell	24.1	78.9	6.2	229	0.26	395 $\mu\text{mol/s}\cdot\text{m}^2$
08/10/92	Test Cell	22.0	78.3	7.4	221	0.00	523 $\mu\text{mol/s}\cdot\text{m}^2$
08/11/92	Test Cell	25.4	66.3	9.1	280	0.00	572 $\mu\text{mol/s}\cdot\text{m}^2$
08/12/92	Test Cell	21.2	71.9	7.0	163	0.04	593 $\mu\text{mol/s}\cdot\text{m}^2$
08/13/92	Test Cell	18.5	76.6	7.8	149	0.00	364 $\mu\text{mol/s}\cdot\text{m}^2$
08/14/92	Test Cell	17.5	77.0	12.1	131	0.40	378 $\mu\text{mol/s}\cdot\text{m}^2$
08/15/92	Test Cell	17.0	84.8	9.5	110	0.00	270 $\mu\text{mol/s}\cdot\text{m}^2$
08/16/92	Test Cell	16.8	88.8	5.0	88	0.57	110 $\mu\text{mol/s}\cdot\text{m}^2$
08/17/92	Test Cell	16.6	75.6	4.9	164	0.08	174 $\mu\text{mol/s}\cdot\text{m}^2$
08/18/92	Test Cell	16.9	71.1	8.7	186	0.00	510 $\mu\text{mol/s}\cdot\text{m}^2$
08/19/92	Test Cell	19.1	76.5	6.8	281	0.54	493 $\mu\text{mol/s}\cdot\text{m}^2$
08/20/92	Test Cell	17.2	72.3	5.4	210	0.03	515 $\mu\text{mol/s}\cdot\text{m}^2$
08/21/92	Test Cell	16.2	67.5	5.6	182	0.00	482 $\mu\text{mol/s}\cdot\text{m}^2$
08/22/92	Test Cell	16.3	70.6	3.6	180	0.00	539 $\mu\text{mol/s}\cdot\text{m}^2$
08/23/92	Test Cell	18.2	73.5	5.9	155	0.00	484 $\mu\text{mol/s}\cdot\text{m}^2$
08/24/92	Test Cell	22.1	88.3	6.7	164	0.00	362 $\mu\text{mol/s}\cdot\text{m}^2$
08/25/92	Test Cell	20.7	77.9	7.0	99	0.00	221 $\mu\text{mol/s}\cdot\text{m}^2$

APPENDIX G

RESULTS OF CHEMICAL CHARACTERIZATION OF GROUNDWATER, POREWATER AND SURFACE WATER SAMPLES

Back up?

Table G-1

Chemical Characteristics of Liquid From Ohio, Event 1

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
Parameter	Units	OH / OHBLNK		OH / OHMW01		OH / OHMW02		OH / OHMW03	
		BLANK-1		OH001		OH002		OH003	
		N		N		N		N	
		10/19/89		10/18/89		10/18/89		10/18/89	
-----	-----	-----		-----		-----		-----	
Anions									
Chloride	mg/L	.9 @	(.2)	208	(.2)	107.7	(.2)	50	(.2)
Fluoride	mg/L	ND	(.2)	9.9	(.2)	10	(.2)	ND	(.2)
Sulfate	mg/L	.504	(.1)	1418	(.1)	798	(.1)	917	(.1)
Sulfite	mg/L	ND	(.2)	3.24	(.2)	1.72	(.2)	1.8	(.2)
Bulk chemistry									
Total phenolics	mg/L	NA		.008 @	(.005)	ND	(.005)	ND	(.005)
Elements by ICPES or AA									
Aluminum	mg/L	NA		ND	(.2)	.266 @	(.2)	.624 @	(.2)
Arsenic	mg/L	NA		NA		ND	(.005)	ND	(.005)
Barium	mg/L	NA		.084	(.01)	.08	(.01)	.037 @	(.01)
Beryllium	mg/L	NA		ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	NA		ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	NA		ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	NA		13.12	(1)	134.3	(1)	212.2	(1)
Chromium	mg/L	NA		ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	NA		ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	NA		ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	NA		ND	(.04)	ND	(.04)	.106 @	(.04)
Lead	mg/L	NA		ND	(.002)	ND	(.002)	ND	(.002)
Magnesium	mg/L	NA		7.026	(1)	88.8	(1)	171.9	(1)
Manganese	mg/L	NA		.12	(.01)	.12	(.01)	.514	(.01)
Molybdenum	mg/L	NA		.061 @	(.05)	ND	(.05)	ND	(.05)
Nickel	mg/L	NA		ND	(.02)	ND	(.02)	ND	(.02)
Phosphorus	mg/L	NA		ND	(.3)	ND	(.3)	ND	(.3)
Potassium	mg/L	NA		12.16 @	(3)	8.34 @	(3)	6.388 @	(3)

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

Table G-1

(Continued)

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
Parameter	Units	OH / OHBLNK		OH / OHMW01		OH / OHMW02		OH / OHMW03	
		BLANK-1		OH001		OH002		OH003	
		N		N		N		N	
		10/19/89		10/18/89		10/18/89		10/18/89	
Selenium	mg/L	NA		ND	(.005)	ND	(.005)	ND	(.005)
Silver	mg/L	NA		ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	NA		717	(1)	352.5	(1)	100.4	(1)
Strontium	mg/L	NA		.47	(.003)	1.235	(.003)	.616	(.003)
Vanadium	mg/L	NA		ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	NA		ND	(.02)	ND	(.02)	.048 @	(.02)
Field measurements									
Conductivity	umhos/cm	NA		2890	(5)	2520	(5)	2320	(5)
TDS	mg/L	18	(2)	2220	(2)	1792	(2)	1866	(2)
Temperature	degrees C	NA		10	(1)	13	(1)	13	(1)
Total Alkalinity	meq/L	ND	(2)	14	(2)	11.8	(2)	9.19 @	(2)
pH	pH units	NA		9	(1)	7	(1)	6.5	(1)

G-4

Table G-1
(Continued)

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
		OH / OHMW04		OH / OHMW05		OH / OHMW05		OH / OHMW06	
		OH004		OH005		OH009 Dup of OH005		OH006	
		N		N		N		N	
Parameter	Units	10/20/89		10/19/89		10/19/89		10/20/89	
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Anions									
Chloride	mg/L	112.8	(.2)	291.4	(.2)	276.6	(.2)	46.4	(.2)
Fluoride	mg/L	9.9	(.2)	5.1	(.2)	ND	(.2)	ND	(.2)
Sulfate	mg/L	502	(2)	NA		6.14	(.1)	547	(.1)
Sulfite	mg/L	2.511	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Bulk chemistry									
Total phenolics	mg/L	ND	(.025)	ND	(.005)	ND	(.005)	ND	(.005)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	.061	(.005)	.016 @	(.005)	.014 @	(.005)	.01 @	(.005)
Barium	mg/L	ND	(.01)	.102	(.01)	.026 @	(.01)	.078	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	12.75	(1)	19.5	(1)	17.62	(1)	107	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Magnesium	mg/L	3.796 @	(1)	8.829	(1)	8.709	(1)	62.29	(1)
Manganese	mg/L	ND	(.01)	.051	(.01)	.043 @	(.01)	.824	(.01)
Molybdenum	mg/L	3.013	(.05)	.064 @	(.05)	ND	(.05)	.058 @	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Phosphorus	mg/L	ND	(.3)	ND	(.3)	ND	(.3)	ND	(.3)
Potassium	mg/L	10.3 @	(3)	8.486 @	(3)	10.9 @	(3)	10.52 @	(3)

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

Table G-1

(Continued)

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
Parameter	Units	OH / OHMW04		OH / OHMW05		OH / OHMW05		OH / OHMW06	
		OH004		OH005		OH009 Dup of OH005		OH006	
		N		N		N		N	
		10/20/89		10/19/89		10/19/89		10/20/89	
Selenium	mg/L	.058	(.01)	ND	(.005)	ND	(.005)	ND	(.005)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	397.2	(1)	469	(1)	465	(1)	192.9	(1)
Strontium	mg/L	.203	(.003)	.453	(.003)	.437	(.003)	1.012	(.003)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	1768	(5)	2260	(5)	2270	(5)	1636	(5)
TDS	mg/L	1234	(2)	1260	(2)	1319	(2)	1231	(2)
Temperature	degrees C	10	( )	14	( )	13	( )	12	( )
Total Alkalinity	meq/L	4.39 @	(2)	15	(2)	NA		7.8 @	(2)
pH	pH units	7.5	( )	7	( )	6.5	( )	6	( )

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

C1-4

Table G-1
(Continued)

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
Parameter	Units	OH / OHMW07		OH / OHMW08		OH / OHLY07		OH / OHLY12	
		OH007		OH008		OH015		OH020	
		N		N		N		N	
		10/20/89		10/20/89		10/20/89		10/20/89	
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Anions									
Chloride	mg/L	4.4	(.2)	4.6	(.2)	68.3	(.2)	274.8	(.2)
Fluoride	mg/L	2.5	(.2)	2	(.2)	ND	(.2)	5.3	(.2)
Sulfate	mg/L	183	(.1)	716	(.1)	1572	(.1)	2287	(.1)
Sulfite	mg/L	2.50	(.2)	ND	(.2)	NA		ND	(.2)
Bulk chemistry									
Total phenolics	mg/L	.28	(.005)	.0055 @	(.005)	.008 @	(.005)	ND	(.005)
Elements by ICPEs or AA									
Aluminum	mg/L	.248 @	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	.015 @	(.005)	.012 @	(.005)	.015 @	(.005)	ND	(.005)
Barium	mg/L	.079	(.01)	.046 @	(.01)	.03 @	(.01)	.028 @	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	58.12	(1)	99.82	(1)	522.1	(1)	374.6	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	.322	(.04)	.542	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Magnesium	mg/L	ND	(1)	58.37	(1)	ND	(1)	ND	(1)
Manganese	mg/L	ND	(.01)	.451	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	.213 @	(.05)	.167 @	(.05)	.873	(.05)	.546	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Phosphorus	mg/L	ND	(.3)	ND	(.3)	ND	(.3)	ND	(.3)
Potassium	mg/L	32.88	(3)	13.96 @	(3)	295.8	(3)	1100	(30)

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

Table G-1

(Continued)

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
Parameter	Units	OH / OHMW07		OH / OHMW08		OH / OHLY07		OH / OHLY12	
		OH007		OH008		OH015		OH020	
		N		N		N		N	
		10/20/89		10/20/89		10/20/89		10/20/89	
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	272	(1)	240	(1)	79.82	(1)	200.3	(1)
Strontium	mg/L	.898	(.003)	2.552	(.003)	3.856	(.003)	4.124	(.003)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	2870	(5)	1870	(5)	3000	(5)	5920	(5)
TDS	mg/L	998	(2)	1363	(2)	2868	(2)	3516	(2)
Temperature	degrees C	10	( )	10	( )	10	( )	10	( )
Total Alkalinity	meq/L	10.046	(2)	6.41 @	(2)	ND	(2)	ND	(2)
pH	pH units	12	( )	6	( )	10.5	( )	10	( )

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

C1-6

Table G-1
(Continued)

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
Parameter	Units	OH / OHLY14		OH / OHSW-S		OH / OHSW-S		OH / OHSW-N	
		OH022		OH025		OH026		OH027	
		N		N		N		N	
		10/20/89		10/18/89		10/19/89		10/19/89	
-----	-----	-----		-----		-----		-----	
Anions									
Chloride	mg/L	390.2	(.2)	55.2	(.2)	38.2	(.2)	4.2	(.2)
Fluoride	mg/L	9.2	(.2)	ND	(.2)	ND	(.2)	.9 @	(.2)
Sulfate	mg/L	3424	(.1)	887	(.1)	689	(.1)	658	(.1)
Sulfite	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Bulk chemistry									
Total phenolics	mg/L	ND	(.005)	.016 @	(.005)	.008 @	(.005)	.007 @	(.005)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	.017 @	(.005)	NA		.0085 @	(.005)	.037	(.005)
Barium	mg/L	.055	(.01)	.065	(.01)	.033 @	(.01)	.018 @	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	.0014 @	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	448.2	(1)	255.1	(1)	206	(1)	243.2	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	ND	(.02)	ND	(.002)	ND	(.002)	ND	(.002)
Magnesium	mg/L	ND	(1)	4.619 @	(1)	3.023 @	(1)	2.429 @	(1)
Manganese	mg/L	ND	(.01)	.021 @	(.01)	.022 @	(.01)	.046 @	(.01)
Molybdenum	mg/L	.88	(.05)	.137 @	(.05)	.072 @	(.05)	ND	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Phosphorus	mg/L	ND	(.3)	ND	(.3)	ND	(.3)	ND	(.3)
Potassium	mg/L	1600	(30)	215.4	(3)	133.5	(3)	10.55 @	(3)

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

Table G-1

(Continued)

		Site ID / Location ID Sample ID Preparation Method Log Date							
Parameter	Units	OH / OHLY14 OH022 N		OH / OHSW-S OH025 N		OH / OHSW-S OH026 N		OH / OHSW-N OH027 N	
		10/20/89		10/18/89		10/19/89		10/19/89	
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	305.6	(1)	44.78	(1)	25.77	(1)	3.728 @	(1)
Strontium	mg/L	4.395	(.003)	.591	(.003)	.45	(.003)	.292	(.003)
Vanadium	mg/L	.047 @	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	8380	(5)	NA		1523	(5)	1045	(5)
TDS	mg/L	6458	(2)	1495	(2)	1105	(2)	934	(2)
Temperature	degrees C	10	(1)	NA		12	(1)	15	(1)
Total Alkalinity	meq/L	2.61 @	(2)	ND	(2)	ND	(2)	ND	(2)
pH	pH units	12	(1)	NA		6	(1)	6	(1)

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

C1-8

G-10

Table G-1

(Continued)

Site ID / Location ID
Sample ID
Preparation Method
Log Date

		OH / OHSW-N	
		OH028	
		N	
Parameter	Units	10/20/89	
-----	----	-----	
Anions			
Chloride	mg/L	6	(.2)
Fluoride	mg/L	1.1	(.2)
Sulfate	mg/L	708	(.1)
Sulfite	mg/L	ND	(.2)
Bulk chemistry			
Total phenolics	mg/L	.018 @	(.005)
Elements by ICPE or AA			
Aluminum	mg/L	ND	(.2)
Arsenic	mg/L	.043	(.005)
Barium	mg/L	.022 @	(.01)
Beryllium	mg/L	ND	(.002)
Boron	mg/L	ND	(.6)
Cadmium	mg/L	ND	(.001)
Calcium	mg/L	294.8	(1)
Chromium	mg/L	ND	(.01)
Cobalt	mg/L	ND	(.01)
Copper	mg/L	ND	(.02)
Iron	mg/L	ND	(.04)
Lead	mg/L	ND	(.002)
Magnesium	mg/L	3.283 @	(1)
Manganese	mg/L	.064	(.01)
Molybdenum	mg/L	ND	(.05)
Nickel	mg/L	ND	(.02)
Phosphorus	mg/L	ND	(.3)
Potassium	mg/L	13.26 @	(3)

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

Table G-1
(Continued)

G-12

		Site ID / Location ID	
		Sample ID	
		Preparation Method	
		Log Date	
		OH / OHSW-N	
		OH028	
		N	
Parameter	Units	10/20/89	
Selenium	mg/L	ND	(.005)
Silver	mg/L	ND	(.01)
Sodium	mg/L	5.139	(1)
Strontium	mg/L	.359	(.003)
Vanadium	mg/L	ND	(.02)
Zinc	mg/L	ND	(.02)
Field measurements			
Conductivity	umhos/cm	1452	(5)
TDS	mg/L	1131	(2)
Temperature	degrees C	45	( )
Total Alkalinity	meq/L	ND	(2)
pH	pH units	6	( )

Table G-2

Chemical Characteristics of Liquid From Ohio, Event 2

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
		OH / OHBLNK		OH / OHMW01		OH / OHMW02		OH / OHMW03	
		BLANK-2		OH029		OH030		OH031	
		N		N		N		N	
		2/11/90		2/11/90		2/11/90		2/11/90	
Parameter	Units	-----		-----		-----		-----	
-----	-----								
Anions									
Ammonia as N	mg/L	ND	(0.020)	3.6	(.1)	1.5	(.04)	.58	(.04)
Chloride	mg/L	ND	(0.020)	110	(.2)	65	(.2)	52	(.2)
Fluoride	mg/L	ND	(0.10)	2.9	(.1)	2.5	(.1)	1.7	(.1)
Sulfate	mg/L	ND	(0.050)	620	(.5)	1000	(1)	880	(1)
Bulk chemistry									
Total organic carbon	mg/L	ND	(1.0)	33	(1)	160	(2)	19	(1)
Total phenolics	mg/L	ND	(0.0070)	.038	(.007)	.011 a	(.007)	ND	(.009)
Elements by ICPES or AA									
Aluminum	mg/L	ND	(0.20)	ND	(.2)	ND	(.2)	ND	(.2)
Antimony	mg/L	ND	(0.20)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(0.0050)	ND	(.005)	ND	(.005)	ND	(.005)
Barium	mg/L	ND	(0.010)	.046 a	(.01)	.065	(.01)	.028 a	(.01)
Beryllium	mg/L	ND	(0.0020)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(0.60)	1 a	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	0.0014 a	(0.0010)	.0016 a	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	ND	(1.0)	11	(1)	ND	(1)	200	(1)
Chromium	mg/L	ND	(0.010)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(0.010)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(0.020)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(0.040)	.062 a	(.04)	.068 a	(.04)	.047 a	(.04)
Lead	mg/L	ND	(0.0020)	ND	(.002)	ND	(.002)	ND	(.002)
Magnesium	mg/L	ND	(1.0)	3.8 a	(1)	150	(1)	170	(1)
Manganese	mg/L	ND	(0.010)	ND	(.01)	.18	(.01)	.38	(.01)
Molybdenum	mg/L	ND	(0.050)	ND	(.05)	ND	(.05)	ND	(.05)
Nickel	mg/L	ND	(0.020)	ND	(.02)	ND	(.02)	ND	(.02)

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

Table G-2

(Continued)

		Site ID / Location ID Sample ID Preparation Method Log Date							
Parameter	Units	OH / OHBLNK BLANK-2 N 2/11/90		OH / OHMW01 OH029 N 2/11/90		OH / OHMW02 OH030 N 2/11/90		OH / OHMW03 OH031 N 2/11/90	
		-----	-----	-----	-----	-----	-----	-----	-----
Potassium	mg/L	ND	(3.0)	9.2 @	(3)	8.6 @	(3)	5.2 @	(3)
Selenium	mg/L	ND	(0.0050)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	ND	(1.0)	5.9	(1)	5.9	(1)	6.2	(1)
Silver	mg/L	ND	(0.010)	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	ND	(1.0)	660	(1)	260	(1)	100	(1)
Strontium	mg/L	ND	(0.0030)	.36	(.003)	1.4	(.003)	.58	(.003)
Thallium	mg/L	ND	(0.10)	ND	(.1)	ND	(.1)	ND	(.1)
Vanadium	mg/L	ND	(0.020)	ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	ND	(0.020)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	10	(5)	2660	(5)	2400	(5)	1880	(5)
TDS	mg/L	ND	(2)	1602	(2)	1880	(2)	1778	(2)
Temperature	degrees C	11.2	( )	11.1	( )	8.8	( )	7.7	( )
Total Alkalinity	meq/L	ND	(2)	12.4	(2)	11.64	(2)	10	(2)
pH	pH units	6.04	( )	10.2	( )	7.32	( )	7.07	( )

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

C1-2

G-14

Table G-2
(Continued)

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
Parameter	Units	OH / OHMW04		OH / OHMW05		OH / OHMW05		OH / OHMW06	
		OH032		OH033		OH033D Dup of OH033		OH034	
		N		N		N		N	
		2/11/90		2/11/90		2/10/90		2/11/90	
-----	-----	-----		-----		-----		-----	
Anions									
Ammonia as N	mg/L	3.2	(.04)	2.2	(.04)	NA		.93 I	(.02)
Chloride	mg/L	200	(.4)	240	(.4)	NA		57	(.2)
Fluoride	mg/L	1.9	(.1)	2.2	(.1)	NA		1.2	(.1)
Sulfate	mg/L	410	(.5)	95	(.5)	NA		450	(.5)
Bulk chemistry									
Total organic carbon	mg/L	14	(1)	46	(1)	NA		23	(1)
Total phenolics	mg/L	ND	(.008)	ND	(.007)	NA		ND	(.007)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	NA		ND	(.2)
Antimony	mg/L	ND	(.2)	ND	(.2)	NA		ND	(.2)
Arsenic	mg/L	.021 a	(.005)	.0053 a	(.005)	NA		ND	(.005)
Barium	mg/L	.014 a	(.01)	.037 a	(.01)	NA		.069	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	NA		ND	(.002)
Boron	mg/L	.74 a	(.6)	1 a	(.6)	NA		ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	NA		.0013 a	(.001)
Calcium	mg/L	10	(1)	18	(1)	NA		110	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	NA		ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	NA		.013 a	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	NA		ND	(.02)
Iron	mg/L	ND	(.04)	.047 a	(.04)	NA		ND	(.04)
Lead	mg/L	ND	(.002)	ND	(.002)	NA		ND	(.002)
Magnesium	mg/L	3.6 a	(1)	11	(1)	NA		65	(1)
Manganese	mg/L	.047 a	(.01)	.021 a	(.01)	NA		.76	(.01)
Molybdenum	mg/L	.64	(.05)	ND	(.05)	NA		ND	(.05)
Nickel	mg/L	.027 a	(.02)	ND	(.02)	NA		.029 a	(.02)

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

Table G-2
(Continued)

G-16

		Site ID / Location ID Sample ID Preparation Method Log Date							
Parameter	Units	OH / OHMW04 OH032 N 2/11/90		OH / OHMW05 OH033 N 2/11/90		OH / OHMW05 OH033D Dup of OH033 N 2/10/90		OH / OHMW06 OH034 N 2/11/90	
		-----	-----	-----	-----	-----	-----	-----	-----
Potassium	mg/L	9 a	(3)	8.4 a	(3)	NA		8.9 a	(3)
Selenium	mg/L	.013 a	(.005)	ND	(.005)	NA		ND	(.005)
Silicon	mg/L	1.4 a	(1)	3.4 a	(1)	NA		3.6 a	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	NA		ND	(.01)
Sodium	mg/L	560	(1)	490	(1)	NA		150	(1)
Strontium	mg/L	.23	(.003)	.55	(.003)	NA		1	(.003)
Thallium	mg/L	ND	(.1)	ND	(.1)	NA		ND	(.1)
Vanadium	mg/L	ND	(.02)	ND	(.02)	NA		ND	(.02)
Zinc	mg/L	ND	(.02)	ND	(.02)	NA		ND	(.02)
Field measurements									
Conductivity	umhos/cm	2240	(5)	1930	(5)	2100	(5)	1755	(5)
TDS	mg/L	1332	(2)	1148	(2)	1274	(2)	1024	(2)
Temperature	degrees C	10.7	( )	10.1	( )	10.4	( )	10	( )
Total Alkalinity	meq/L	12.32	(2)	16	(2)	16	(2)	8.06 a	(2)
pH	pH units	8.76	( )	8.3	( )	8.32	( )	7.41	( )

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

Table G-2

(Continued)

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
		OH / OHMW07		OH / OHMW08		OH / OHLY07		OH / OHLY10	
		OH035		OH036		OH043		OH046	
		N		N		N		N	
Parameter	Units	2/11/90		2/11/90		2/11/90		2/11/90	
-----	----	-----		-----		-----		-----	
Anions									
Ammonia as N	mg/L	2.8	(.04)	.6	(.02)	.082 a	(.02)	4.1	(.2)
Chloride	mg/L	4.2	(.02)	3.7	(.02)	NA		1700	(.4)
Fluoride	mg/L	1.1	(.1)	1.2	(.1)	NA		9.5	(1)
Sulfate	mg/L	270	(.5)	620	(.5)	NA		5100	(5)
Bulk chemistry									
Total organic carbon	mg/L	78	(1)	80	(1)	ND	(1)	5.5	(1)
Total phenolics	mg/L	.008 a	(.007)	ND	(.007)	ND	(.007)	ND	(.007)
Elements by AA									
Cadmium	mg/L	NA		NA		NA		ND	(.0003)
Lead	mg/L	NA		NA		NA		.0047 a	(.002)
Elements by ICPES or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	NA		ND	(.2)
Antimony	mg/L	ND	(.2)	ND	(.2)	NA		.21 a	(.2)
Arsenic	mg/L	.0055 a	(.005)	ND	(.005)	NA		ND	(.005)
Barium	mg/L	.13	(.01)	.026 a	(.01)	NA		.039 a	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	NA		ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	NA		ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	NA		ND	(.005)
Calcium	mg/L	110	(1)	100	(1)	NA		230	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	NA		.026 a	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	NA		ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	NA		ND	(.02)
Iron	mg/L	.15 a	(.04)	.39	(.04)	NA		ND	(.04)
Lead	mg/L	ND	(.002)	ND	(.002)	NA		ND	(.05)

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

C1-5

Table G-2

(Continued)

G-18

		Site ID / Location ID Sample ID Preparation Method Log Date							
Parameter	Units	OH / OHMW07 OH035 N 2/11/90		OH / OHMW08 OH036 N 2/11/90		OH / OHLY07 OH043 N 2/11/90		OH / OHLY10 OH046 N 2/11/90	
Magnesium	mg/L	ND	(1)	62	(1)	NA		ND	(1)
Manganese	mg/L	ND	(.01)	.16	(.01)	NA		ND	(.01)
Molybdenum	mg/L	.097 a	(.05)	.14 a	(.05)	NA		2.2	(.05)
Nickel	mg/L	ND	(.02)	.075 a	(.02)	NA		ND	(.02)
Potassium	mg/L	25	(3)	12 a	(3)	NA		4200	(30)
Selenium	mg/L	ND	(.005)	ND	(.005)	NA		ND	(.005)
Silicon	mg/L	3.8 a	(1)	5.2	(1)	NA		12	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	NA		ND	(.01)
Sodium	mg/L	200	(1)	180	(1)	NA		670	(1)
Strontium	mg/L	.98	(.003)	2.4	(.003)	NA		5.9	(.003)
Thallium	mg/L	ND	(.1)	ND	(.1)	NA		ND	(.1)
Vanadium	mg/L	ND	(.02)	ND	(.02)	NA		ND	(.02)
Zinc	mg/L	ND	(.02)	ND	(.02)	NA		ND	(.02)
Field measurements									
Conductivity	umhos/cm	1620	(5)	2340	(5)	2660	(5)	16860	(5)
TDS	mg/L	814	(2)	1138	(2)	NA		NA	
Temperature	degrees C	10.9	( )	10.2	( )	5.2	( )	11	( )
Total Alkalinity	meq/L	8.28 a	(2)	6 a	(2)	2.8 a	(2)	10.44	(2)
pH	pH units	7.66	( )	12.72	( )	12.84	( )	12.27	( )

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

Table G-2

(Continued)

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
		OH / OHLY11		OH / OHLY13		OH / OHLY14		OH / OHLY16	
		OH047		OH049		OH050		OH052	
		N		N		N		N	
Parameter	Units	2/11/90		2/08/90		2/08/90		2/11/90	
-----	-----	-----		-----		-----		-----	
Anions									
Ammonia as N	mg/L	11	(.4)	9.4	(.4)	.36	(.02)	1.6	(.02)
Chloride	mg/L	820	(2)	1200	(2)	200	(1)	780	(2)
Fluoride	mg/L	5.8	(1)	7	(1)	2.8	(.1)	4.4 a	(1)
Sulfate	mg/L	3600	(5)	3600	(5)	2000	(2.5)	2300	(5)
Bulk chemistry									
Total organic carbon	mg/L	ND	(1)	ND	(1)	13	(1)	ND	(1)
Total phenolics	mg/L	ND	(.007)	ND	(.007)	ND	(.007)	ND	(.007)
Elements by AA									
Cadmium	mg/L	ND	(.0003)	NA		ND	(.0003)	ND	(.0003)
Lead	mg/L	.0049 a	(.002)	NA		.0053 a	(.002)	.0028 a	(.002)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Antimony	mg/L	.37 a	(.2)	ND	(.2)	.3 a	(.2)	.47 a	(.2)
Arsenic	mg/L	.019 a	(.005)	ND	(.005)	.0063 a	(.005)	.022 a	(.005)
Barium	mg/L	.022 a	(.01)	.023 a	(.01)	.027 a	(.01)	.045 a	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.005)	ND	(.001)	ND	(.005)	ND	(.005)
Calcium	mg/L	420	(1)	160	(1)	450	(1)	630	(1)
Chromium	mg/L	ND	(.01)	.028 a	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	ND	(.05)	ND	(.002)	ND	(.05)	ND	(.05)

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

C1-7

Table G-2

(Continued)

		Site ID / Location ID Sample ID Preparation Method Log Date							
Parameter	Units	OH / OHLY11 OH047 N 2/11/90		OH / OHLY13 OH049 N 2/08/90		OH / OHLY14 OH050 N 2/08/90		OH / OHLY16 OH052 N 2/11/90	
Magnesium	mg/L	ND	(1)	ND	(1)	ND	(1)	1.7 a	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	2.3	(.05)	1.3	(.05)	.48	(.05)	.77	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	1600	(30)	3200	(30)	740	(3)	980	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	65	(1)	54	(1)	55	(1)	66	(1)
Silver	mg/L	.013 a	(.01)	ND	(.01)	.017 a	(.01)	.022 a	(.01)
Sodium	mg/L	780	(1)	590	(1)	120	(1)	320	(1)
Strontium	mg/L	5.3	(.003)	5.4	(.003)	3.2	(.003)	5.1	(.003)
Thallium	mg/L	ND	(.1)	ND	(.1)	ND	(.1)	ND	(.1)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	9010	(5)	6900	(5)	3760	(5)	NA	
Temperature	degrees C	8.3	( )	11.5	( )	7.3	( )	NA	
Total Alkalinity	meq/L	ND	(2)	10.4	(2)	ND	(2)	ND	(2)
pH	pH units	9.94	( )	9.86	( )	10.6	( )	NA	

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

C1-8

Table G-2
(Continued)

		Site ID / Location ID			
		Sample ID			
		Preparation Method			
		Log Date			
		OH / OHSW-N		OH / OHSW-N	
		OH053		OH054	
		N		N	
Parameter	Units	2/08/90		2/08/90	
-----	-----	-----		-----	
Anions					
Ammonia as N	mg/L	.22	(.02)	.08 a	(.02)
Chloride	mg/L	4.3	(.02)	8.7	(.02)
Fluoride	mg/L	.43 a	(.1)	.72	(.1)
Sulfate	mg/L	200	(.5)	300	(.5)
Bulk chemistry					
Total organic carbon	mg/L	ND	(1)	20	(1)
Total phenolics	mg/L	ND	(.007)	.014 a	(.007)
Elements by ICPES or AA					
Aluminum	mg/L	ND	(.2)	ND	(.2)
Antimony	mg/L	ND	(.2)	ND	(.2)
Arsenic	mg/L	.023 a	(.005)	.04	(.005)
Barium	mg/L	.024 a	(.01)	.027 a	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	.69 a	(.6)
Cadmium	mg/L	.002 a	(.001)	.0086	(.001)
Calcium	mg/L	170	(1)	160	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)
Lead	mg/L	ND	(.002)	ND	(.002)
Magnesium	mg/L	2 a	(1)	2.4 a	(1)
Manganese	mg/L	.016 a	(.01)	ND	(.01)
Molybdenum	mg/L	ND	(.05)	ND	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)

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

Table G-2
(Continued)

		Site ID / Location ID Sample ID Preparation Method Log Date			
Parameter	Units	OH / OHSW-N OH053 N 2/08/90		OH / OHSW-N OH054 N 2/08/90	
Potassium	mg/L	22	(3)	33	(3)
Selenium	mg/L	.0055 a	(.005)	.007 a	(.005)
Silicon	mg/L	2.2 a	(1)	4.1 a	(1)
Silver	mg/L	ND	(.01)	ND	(.01)
Sodium	mg/L	6.5	(1)	11	(1)
Strontium	mg/L	.26	(.003)	.26	(.003)
Thallium	mg/L	ND	(.1)	ND	(.1)
Vanadium	mg/L	ND	(.02)	ND	(.02)
Zinc	mg/L	ND	(.02)	.047 a	(.02)
Field measurements					
Conductivity	umhos/cm	744	(5)	643	(5)
TDS	mg/L	316	(2)	738	(2)
Temperature	degrees C	9.1	( )	8.5	( )
Total Alkalinity	meq/L	8.7 a	(2)	2.2 a	(2)
Total suspended solids	mg/L	ND	(2)	112	(2)
pH	pH units	7.88	( )	8.16	( )

Table G-3

Chemical Characteristics of Liquid From Ohio, Event 3

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
		OH / OHBLNK		OH / OHMW01		OH / OHMW02		OH / OHMW03	
		BLANK-3		OH070		OH071		OH072	
		N		N		N		N	
Parameter	Units	6/03/90		6/03/90		6/03/90		6/03/90	
-----	----	-----		-----		-----		-----	
Anions									
Ammonia as N	mg/L	.032	@ (.02)	2.3	(.04)	1.3	(.02)	.62	(.02)
Chloride	mg/L	ND	(.02)	67	(.2)	47	(.1)	33	(.1)
Fluoride	mg/L	ND	(.1)	2.5	(.1)	2.5	(.1)	2.2	(.1)
Nitrate-Nitrite as N	mg/L	ND	(.03)	1.2	(.03)	ND	(.03)	ND	(.03)
Sulfate	mg/L	ND	(.05)	500	(.5)	1100	(1)	870	(.5)
Bulk chemistry									
Total organic carbon	mg/L	120	(2)	18	(1)	17	(1)	25	(1)
Total phenolics	mg/L	.017	@ (.005)	.18	(.005)	.11	(.005)	.1	(.005)
Elements by AA									
Cadmium	mg/L	ND	(.0006)	ND	(.0006)	ND	(.0006)	ND	(.0006)
Lead	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Elements by ICPES or AA									
Aluminum	mg/L	ND	(.2)	.23	@ (.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Barium	mg/L	ND	(.01)	.067	(.01)	.053	(.01)	.027	@ (.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	.94	@ (.6)	ND	(.6)	ND	(.6)
Calcium	mg/L	ND	(1)	32	(1)	220	(1)	190	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	.42	(.04)	.098	@ (.04)	ND	(.04)
Magnesium	mg/L	ND	(1)	4.9	@ (1)	150	(1)	160	(1)
Manganese	mg/L	ND	(.01)	.019	@ (.01)	.2	(.01)	.26	(.01)

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

C1-1

Table G-3
(Continued)

G-24

		Site ID / Location ID Sample ID Preparation Method Log Date							
Parameter	Units	OH / OHBLNK BLANK-3 N 6/03/90		OH / OHMW01 OH070 N 6/03/90		OH / OHMW02 OH071 N 6/03/90		OH / OHMW03 OH072 N 6/03/90	
Molybdenum	mg/L	ND	(.05)	ND	(.05)	ND	(.05)	ND	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Phosphorus	mg/L	ND	(.3)	ND	(.3)	ND	(.3)	ND	(.3)
Potassium	mg/L	ND	(3)	8 @	(3)	8.2 @	(3)	5.9 @	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	NA		2.9 @	(1)	5.11	(1)	5.35	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	ND	(1)	680	(1)	200	(1)	93	(1)
Strontium	mg/L	ND	(.003)	.65	(.003)	1.4	(.003)	.58	(.003)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	2.1	(5)	2270	(5)	1920	(5)	1680	(5)
Redox (Eh)	mV	83	( )	-113.4	( )	-6	( )	2.8	( )
TDS	mg/L	ND	(.5)	1260	(.5)	1259	(.5)	946	(.5)
Temperature	degrees C	25	( )	11.1	( )	11.1	( )	13.8	( )
Total Alkalinity	meq/L	ND	(2)	10.554	(2)	12.193	(2)	9.997 @	(2)
Total suspended solids	mg/L	ND	(.5)	NA		NA		NA	
pH	pH units	5.76	( )	9.21	( )	7.15	( )	7.01	( )

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

C1-2

Table G-3

(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
		OH / OHMW03 OH072D Dup of OH072 N 6/03/90		OH / OHMW04 OH073 N 6/03/90		OH / OHMW05 OH074 N 6/03/90		OH / OHMW06 OH075 N 6/03/90	
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Anions									
Ammonia as N	mg/L	.6	(.02)	1.8	(.02)	1.7	(.02)	.96	(.04)
Chloride	mg/L	38	(.1)	200	(.4)	180	(.2)	55	(.1)
Fluoride	mg/L	2.2	(.1)	2.4	(.1)	2.6	(.1)	1.6	(.1)
Nitrate-Nitrite as N	mg/L	ND	(.03)	.81	(.03)	.76	(.03)	.61	(.03)
Sulfate	mg/L	840	(.5)	330	(.5)	140	(.25)	460	(.5)
Bulk chemistry									
Total organic carbon	mg/L	8.1	(1)	14	(1)	82	(2)	30	(1)
Total phenolics	mg/L	.085	(.005)	.21	(.005)	.18	(.005)	.071	(.005)
Elements by AA									
Cadmium	mg/L	ND	(.0006)	ND	(.0006)	ND	(.0006)	ND	(.0006)
Lead	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.005)	.011 @	(.005)	.0059 @	(.005)	ND	(.005)
Barium	mg/L	.029 @	(.01)	.015 @	(.01)	.039 @	(.01)	.057	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	.88 @	(.6)	.95 @	(.6)	ND	(.6)
Calcium	mg/L	200	(1)	11	(1)	21	(1)	130	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	.076 @	(.04)	ND	(.04)
Magnesium	mg/L	170	(1)	3.7 @	(1)	13	(1)	73	(1)
Manganese	mg/L	.27	(.01)	.053	(.01)	.017 @	(.01)	.9	(.01)

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

C1-3

G-25

Table G-3

(Continued)

		Site ID / Location ID Sample ID Preparation Method Log Date							
		OH / OHMW03 OH072D Dup of OH072 N 6/03/90		OH / OHMW04 OH073 N 6/03/90		OH / OHMW05 OH074 N 6/03/90		OH / OHMW06 OH075 N 6/03/90	
Parameter	Units								
Molybdenum	mg/L	ND	(.05)	.43	(.05)	ND	(.05)	ND	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	.021 @	(.02)
Phosphorus	mg/L	ND	(.3)	ND	(.3)	ND	(.3)	ND	(.3)
Potassium	mg/L	6.3 @	(3)	7.8 @	(3)	7.6 @	(3)	8.2 @	(3)
Selenium	mg/L	ND	(.005)	.0088 @	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	5.7	(1)	1.66 @	(1)	2.86 @	(1)	4.08 @	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	99	(1)	570	(1)	460	(1)	150	(1)
Strontium	mg/L	.62	(.003)	.25	(.003)	.58	(.003)	1	(.003)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	1640	(5)	1940	(5)	1600	(5)	1200	(5)
Redox (Eh)	mV	-.4	( )	-68.1	( )	-65.2	( )	-21.2	( )
TDS	mg/L	1034	(.5)	875	(.5)	757	(.5)	679	(.5)
Temperature	degrees C	12.4	( )	12.2	( )	11.8	( )	13.2	( )
Total Alkalinity	meq/L	9.915 @	(2)	14.242	(2)	14.996	(2)	8.112 @	(2)
pH	pH units	7.12	( )	8.33	( )	8.21	( )	7.53	( )

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

C1-4

Table G-3

(Continued)

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
Parameter	Units	OH / OHMW07		OH / OHMW08		OH / OHLY07		OH / OHLY10	
		OH076		OH077		OH084		OH087	
		N		N		N		N	
		6/03/90		6/03/90		6/03/90		6/03/90	
-----	-----	-----		-----		-----		-----	
Anions									
Ammonia as N	mg/L	2.3	(.02)	.46	(.02)	NA		NA	
Chloride	mg/L	4.2	(.02)	3.3	(.02)	NA		NA	
Fluoride	mg/L	1.1	(.1)	1.2	(.1)	NA		NA	
Nitrate-Nitrite as N	mg/L	1.4	(.03)	ND	(.03)	NA		NA	
Sulfate	mg/L	240	(.25)	470	(.5)	NA		NA	
Bulk chemistry									
Total organic carbon	mg/L	5.8	(1)	40	(1)	NA		NA	
Total phenolics	mg/L	.026	(.005)	.02 @	(.005)	NA		NA	
Elements by AA									
Cadmium	mg/L	ND	(.0006)	ND	(.0006)	ND	(.0006)	ND	(.0006)
Lead	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	.21 @	(.2)
Arsenic	mg/L	ND	(.005)	ND	(.005)	.0087 @	(.005)	.034	(.005)
Barium	mg/L	.098	(.01)	.021 @	(.01)	.054	(.01)	.014 @	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	1.1 @	(.6)	ND	(.6)
Calcium	mg/L	120	(1)	80	(1)	490	(1)	6.7	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	.015 @	(.01)	.023 @	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	.14 @	(.04)	.059 @	(.04)	ND	(.04)	ND	(.04)
Magnesium	mg/L	ND	(1)	50	(1)	ND	(1)	ND	(1)
Manganese	mg/L	ND	(.01)	.11	(.01)	ND	(.01)	ND	(.01)

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

C1-5

Table G-3
(Continued)

G-28

		Site ID / Location ID Sample ID Preparation Method Log Date							
Parameter	Units	OH / OHMW07 OH076 N 6/03/90		OH / OHMW08 OH077 N 6/03/90		OH / OHLY07 OH084 N 6/03/90		OH / OHLY10 OH087 N 6/03/90	
		-----		-----		-----		-----	
Molybdenum	mg/L	.075 @	(.05)	.12 @	(.05)	.59	(.05)	1.4	(.05)
Nickel	mg/L	ND	(.02)	.17	(.02)	ND	(.02)	ND	(.02)
Phosphorus	mg/L	ND	(.3)	ND	(.3)	ND	(.3)	ND	(.3)
Potassium	mg/L	18	(3)	9.9 @	(3)	420	(3)	3800	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	.01 @	(.01)	ND	(.005)
Silicon	mg/L	3.3 @	(1)	3.0 @	(1)	63.6	(1)	328	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	170	(1)	130	(1)	82	(1)	580	(1)
Strontium	mg/L	.85	(.003)	1.9	(.003)	3.7	(.003)	.79	(.003)
Vanadium	mg/L	ND	(.02)	ND	(.02)	.04 @	(.02)	.062 @	(.02)
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	.02 @	(.02)
Field measurements									
Conductivity	umhos/cm	1800	(5)	890	(5)	NA	(5)	NA	(5)
Redox (Eh)	mV	-270.7	( )	52.6	( )	-178.7	( )	-309.9	( )
TDS	mg/L	447	(.5)	525	(.5)	NA	( )	NA	( )
Temperature	degrees C	14.2	( )	10.3	( )	NA	( )	16.2	( )
Total Alkalinity	meq/L	7.867 @	(2)	4.163 @	(2)	NA		NA	
pH	pH units	12.42	( )	8.1	( )	10.23	( )	12.8	( )

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

Table G-3

(Continued)

		Site ID / Location ID					
		Sample ID					
		Preparation Method					
		Log Date					
		OH / OHLY12		OH / OHLY16		OH / OHSW-N	
		OH089		OH093		OH094	
		N		N		N	
Parameter	Units	6/03/90		6/03/90		6/03/90	
-----	-----	-----		-----		-----	
Anions							
Ammonia as N	mg/L	NA		NA		.032 @	(.02)
Chloride	mg/L	NA		660	(2)	1.8	(.02)
Fluoride	mg/L	NA		3	(.1)	.5	(.1)
Nitrate-Nitrite as N	mg/L	NA		ND	(.03)	2.9	(.03)
Sulfate	mg/L	NA		1800	(5)	20	(.05)
Bulk chemistry							
Total organic carbon	mg/L	NA		NA		17	(1)
Total phenolics	mg/L	NA		NA		.007 @	(.005)
Elements by AA							
Cadmium	mg/L	ND	(.0006)	ND	(.0006)	ND	(.0006)
Lead	mg/L	ND	(.002)	ND	(.002)	ND	(.002)
Elements by ICPES or AA							
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.005)	.01 @	(.005)	.017 @	(.005)
Barium	mg/L	.043 @	(.01)	.027 @	(.01)	.013 @	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)
Calcium	mg/L	240	(1)	570	(1)	41	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	.01 @	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	.048 @	(.04)
Magnesium	mg/L	ND	(1)	2 @	(1)	1.2 @	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)

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

C1-7

Table G-3

(Continued)

		Site ID / Location ID					
		Sample ID					
		Preparation Method					
		Log Date					
Parameter	Units	OH / OHLY12		OH / OHLY16		OH / OHSW-N	
		OH089		OH093		OH094	
		N		N		N	
		6/03/90		6/03/90		6/03/90	
Molybdenum	mg/L	.5	(.05)	.56	(.05)	ND	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)
Phosphorus	mg/L	ND	(.3)	ND	(.3)	ND	(.3)
Potassium	mg/L	880	(3)	590	(3)	3 @	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	65.2	(1)	54.3	(1)	2.19 @	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	130	(1)	250	(1)	1.1 @	(1)
Strontium	mg/L	5.2	(.003)	4.1	(.003)	.11	(.003)
Vanadium	mg/L	.02 @	(.02)	.036 @	(.02)	ND	(.02)
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements							
Conductivity	umhos/cm	NA	(5)	4200	(5)	200	(5)
Redox (Eh)	mV	-1865	( )	-156.4	( )	-58.4	( )
TDS	mg/L	NA	( )	NA	( )	58	(.5)
Temperature	degrees C	17.5	( )	17.3	( )	20.4	( )
Total Alkalinity	meq/L	NA		ND	(2)	ND	(2)
Total suspended solids	mg/L	NA		NA	(.5)	4	(.5)
pH	pH units	10.31	( )	9.84	( )	8.12	( )

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

Table G-4

Chemical Characteristics of Liquid From Ohio, Event 4

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
Parameter	Units	OH / OHBLNK		OH / OHMW01		OH / OHMW02		OH / OHMW02	
		BLANK-4		OH100		OH101		OH101D Dup of OH101	
		N		N		N		N	
		8/05/90		8/05/90		8/05/90		8/05/90	
-----	-----	-----		-----		-----		-----	
Anions									
Ammonia as N	mg/L	ND	(.01)	2.5	(.02)	1.2	(.01)	1.2	(.01)
Chloride	mg/L	ND	(.02)	130	(.2)	53	(.2)	52	(.2)
Fluoride	mg/L	ND	(.1)	2.8	(.1)	1.9	(.2)	2.4	(.1)
Nitrate-Nitrite as N	mg/L	ND	(.03)	ND	(.3)	ND	(.3)	ND	(.3)
Sulfate	mg/L	ND	(.05)	890	(1)	1000	(1)	1100	(5)
Bulk chemistry									
Total inorganic carbon	mg CO3/g	ND	(.14745)	NA		NA		NA	
Total organic carbon	mg/L	13	(1)	4.8 @	(1)	22	(1)	14	(1)
Total phenolics	mg/L	ND	(.005)	.15	(.005)	.038	(.005)	ND	(.005)
Elements by ICPES									
Sodium	mg/L	ND	(1)	710	(1)	140	(1)	130	(1)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Elements by ICPES or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Barium	mg/L	ND	(.01)	.047 @	(.01)	.04 @	(.01)	.038 @	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	1 @	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	ND	(1)	17	(1)	220	(1)	220	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	ND	(.04)	ND	(.04)

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

C1-1

Table G-4

(Continued)

Parameter	Units	Site ID / Location ID Sample ID Preparation Method Log Date							
		OH / OHBLNK		OH / OHMW01		OH / OHMW02		OH / OHMW02	
		BLANK-4		OH100		OH101		OH101D Dup of OH101	
		N		N		N		N	
		8/05/90		8/05/90		8/05/90		8/05/90	
Lead	mg/L	.0031 @	(.003)	.0082 @	(.003)	.0063 @	(.003)	.0066 @	(.003)
Magnesium	mg/L	ND	(1)	5.8	(1)	160	(1)	160	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	.2	(.01)	.2	(.01)
Molybdenum	mg/L	ND	(.05)	ND	(.05)	.058 @	(.05)	.073 @	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Phosphorus	mg/L	ND	(.3)	ND	(.3)	ND	(.3)	ND	(.3)
Potassium	mg/L	ND	(3)	7.3 @	(3)	7.3 @	(3)	7.1 @	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	1 @	(1)	3.1 @	(1)	6.1	(1)	6.1	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Strontium	mg/L	ND	(.003)	.56	(.003)	1.1	(.003)	1	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	5	(5)	2770	(5)	2160	(5)	2040	(5)
Redox (Eh)	mV	81.7	( )	-102.4	( )	4.7	( )	5.3	( )
TDS	mg/L	16 @	(10)	2393	(10)	2256	(10)	NA	(10)
Temperature	degrees C	23.1	( )	13.9	( )	16.1	( )	14.5	( )
Total Alkalinity	meq/L	.09833	(2)	12.75054	(2)	10.52165	(2)	10.47249	(2)
Total suspended solids	mg/L	4 @	(2)	NA	(2)	NA	(2)	NA	(2)
pH	pH units	5.9	( )	8.93	( )	7.1	( )	7.1	( )

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

C1-2

G-32

Table G-4

(Continued)

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
		OH / OHMW03		OH / OHMW04		OH / OHMW05		OH / OHMW06	
		OH102		OH103		OH104		OH105	
		N		N		N		N	
Parameter	Units	8/05/90		8/05/90		8/05/90		8/05/90	
-----	-----	-----		-----		-----		-----	
Anions									
Ammonia as N	mg/L	.66	(.01)	1.8	(.01)	2.1	(.02)	.97	(.01)
Chloride	mg/L	45	(.2)	230	(.4)	180	(.2)	85	(.2)
Fluoride	mg/L	1.7	(.2)	2.3	(.2)	2.1	(.1)	1.4	(.1)
Nitrate-Nitrite as N	mg/L	ND	(.06)	1.3	(.06)	.9	(.03)	.71	(.03)
Sulfate	mg/L	860	(.5)	200	(.5)	160	(.5)	490	(.5)
Bulk chemistry									
Total organic carbon	mg/L	4.6 @	(1)	3.2 @	(1)	1.5 @	(1)	6.8	(1)
Total phenolics	mg/L	.015 @	(.005)	.17	(.005)	.13	(.005)	.037	(.005)
Elements by ICPEs									
Sodium	mg/L	100	(1)	580	(1)	450	(1)	180	(1)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Barium	mg/L	.028 @	(.01)	.015 @	(.01)	.032 @	(.01)	.059	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	1 @	(.6)	1 @	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	190	(1)	10	(1)	20	(1)	140	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	.011 @	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	.14 @	(.04)	.061 @	(.04)	ND	(.04)
Lead	mg/L	.0076 @	(.003)	.0092 @	(.003)	.0092 @	(.003)	.013 @	(.003)

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

C1-3

Table G-4

(Continued)

Parameter	Units	Site ID / Location ID			
		Sample ID		Preparation Method	
		Log Date		Log Date	
		OH / OHMW03 OH102 N	OH / OHMW04 OH103 N	OH / OHMW05 OH104 N	OH / OHMW06 OH105 N
		8/05/90	8/05/90	8/05/90	8/05/90
Magnesium	mg/L	160 (1)	4.8 @ (1)	12 (1)	90 (1)
Manganese	mg/L	.24 (.01)	.027 @ (.01)	ND (.01)	.78 (.01)
Molybdenum	mg/L	.061 @ (.05)	ND (.05)	ND (.05)	.051 @ (.05)
Nickel	mg/L	ND (.02)	.023 @ (.02)	ND (.02)	.051 @ (.02)
Phosphorus	mg/L	ND (.3)	ND (.3)	ND (.3)	ND (.3)
Potassium	mg/L	6.4 @ (3)	5.6 @ (3)	6.8 @ (3)	9.4 @ (3)
Selenium	mg/L	ND (.005)	ND (.005)	ND (.005)	ND (.005)
Silicon	mg/L	6.6 (1)	3.2 @ (1)	3.4 @ (1)	4.6 @ (1)
Silver	mg/L	ND (.01)	ND (.01)	ND (.01)	ND (.01)
Strontium	mg/L	.57 (.003)	.3 (.003)	.52 (.003)	1.2 (.003)
Tin	mg/L	ND (.6)	ND (.6)	ND (.6)	ND (.6)
Zinc	mg/L	ND (.02)	ND (.02)	ND (.02)	ND (.02)
Field measurements					
Conductivity	umhos/cm	1930 (5)	2120 (5)	1830 (5)	1640 (5)
Redox (Eh)	mV	8.7 (1)	-52.2 (1)	-54.5 (1)	-1.9 (1)
TDS	mg/L	1966 (10)	1778 (10)	1429 (10)	1494 (10)
Temperature	degrees C	17.1 (1)	13.2 (1)	17.8 (1)	15.5 (1)
Total Alkalinity	meq/L	9.98082 @ (2)	18.35554 (2)	15.35637 (2)	11.86554 (2)
pH	pH units	7.04 (1)	8.1 (1)	8.13 (1)	7.14 (1)

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

CI-4

Table G-4
(Continued)

G-35

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
		OH / OHMW07		OH / OHMW08		OH / OHLY01		OH / OHLY02	
		OH106		OH107		OH108		OH109	
		N		N		N		N	
Parameter	Units	8/05/90		8/05/90		8/05/90		8/05/90	
-----	-----	-----		-----		-----		-----	
Anions									
Ammonia as N	mg/L	2.2	(.02)	.045 @	(.01)	NA		.26	(.01)
Chloride	mg/L	3.8	(.04)	3.1	(.02)	310	(1)	1800	(2)
Fluoride	mg/L	.93 @	(.2)	1.1	(.1)	2.9	(.2)	7.3	(.5)
Nitrate-Nitrite as N	mg/L	1	(.06)	4	(.06)	4.2	(.15)	45	(.3)
Sulfate	mg/L	320	(.5)	580	(.5)	2200	(5)	3400	(5)
Bulk chemistry									
Total organic carbon	mg/L	4 @	(1)	5.5	(1)	NA		8.3	(1)
Total phenolics	mg/L	ND	(.005)	ND	(.005)	NA		1.6	(.02)
Elements by ICPES									
Sodium	mg/L	150	(1)	130	(1)	570	(1)	450	(1)
Vanadium	mg/L	ND	(.02)	ND	(.02)	.052 @	(.02)	.11	(.02)
Elements by ICPES or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	.005 @	(.005)	ND	(.005)	.029	(.005)	.116	(.005)
Barium	mg/L	.072	(.01)	.019 @	(.01)	.035 @	(.01)	.04 @	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	.72 @	(.6)	4.1	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	110	(1)	100	(1)	250	(1)	470	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	.012 @	(.01)	.034 @	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	.09 @	(.04)	ND	(.04)	.049 @	(.04)	ND	(.04)
Lead	mg/L	.0044 @	(.003)	.0058 @	(.003)	.014 @	(.003)	.019	(.003)

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

Table G-4

(Continued)

		Site ID / Location ID Sample ID Preparation Method Log Date							
Parameter	Units	OH / OHMW07 OH106 N 8/05/90		OH / OHMW08 OH107 N 8/05/90		OH / OHLY01 OH108 N 8/05/90		OH / OHLY02 OH109 N 8/05/90	
Magnesium	mg/L	ND	(1)	55	(1)	1.8 @	(1)	5	(1)
Manganese	mg/L	ND	(.01)	.11	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	.078 @	(.05)	.096 @	(.05)	1.3	(.05)	1.8	(.05)
Nickel	mg/L	ND	(.02)	1.7	(.02)	ND	(.02)	ND	(.02)
Phosphorus	mg/L	ND	(.3)	ND	(.3)	ND	(.6)	ND	(.6)
Potassium	mg/L	14 @	(3)	8.6 @	(3)	690	(3)	2500	(30)
Selenium	mg/L	ND	(.005)	ND	(.005)	.041	(.005)	.152	(.005)
Silicon	mg/L	4.1 @	(1)	4 @	(1)	71	(1)	46	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Strontium	mg/L	.69	(.003)	2.2	(.003)	5.3	(.003)	1.6	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Zinc	mg/L	ND	(.02)	ND	(.02)	.13	(.02)	.13	(.02)
Field measurements									
Conductivity	umhos/cm	1755	(5)	1240	(5)	5500	(5)	13000	(5)
Redox (Eh)	mV	-275.8	( )	-22.5	( )	-125.4	( )	-75.4	( )
TDS	mg/L	817	(10)	1194	(10)	NA	(10)	9823	(10)
Temperature	degrees C	13.8	( )	15.1	( )	23.5	( )	24.5	( )
Total Alkalinity	meq/L	6.58832 @	(2)	5.08055 @	(2)	1.86833	(2)	.44249	(2)
pH	pH units	12.09	( )	7.53	( )	9.32	( )	8.5	( )

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

C1-6

G-36

Table G-4

(Continued)

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
		OH / OHLY04		OH / OHLY07		OH / OHLY08		OH / OHLY11	
		OH111		OH114		OH115		OH118	
		N		N		N		N	
Parameter	Units	8/04/90		8/04/90		8/04/90		8/04/90	
-----	-----	-----		-----		-----		-----	
Anions									
Ammonia as N	mg/L	.8	(.01)	NA		NA		3.3	(.05)
Chloride	mg/L	3600	(10)	87	(.2)	2100	(4)	2000	(4)
Fluoride	mg/L	18	(1)	2.2	(.1)	7.6	(.5)	7.7	(.5)
Nitrate-Nitrite as N	mg/L	25	(.3)	6.4	(.3)	30	(.3)	13	(.15)
Sulfate	mg/L	8000	(5)	1800	(10)	3500	(10)	4100	(5)
Bulk chemistry									
Total organic carbon	mg/L	89	(1)	NA		NA		2.2 @	(1)
Total phenolics	mg/L	2.7	(.08)	NA		NA		1.2	(.04)
Elements by ICPES									
Sodium	mg/L	1900	(20)	82	(1)	580	(1)	840	(1)
Vanadium	mg/L	.18	(.02)	.032 @	(.02)	.037 @	(.02)	.16	(.02)
Elements by ICPES or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	.176	(.005)	.009 @	(.005)	.031	(.005)	.021 @	(.005)
Barium	mg/L	.018 @	(.01)	.043 @	(.01)	.034 @	(.01)	.04 @	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	.61 @	(.6)	1.2 @	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	.0017 @	(.001)	.0024 @	(.001)	ND	(.001)
Calcium	mg/L	7.6	(1)	380	(1)	410	(1)	500	(1)
Chromium	mg/L	.058	(.01)	ND	(.01)	.028 @	(.01)	.029 @	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	.11	(.02)	ND	(.02)	.13	(.02)	ND	(.02)
Iron	mg/L	.45	(.04)	.045 @	(.04)	.12 @	(.04)	ND	(.04)
Lead	mg/L	.045	(.006)	.028	(.003)	.081	(.006)	.013 @	(.003)

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

C1-7

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Table G-4

(Continued)

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
Parameter	Units	OH / OHLY04		OH / OHLY07		OH / OHLY08		OH / OHLY11	
		OH111		OH114		OH115		OH118	
		N		N		N		N	
		8/04/90		8/04/90		8/04/90		8/04/90	
Magnesium	mg/L	ND	(1)	ND	(1)	20	(1)	ND	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	2.6	(.05)	.55	(.05)	.84	(.05)	3.9	(.05)
Nickel	mg/L	.14	(.02)	ND	(.02)	.32	(.02)	ND	(.02)
Phosphorus	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.3)
Potassium	mg/L	8200	(60)	400	(3)	2200	(30)	3000	(30)
Selenium	mg/L	.154	(.005)	.026	(.005)	.09	(.005)	.068	(.005)
Silicon	mg/L	1060	(1)	70	(1)	45	(1)	76	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Strontium	mg/L	.3	(.003)	3.5	(.003)	2.6	(.003)	5.8	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Zinc	mg/L	.25	(.02)	.028 @	(.02)	.29	(.02)	.049 @	(.02)
Field measurements									
Conductivity	umhos/cm	28000	(5)	3800	(5)	12000	(5)	15000	(5)
Redox (Eh)	mV	-234.1	( )	-159.3	( )	-109.2	( )	-139.1	( )
TDS	mg/L	26928	(10)	NA	(10)	NA	(10)	10587	(10)
Temperature	degrees C	21.7	( )	25.3	( )	22.7	( )	21.4	( )
Total Alkalinity	meq/L	37.35024	(2)	1.67166	(2)	.81944	(2)	1.42583	(2)
pH	pH units	11.28	( )	9.95	( )	9.16	( )	9.65	( )

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

C1-8

Table G-4
(Continued)

G-39

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
		OH / OHLY12		OH / OHLY13		OH / OHLY14		OH / OHLY16	
		OH119		OH120		OH121		OH123	
		N		N		N		N	
Parameter	Units	8/04/90		8/04/90		8/04/90		8/04/90	

Anions									
Ammonia as N	mg/L	NA		5.4	(.05)	7.4	(.1)	NA	
Chloride	mg/L	610	(2)	1900	(4)	1900	(4)	730	(4)
Fluoride	mg/L	3.3	(.5)	8.5	(.5)	9.3	(.5)	3.7	(.5)
Nitrate-Nitrite as N	mg/L	4.9	(.15)	14	(.15)	17	(.15)	6.8	(.3)
Sulfate	mg/L	1800	(5)	4100	(5)	4600	(5)	2100	(10)
Bulk chemistry									
Total organic carbon	mg/L	NA		3 @	(1)	8.2	(1)	NA	
Total phenolics	mg/L	NA		1.4	(.02)	1.6	(.02)	NA	
Elements by ICPEs									
Sodium	mg/L	200	(1)	670	(1)	1800	(10)	300	(1)
Vanadium	mg/L	.032 @	(.02)	.053 @	(.02)	.17	(.02)	.031 @	(.02)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	.006 @	(.005)	.008 @	(.005)	.052	(.005)	.011 @	(.005)
Barium	mg/L	.048 @	(.01)	.038 @	(.01)	.036 @	(.01)	.038 @	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	.002 @	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	250	(1)	93	(1)	460	(1)	480	(1)
Chromium	mg/L	.013 @	(.01)	.011 @	(.01)	.041 @	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	.031	(.003)	.027	(.003)	.021	(.003)	.018	(.003)

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

Table G-4
(Continued)

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		Site ID / Location ID Sample ID Preparation Method Log Date							
Parameter	Units	OH / OHLY12 OH119 N 8/04/90		OH / OHLY13 OH120 N 8/04/90		OH / OHLY14 OH121 N 8/04/90		OH / OHLY16 OH123 N 8/04/90	
Magnesium	mg/L	ND	(1)	ND	(1)	1.5 @	(1)	ND	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	.86	(.05)	1.4	(.05)	3.8	(.05)	.66	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Phosphorus	mg/L	ND	(.6)	ND	(.3)	ND	(.3)	ND	(.6)
Potassium	mg/L	1200	(30)	4200	(30)	1800	(30)	850	(3)
Selenium	mg/L	ND	(.005)	.019 @	(.005)	.055	(.005)	.011 @	(.005)
Silicon	mg/L	66	(1)	126	(1)	63	(1)	66	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Strontium	mg/L	5.7	(.003)	4.6	(.003)	5.5	(.003)	4.2	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Zinc	mg/L	.085 @	(.02)	ND	(.02)	.036 @	(.02)	.022 @	(.02)
Field measurements									
Conductivity	umhos/cm	5600	(5)	16500	(5)	13500	(5)	5200	(5)
Redox (Eh)	mV	-164.1	( )	-264.5	( )	-118.5	( )	-180.5	( )
TDS	mg/L	NA	(10)	11666	(10)	10961	(10)	NA	(10)
Temperature	degrees C	23	( )	19	( )	20.8	( )	18.7	( )
Total Alkalinity	meq/L	1.31111	(2)	13.70109	(2)	1.50777	(2)	2.91721 @	(2)
pH	pH units	10.02	( )	11.88	( )	9.24	( )	10.36	( )

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

C1-10

Table G-4

(Continued)

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
		OH / OHSW-N		OH / OHSW-S		OH / OHLY17			
		OH124		OH126		OH128			
		N		N		N			
Parameter	Units	8/04/90		8/04/90		8/04/90			
-----	-----	-----		-----		-----			
Anions									
Ammonia as N	mg/L	.029	@ (.01)	.049	@ (.01)	2.8		(.05)	
Chloride	mg/L	.6	(.02)	5.4	(.04)	1100		(4)	
Fluoride	mg/L	.71	(.1)	.98	@ (.2)	5.8		(1)	
Nitrate-Nitrite as N	mg/L	ND	(.03)	5.4	(.06)	11		(.3)	
Sulfate	mg/L	450	(.25)	56	(.1)	3300		(10)	
Bulk chemistry									
Total organic carbon	mg/L	2.4	@ (.1)	40	(1)	2.6	@	(1)	
Total phenolics	mg/L	ND	(.005)	ND	(.005)	.7		(.02)	
Elements by ICPEs									
Sodium	mg/L	ND	(1)	3.8	@ (1)	560		(1)	
Vanadium	mg/L	ND	(.02)	ND	(.02)	.066	@	(.02)	
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	.52	@ (.2)	ND		(.2)	
Arsenic	mg/L	.041	(.005)	ND	(.005)	.006	@	(.005)	
Barium	mg/L	.019	@ (.01)	.016	@ (.01)	.038	@	(.01)	
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND		(.002)	
Boron	mg/L	ND	(.6)	ND	(.6)	ND		(.6)	
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND		(.001)	
Calcium	mg/L	180	(1)	48	(1)	360		(1)	
Chromium	mg/L	ND	(.01)	ND	(.01)	.021	@	(.01)	
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND		(.01)	
Copper	mg/L	ND	(.02)	ND	(.02)	ND		(.02)	
Iron	mg/L	ND	(.04)	.52	(.04)	ND		(.04)	
Lead	mg/L	ND	(.003)	.008	@ (.003)	.01	@	(.003)	

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

Table G-4

(Continued)

		Site ID / Location ID Sample ID Preparation Method Log Date					
Parameter	Units	OH / OHSW-N OH124 N 8/04/90		OH / OHSW-S OH126 N 8/04/90		OH / OHLY17 OH128 N 8/04/90	
		-----		-----		-----	
Magnesium	mg/L	ND	(1)	4.1 @	(1)	ND	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	ND	(.05)	ND	(.05)	2.1	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)
Phosphorus	mg/L	ND	(.3)	ND	(.3)	ND	(.3)
Potassium	mg/L	3.7 @	(3)	3.6 @	(3)	2000	(30)
Selenium	mg/L	.007 @	(.005)	ND	(.005)	.05	(.005)
Silicon	mg/L	2.2 @	(1)	5.1	(1)	88	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)
Strontium	mg/L	.22	(.003)	.097	(.003)	5.5	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements							
Conductivity	umhos/cm	850	(5)	350	(5)	9100	(5)
Redox (Eh)	mV	-42.8	( )	-41.2	( )	-171.6	( )
TDS	mg/L	757	(10)	289	(10)	7515	(10)
Temperature	degrees C	22.2	( )	23.9	( )	20.9	( )
Total Alkalinity	meq/L	.70472	(2)	1.49138	(2)	NA	
Total suspended solids	mg/L	10	(2)	21890	(2)	NA	(2)
pH	pH units	8.14	( )	7.78	( )	10.17	( )

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

C1-12

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Table G-5

Chemical Characteristics of Liquid From Ohio, Event 5

Parameter	Units	Site ID / Location ID							
		Sample ID				Log Date			
		OH / OHBLNK		OH / OHMW01		OH / OHMW02		OH / OHMW03	
		BLANK-5		OH130		OH131		OH132	
		11/26/90		11/25/90		11/25/90		11/25/90	
Anions									
Ammonia as N	mg/L	.074 @	(.05)	2	(.06)	1.3	(.06)	.63	(.06)
Chloride	mg/L	ND	(.02)	120	(.2)	55	(.2)	46	(.2)
Fluoride	mg/L	ND	(.1)	3.2	(.1)	2.6	(.1)	2.3	(.1)
Nitrate-Nitrite as N	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Sulfate	mg/L	ND	(.05)	860	(.5)	980	(1)	810	(.5)
Bulk chemistry									
Total organic carbon	mg/L	2.1 @	(1)	11	(1)	3.8 @	(1)	7.2	(1)
Total phenolics	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Barium	mg/L	ND	(.01)	.048 @	(.01)	.049 @	(.01)	.029 @	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	1.1 @	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	ND	(1)	11	(1)	240	(1)	210	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	.021 @	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	.0064 @	(.003)	.0037 @	(.003)	.0078 @	(.003)	.0066 @	(.003)
Magnesium	mg/L	ND	(1)	6.6	(1)	180	(1)	170	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	.23	(.01)	.24	(.01)
Molybdenum	mg/L	ND	(.05)	ND	(.05)	ND	(.05)	ND	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Phosphorus	mg/L	ND	(.3)	ND	(.3)	.56 @	(.3)	.7 @	(.3)
Potassium	mg/L	ND	(3)	9.6 @	(3)	8.4 @	(3)	6.4 @	(3)

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

Table G-5

(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID				Log Date			
		OH / OHBLNK		OH / OHMW01		OH / OHMW02		OH / OHMW03	
		BLANK-5		OH130		OH131		OH132	
		11/26/90		11/25/90		11/25/90		11/25/90	
Elements by ICPE or AA, cont.									
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	ND	(1)	2.9 @	(1)	6.6	(1)	6.4	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	.025 @	(.01)	ND	(.01)
Sodium	mg/L	ND	(1)	740	(1)	160	(1)	100	(1)
Strontium	mg/L	ND	(.003)	.42	(.003)	1.2	(.003)	.62	(.003)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	1.3	(5)	2380	(5)	1850	(5)	1550	(5)
Redox (Eh)	mV	246.8	( )	-142.4	( )	-20.9	( )	-7.7	( )
TDS	mg/L	ND	(2)	1948	(2)	2022	(2)	1512	(2)
Temperature	degrees C	13.7	( )	12.5	( )	11.9	( )	10.6	( )
Total Alkalinity	meq/L	.024	(2)	12.84	(2)	10.88	(2)	9.92 @	(2)
pH	pH units	6.23	( )	9.55	( )	6.62	( )	6.87	( )

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

C1-2

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Table G-5

(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID				Log Date			
		OH / OHMW04		OH / OHMW05		OH / OHMW06		OH / OHMW07	
		OH133		OH134		OH135		OH136	
		11/01/90		11/26/90		11/26/90		11/26/90	
Anions									
Ammonia as N	mg/L	2	(.055)	2.2	(.055)	.54	(.05)	2.2	(.06)
Chloride	mg/L	210	(.4)	170	(.2)	140	(.2)	4.3	(.02)
Fluoride	mg/L	3	(.1)	2.1	(.1)	1.5	(.1)	1.1	(.1)
Nitrate-Nitrite as N	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Sulfate	mg/L	170	(.5)	160	(.5)	420	(.5)	260	(.5)
Bulk chemistry									
Total organic carbon	mg/L	3.5 @	(1)	4 @	(1)	3.5 @	(1)	3 @	(1)
Total phenolics	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	.0052 @	(.005)
Barium	mg/L	.052	(.01)	.043 @	(.01)	.065	(.01)	.072	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	1.2 @	(.6)	1.3 @	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	11	(1)	23	(1)	170	(1)	110	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	.012 @	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	.14 @	(.04)	.074 @	(.04)	.3	(.04)	.078 @	(.04)
Lead	mg/L	.0047 @	(.003)	.0093 @	(.003)	.0073 @	(.003)	.008 @	(.003)
Magnesium	mg/L	5	(1)	11	(1)	98	(1)	ND	(1)
Manganese	mg/L	.011 @	(.01)	ND	(.01)	1.1	(.01)	ND	(.01)
Molybdenum	mg/L	ND	(.05)	ND	(.05)	ND	(.05)	.054 @	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	.026 @	(.02)	ND	(.02)
Phosphorus	mg/L	ND	(.3)	ND	(.3)	ND	(.3)	ND	(.3)
Potassium	mg/L	6.3 @	(3)	7.8 @	(3)	8.5 @	(3)	13 @	(3)

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

C1-3

G-45

Table G-5

(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID				Log Date			
		OH / OHMW04		OH / OHMW05		OH / OHMW06		OH / OHMW07	
		OH133		OH134		OH135		OH136	
		11/01/90		11/26/90		11/26/90		11/26/90	

Elements by ICPEs or AA, cont.									
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	3.4 @	(1)	3.7 @	(1)	5.1	(1)	4.7 @	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	610	(1)	490	(1)	160	(1)	160	(1)
Strontium	mg/L	.3	(.003)	.63	(.003)	1.1	(.003)	.75	(.003)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	.031 @	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	1790	(5)	1660	(5)	1520	(5)	1390	(5)
Redox (Eh)	mV	-140.5	( )	-50.2	( )	10.4	( )	-227.3	( )
TDS	mg/L	1546	(2)	1148	(2)	1306	(2)	700	(2)
Temperature	degrees C	13.3	( )	13.3	( )	14.4	( )	12.6	( )
Total Alkalinity	meq/L	18.64	(2)	15.68	(2)	10.12	(2)	6.24 @	(2)
pH	pH units	9.54	( )	7.91	( )	6.78	( )	12.01	( )

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

Table G-5
(Continued)

		Site ID / Location ID							
		Sample ID							
		Log Date							
		OH / OHMW08		OH / OHLY01		OH / OHLY02		OH / OHLY03	
		OH137		OH138		OH139		OH140	
Parameter	Units	11/26/90		11/24/90		11/26/90		11/24/90	
-----	-----	-----		-----		-----		-----	
Anions									
Ammonia as N	mg/L	.15 @	(.055)	2.6	(.055)	1.5	(.05)	2.4	(.055)
Chloride	mg/L	3.2	(.02)	150	(.2)	1600	(2)	1600	(2)
Fluoride	mg/L	1.2	(.1)	3.8	(.1)	9.7	(1)	9.1	(1)
Nitrate-Nitrite as N	mg/L	.24	(.02)	3.5	(.1)	3.4	(.1)	5.4	(.1)
Sulfate	mg/L	440	(.5)	3200	(5)	5500	(5)	4500	(5)
Bulk chemistry									
Total organic carbon	mg/L	4.2 @	(1)	6.8	(1)	2.1 @	(1)	3.8 @	(1)
Total phenolics	mg/L	ND	(.005)	ND	(.005)	.0068 @	(.005)	.012 @	(.005)
Elements by ICPES or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.005)	.081	(.01)	.08	(.01)	.092	(.01)
Barium	mg/L	.033 @	(.01)	.019 @	(.01)	.034 @	(.01)	.04 @	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	120	(1)	150	(1)	450	(1)	490	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	.68	(.04)	ND	(.04)	.068 @	(.04)	ND	(.04)
Lead	mg/L	.0073 @	(.003)	ND	(.003)	ND	(.003)	ND	(.003)
Magnesium	mg/L	58	(1)	2.7 @	(1)	1.1 @	(1)	3 @	(1)
Manganese	mg/L	.12	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	.069 @	(.05)	1.3	(.05)	1.7	(.05)	2.1	(.05)
Nickel	mg/L	.082 @	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Phosphorus	mg/L	ND	(.3)	ND	(.3)	ND	(.3)	ND	(.3)
Potassium	mg/L	9.3 @	(3)	290	(3)	3400	(30)	3100	(30)

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

Table G-5

(Continued)

Parameter	Units	Site ID / Location ID							
		OH / OHMW08		OH / OHLY01		OH / OHLY02		OH / OHLY03	
		OH137		OH138		OH139		OH140	
		11/26/90		11/24/90		11/26/90		11/24/90	
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Elements by ICPEs or AA, cont.									
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	9	(1)	67	(1)	50	(1)	52	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	.023 @	(.01)	ND	(.01)
Sodium	mg/L	150	(1)	1400	(10)	1200	(10)	930	(1)
Strontium	mg/L	2.4	(.003)	3.2	(.003)	2.2	(.003)	2.1	(.003)
Vanadium	mg/L	ND	(.02)	.092 @	(.02)	.28	(.02)	.16	(.02)
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	1025	(5)	5000	(5)	12500	(5)	11000	(5)
Redox (Eh)	mV	-26.7	( )	-130.9	( )	-120.7	( )	-10.5	( )
TDS	mg/L	1056	(2)	NA		NA		NA	
Temperature	degrees C	13.1	( )	11.5	( )	16.2	( )	15	( )
Total Alkalinity	meq/L	6.36 @	(2)	1.88	(2)	.68	(2)	.92	(2)
pH	pH units	7.45	( )	9.27	( )	9.15	( )	7.3	( )

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

C1-6

G-48

Table G-5
(Continued)

		Site ID / Location ID							
		Sample ID							
		Log Date							
Parameter	Units	OH / OHLY04		OH / OHLY06		OH / OHLY07		OH / OHLY08	
		OH141		OH143		OH144		OH145	
		11/24/90		11/24/90		11/24/90		11/24/90	
Anions									
Ammonia as N	mg/L	.73	(.05)	NA		NA		NA	
Chloride	mg/L	2900	(4)	NA		47	(.2)	920	(2)
Fluoride	mg/L	15	(1)	NA		2.1	(.1)	3.6	(.1)
Nitrate-Nitrite as N	mg/L	.84	(.02)	NA		NA		NA	
Sulfate	mg/L	6000	(10)	NA		1400	(2.5)	2400	(5)
Bulk chemistry									
Total organic carbon	mg/L	16	(1)	NA		NA		NA	
Total phenolics	mg/L	.045	(.005)	NA		NA		NA	
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	.18	(.025)	.012 @	(.005)	.0056 @	(.005)	.026	(.005)
Barium	mg/L	.024 @	(.01)	.068 @	(.01)	.039 @	(.01)	.035 @	(.01)
Beryllium	mg/L	.002 @	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	2.5 @	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	15	(1)	330	(1)	570	(1)	520	(1)
Chromium	mg/L	.034 @	(.01)	.016 @	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	.033 @	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	ND	(.003)	.0044 @	(.003)	.0041 @	(.003)	ND	(.003)
Magnesium	mg/L	ND	(1)	ND	(1)	ND	(1)	34	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	2.4	(.05)	.72	(.05)	.45	(.05)	.78	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Phosphorus	mg/L	ND	(.3)	ND	(.3)	ND	(.3)	ND	(.3)
Potassium	mg/L	6200	(30)	1600	(30)	270	(3)	940	(3)

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

Table G-5

(Continued)

Parameter	Units	Site ID / Location ID							
		OH / OHLY04		OH / OHLY06		OH / OHLY07		OH / OHLY08	
		OH141		OH143		OH144		OH145	
		11/24/90		11/24/90		11/24/90		11/24/90	
-----	-----	-----		-----		-----		-----	
Elements by ICPEs or AA, cont.									
Selenium	mg/L	.0071 @	(.005)	ND	(.005)	ND	(.005)	.0051 @	(.005)
Silicon	mg/L	250	(1)	47	(1)	50	(1)	43	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	1600	(10)	390	(1)	59	(1)	490	(1)
Strontium	mg/L	1	(.003)	3.7	(.003)	2.8	(.003)	3.4	(.003)
Vanadium	mg/L	.24	(.02)	.048 @	(.02)	.036 @	(.02)	.026 @	(.02)
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	21000	(5)	6600	(5)	2270	(5)	5900	(5)
Redox (Eh)	mV	-287.1	( )	-242.8	( )	-201.2	( )	-60.7	( )
Temperature	degrees C	13.5	( )	13.5	( )	12.9	( )	14	( )
Total Alkalinity	meq/L	34.4	(2)	NA		NA		.704	(2)
pH	pH units	12.26	( )	11.45	( )	10.79	( )	8.19	( )

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

C1-8

G-50

Table G-5
(Continued)

		Site ID / Location ID							
		Sample ID							
		Log Date							
Parameter	Units	OH / OHLY10		OH / OHLY11		OH / OHLY12		OH / OHLY13	
		OH147		OH148		OH149		OH150	
		11/25/90		11/25/90		11/25/90		11/25/90	
Anions									
Ammonia as N	mg/L	NA		1.1	(.05)	.5	(.05)	4.8	(.1)
Chloride	mg/L	1100	(2)	1200	(2)	300	(2)	2000	(4)
Fluoride	mg/L	7.2	(1)	6.8	(1)	2.1	(.1)	10	(1)
Nitrate-Nitrite as N	mg/L	NA		.66	(.02)	.17	(.02)	.32	(.02)
Sulfate	mg/L	2600	(5)	3200	(5)	1100	(2.5)	4100	(5)
Bulk chemistry									
Total organic carbon	mg/L	NA		5.1	(1)	3.4 @	(1)	16	(1)
Total phenolics	mg/L	NA		.014 @	(.005)	ND	(.005)	.028	(.005)
Elements by ICPES or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	.068	(.005)	.012 @	(.005)	.025	(.005)	.012 @	(.005)
Barium	mg/L	.039 @	(.01)	.039 @	(.01)	.034 @	(.01)	.042 @	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	.0044 @	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	15	(1)	520	(1)	240	(1)	56	(1)
Chromium	mg/L	.014 @	(.01)	.031 @	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	ND	(.003)	ND	(.003)	ND	(.003)	ND	(.003)
Magnesium	mg/L	ND	(1)	ND	(1)	ND	(1)	ND	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	1.6	(.05)	3.5	(.05)	.54	(.05)	1.6	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Phosphorus	mg/L	ND	(.3)	ND	(.3)	ND	(.3)	ND	(.3)
Potassium	mg/L	2900	(30)	1900	(30)	680	(3)	4200	(30)

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

C1-9

Table G-5

(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID				Log Date			
		OH / OHLY10		OH / OHLY11		OH / OHLY12		OH / OHLY13	
		OH147		OH148		OH149		OH150	
		11/25/90		11/25/90		11/25/90		11/25/90	
Elements by ICPEs or AA, cont.									
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	270	(1)	62	(1)	54	(1)	110	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	530	(1)	710	(1)	140	(1)	740	(1)
Strontium	mg/L	2.6	(.003)	6.5	(.003)	4.9	(.003)	4.4	(.003)
Vanadium	mg/L	.063 @	(.02)	.098 @	(.02)	.025 @	(.02)	.05 @	(.02)
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	8900	(5)	7500	(5)	2400	(5)	14000	(5)
Redox (Eh)	mV	-284	( )	-118.6	( )	-192.7	( )	-280.9	( )
Temperature	degrees C	14.7	( )	12.9	( )	9.4	( )	15.2	( )
Total Alkalinity	meq/L	20.48	(2)	1.048	(2)	2.12 @	(2)	12.8	(2)
pH	pH units	12.25	( )	9.26	( )	10.7	( )	12.33	( )

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

C1-10

Table G-5

(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID				Log Date			
		OH / OHLY14		OH / OHLY15		OH / OHLY16		OH / OHLY17	
		OH151		OH152		OH153		OH154	
		11/25/90		11/25/90		11/25/90		11/25/90	
Anions									
Ammonia as N	mg/L	.98	(.05)	1.3	(.055)	NA		.3	(.055)
Chloride	mg/L	1200	(2)	1300	(2)	NA		950	(1)
Fluoride	mg/L	7.5	(1)	7.5	(1)	NA		6.1	(1)
Nitrate-Nitrite as N	mg/L	4.1	(.1)	200	(2)	NA		.082 @	(.02)
Sulfate	mg/L	3900	(2.5)	3800	(2.5)	NA		2800	(2.5)
Bulk chemistry									
Total organic carbon	mg/L	2.9 @	(1)	14	(1)	NA		6.7	(1)
Total phenolics	mg/L	.012 @	(.005)	.073	(.005)	NA		.054	(.005)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	.043	(.005)	.028	(.005)	ND	(.005)	ND	(.005)
Barium	mg/L	.037 @	(.01)	.044 @	(.01)	.038 @	(.01)	.042 @	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	490	(1)	400	(1)	380	(1)	330	(1)
Chromium	mg/L	.025 @	(.01)	ND	(.01)	ND	(.01)	.024 @	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	ND	(.003)	ND	(.003)	ND	(.003)	ND	(.003)
Magnesium	mg/L	1.7 @	(1)	9.7	(1)	ND	(1)	ND	(1)
Manganese	mg/L	ND	(.01)	.012 @	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	3.2	(.05)	3.2	(.05)	.64	(.05)	2.1	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Phosphorus	mg/L	ND	(.3)	ND	(.3)	ND	(.3)	ND	(.3)
Potassium	mg/L	1300	(30)	1000	(3)	880	(3)	1900	(30)

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

C1-11

Table G-5

(Continued)

Parameter	Units	Site ID / Location ID							
		OH / OHLY14		OH / OHLY15		OH / OHLY16		OH / OHLY17	
		OH151		OH152		OH153		OH154	
		11/25/90		11/25/90		11/25/90		11/25/90	
Elements by ICPES or AA, cont.									
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	.008 @	(.005)
Silicon	mg/L	54	(1)	48	(1)	52	(1)	78	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	1300	(10)	1700	(10)	310	(1)	610	(1)
Strontium	mg/L	6.3	(.003)	6.8	(.003)	4	(.003)	5.5	(.003)
Vanadium	mg/L	.076 @	(.02)	ND	(.02)	.024 @	(.02)	.05 @	(.02)
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	8500	(5)	8100	(5)	4300	(5)	7000	(5)
Redox (Eh)	mV	-25.4	( )	-4.1	( )	-188	( )	-204.4	( )
Temperature	degrees C	14.2	( )	11.3	( )	15.7	( )	13.9	( )
Total Alkalinity	meq/L	1.388	(2)	1.172	(2)	NA		3.44 @	(2)
pH	pH units	7.41	( )	7.42	( )	10.38	( )	10.84	( )

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

C1-12

G-54

Table G-5

(Continued)

Parameter	Units	OH / OHMW02		OH / OHMW02	
		OH158	OH158	OH159	OH159
		11/25/90	11/25/90	11/25/90	11/25/90
Anions					
Ammonia as N	mg/L	1	(.055)	NA	
Chloride	mg/L	55	(.2)	NA	
Fluoride	mg/L	2.6	(.1)	NA	
Nitrate-Nitrite as N	mg/L	ND	(.02)	NA	
Sulfate	mg/L	20	(.05)	NA	
Bulk chemistry					
Total organic carbon	mg/L	2.8 @	(1)	NA	
Total phenolics	mg/L	ND	(.005)	NA	
Elements by ICPEs or AA					
Aluminum	mg/L	ND	(.2)	NA	
Arsenic	mg/L	ND	(.005)	NA	
Barium	mg/L	.047 @	(.01)	NA	
Beryllium	mg/L	ND	(.002)	NA	
Boron	mg/L	ND	(.6)	NA	
Cadmium	mg/L	ND	(.001)	NA	
Calcium	mg/L	240	(1)	NA	
Chromium	mg/L	ND	(.01)	NA	
Cobalt	mg/L	ND	(.01)	NA	
Copper	mg/L	ND	(.02)	NA	
Iron	mg/L	ND	(.04)	NA	
Lead	mg/L	.0057 @	(.003)	NA	
Magnesium	mg/L	190	(1)	NA	
Manganese	mg/L	.22	(.01)	NA	
Molybdenum	mg/L	ND	(.05)	NA	
Nickel	mg/L	ND	(.02)	NA	
Phosphorus	mg/L	ND	(.3)	NA	
Potassium	mg/L	8.4 @	(3)	NA	

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

C1-13

G-55

Table G-5

(Continued)

		Site ID / Location ID			
		Sample ID		Log Date	
Parameter	Units	OH / OHMW02 OH158 11/25/90		OH / OHMW02 OH159 11/25/90	
-----	-----	-----		-----	
Elements by ICPES or AA, cont.					
Selenium	mg/L	ND	(.005)	NA	
Silicon	mg/L	6.8	(1)	NA	
Silver	mg/L	ND	(.01)	NA	
Sodium	mg/L	150	(1)	NA	
Strontium	mg/L	1.2	(.003)	NA	
Vanadium	mg/L	ND	(.02)	NA	
Zinc	mg/L	ND	(.02)	NA	
Field measurements					
Conductivity	umhos/cm	NA		1900	(5)
Redox (Eh)	mV	NA		-4.2	( )
TDS	mg/L	2120	(2)	NA	
Temperature	degrees C	NA		11.6	( )
Total Alkalinity	meq/L	10.8	(2)	NA	
pH	pH units	NA		6.95	( )

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

Table G-6

Chemical Characteristics of Deionized Water Leachates of Ohio Soils, Event 6

Parameter	Units	Site ID / Location ID				Log Date							
		OH / OHBLNK	OH160	OH / OHMW01	OH161								

Anions	Chloride	mg/L	ND	(.02)	170	(.4)	60	ND	(.04)	(1)	69	ND	(.4)
	Nitrate-Nitrite as N	mg/L	NA		ND	(.04)	ND	ND	(.04)		ND	ND	(.04)
	Sulfate	mg/L	ND	(.05)	690	(1)	960	(1)			990	(1)	

Elements by ICPCS or AA	Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	ND	(.2)	ND	ND	ND	(.2)
	Antimony	mg/L	ND	(.1)	ND	(.1)	ND	ND	(.1)	ND	ND	ND	(.1)
	Arsenic	mg/L	ND	(.005)	ND	(.005)	ND	ND	(.005)	ND	ND	ND	(.005)
	Barium	mg/L	ND	(.01)	.019 @	(.01)	.049 @	(.01)	(.01)	.049 @	ND	ND	(.01)
	Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	ND	(.002)	ND	ND	ND	(.002)
	Boron	mg/L	ND	(.6)	.96 @	(.6)	ND	ND	(.6)	ND	ND	ND	(.6)
	Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	ND	(.001)	ND	ND	ND	(.001)
	Calcium	mg/L	2.04 @	(1)	6.26	(1)	216	(1)	(.001)	213	(1)	ND	(.001)
	Chromium	mg/L	ND	(.01)	ND	(.01)	ND	ND	(.01)	ND	ND	ND	(.01)
	Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	ND	(.01)	ND	ND	ND	(.01)
	Copper	mg/L	ND	(.02)	ND	(.02)	ND	ND	(.02)	ND	ND	ND	(.02)
	Iron	mg/L	ND	(.04)	ND	(.04)	.044 @	(.04)	(.04)	ND	ND	ND	(.04)
	Lead	mg/L	ND	(.003)	ND	(.003)	ND	ND	(.003)	ND	ND	ND	(.003)
	Magnesium	mg/L	1.35 @	(1)	3.13 @	(1)	151	(1)	(.003)	148	(1)	ND	(.003)
	Manganese	mg/L	ND	(.01)	ND	(.01)	.188	(.01)	(.01)	.185	(.01)	ND	(.01)
	Molybdenum	mg/L	ND	(.05)	ND	(.05)	ND	(.05)	(.05)	ND	ND	ND	(.05)
	Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	(.02)	ND	ND	ND	(.02)
	Potassium	mg/L	ND	(3)	9.68 @	(3)	7.73 @	(3)	(3)	7.39 @	(3)	ND	(.005)
	Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	(.005)	ND	ND	ND	(.005)
	Silicon	mg/L	ND	(1)	3.17 @	(1)	5.87	(1)	(.01)	5.78	(1)	ND	(.01)
	Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	(.01)	189	(1)	ND	(.01)
	Sodium	mg/L	1.75 @	(1)	630	(1)	188	(1)	(.003)	1.31	(.003)	189	(.003)
	Strontium	mg/L	.012 @	(.003)	.272	(.003)	1.32	(.003)	(.003)	1.31	(.003)	ND	(.003)
	Thallium	mg/L	ND	(.1)	ND	(.1)	ND	(.1)	(.1)	ND	(.1)	ND	(.1)

Table G-6

(Continued)

		Site ID / Location ID							
		Sample ID							
		Log Date							
		OH / OHBLNK		OH / OHMW01		OH / OHMW02		OH / OHMW02	
		BLANK-6		OH160		OH161		OH161D Dup of OH161	
		2/01/91		2/01/91		2/01/91		2/01/91	
Parameter	Units								
-----	-----	-----		-----		-----		-----	
Elements by ICPEs or AA, cont.									
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	.95	(5)	1970	(5)	1760	(5)	1850	(5)
Redox (Eh)	mV	124	( )	-90.4	( )	5.8	( )	.09	( )
TDS	mg/L	ND	(2)	2041	(2)	2184	(2)	2159	(2)
Temperature	degrees C	9.3	( )	10.2	( )	8.2	( )	7.8	( )
Total Alkalinity	meq/L	NA		12.92	(.03)	10.98	(.03)	11	(.03)
pH	pH units	6.52	( )	8.71	( )	6.82	( )	6.87	( )

G-58

Table G-6

(Continued)

Parameter	Units	Site ID / Location ID			
		Sample ID		Log Date	
		OH / OHMW03 OH162	OH / OHMW04 OH163	OH / OHMW05 OH164	OH / OHMW06 OH165
		2/01/91	2/01/91	2/01/91	2/01/91
Anions					
Chloride	mg/L	53	230	170	240
Nitrate-Nitrite as N	mg/L	ND	ND	ND	ND
Sulfate	mg/L	750	57	67	440
Elements by ICPEs or AA					
Aluminum	mg/L	ND	ND	ND	ND
Antimony	mg/L	ND	ND	ND	ND
Arsenic	mg/L	ND	.018 @	.0099 @	ND
Barium	mg/L	.027 @	ND	.036 @	.047 @
Beryllium	mg/L	ND	ND	ND	ND
Boron	mg/L	ND	.762 @	1.02 @	ND
Cadmium	mg/L	ND	ND	ND	ND
Calcium	mg/L	190	6.15	15.9	172
Chromium	mg/L	ND	ND	ND	ND
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	161	2.34 @	10.2	85.2
Manganese	mg/L	.21	.016 @	ND	1.77
Molybdenum	mg/L	ND	.129 @	ND	ND
Nickel	mg/L	ND	ND	ND	.022 @
Potassium	mg/L	5.51 @	5.57 @	7.32 @	6.57 @
Selenium	mg/L	ND	ND	ND	ND
Silicon	mg/L	6.12	2.36 @	3.05 @	4.43 @
Silver	mg/L	ND	ND	ND	ND
Sodium	mg/L	98.3	509	439	131
Strontium	mg/L	.59	.155	.489	1.12
Thallium	mg/L	ND	ND	ND	ND

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

C1-3

Table G-6

(Continued)

Parameter	Site ID / Location ID			
	Sample ID		Log Date	
	OH / OHMW03 OH162 2/01/91	OH / OHMW04 OH163 2/01/91	OH / OHMW05 OH164 2/01/91	OH / OHMW06 OH165 2/01/91

Elements by ICPEs or AA, cont.				
Tin	mg/L	ND	ND	ND
Vanadium	mg/L	ND	ND	ND
Zinc	mg/L	ND	ND	ND

Field measurements				
Conductivity	umhos/cm	1430	1700	1450
Redox (Eh)	mV	.5	-118.6	-54.5
TDS	mg/L	1784	1457	1281
Temperature	degrees C	7	11.2	10.6
Total Alkalinity	meq/L	10.34	17.68	14.52
pH	pH units	7.3	9.3	8.56

G-60

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

CI-4

Table G-6

(Continued)

		Site ID / Location ID							
		Sample ID				Log Date			
		OH / OHMW07		OH / OHMW08		OH / OHLY01		OH / OHLY02	
		OH166		OH167		OH168		OH169	
		2/01/91		2/01/91		2/01/91		2/01/91	
Parameter	Units								
Anions									
Chloride	mg/L	5.3	(.04)	3.4	(.04)	100	(1)	920	(4)
Nitrate-Nitrite as N	mg/L	.063 @	(.04)	.12 @	(.04)	2	(.04)	NA	
Sulfate	mg/L	240	(1)	410	(1)	2200	(2.5)	3800	(10)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Antimony	mg/L	ND	(.1)	ND	(.1)	ND	(.1)	ND	(.1)
Arsenic	mg/L	ND	(.005)	ND	(.005)	.0479	(.005)	.0439	(.005)
Barium	mg/L	.065	(.01)	.016 @	(.01)	.014 @	(.01)	.026 @	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	1.04 @	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	108	(1)	95.1	(1)	139	(1)	356	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	.072 @	(.04)	ND	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	ND	(.003)	ND	(.003)	ND	(.003)	ND	(.003)
Magnesium	mg/L	ND	(1)	48.8	(1)	1.01 @	(1)	ND	(1)
Manganese	mg/L	ND	(.01)	.105	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	ND	(.05)	ND	(.05)	.672	(.05)	1.06	(.05)
Nickel	mg/L	ND	(.02)	.462	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	10.8 @	(3)	7.23 @	(3)	240	(3)	1970	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	4.49 @	(1)	5.07	(1)	75.5	(1)	35.1	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	135	(1)	122	(1)	851	(1)	790	(1)
Strontium	mg/L	.652	(.003)	2.03	(.003)	2.5	(.003)	1.59	(.003)
Thallium	mg/L	ND	(.1)	ND	(.1)	ND	(.1)	ND	(.1)

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

C1-5

G-61

Table G-6

(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID				Log Date			
		OH / OHMW07		OH / OHMW08		OH / OHLY01		OH / OHLY02	
		OH166		OH167		OH168		OH169	
		2/01/91		2/01/91		2/01/91		2/01/91	
-----	-----	-----		-----		-----		-----	
Elements by ICPEs or AA, cont.									
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)	.09 @	(.02)	.185	(.02)
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	1480	(5)	990	(5)	3550	(5)	8200	(5)
Redox (Eh)	mV	-261.8	( )	-36	( )	-145.5	( )	-52.6	( )
TDS	mg/L	731	(2)	967	(2)	NA		NA	
Temperature	degrees C	10.9	( )	11.2	( )	NA		9.5	( )
Total Alkalinity	meq/L	7.16	(.03)	6.02	(.03)	2.36	(.03)	.65	(.03)
pH	pH units	11.61	( )	7.54	( )	9.47	( )	7.37	( )

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

C1-6

Table G-6

(Continued)

		Site ID / Location ID							
		Sample ID							
		Log Date							
Parameter	Units	OH / OHLY04		OH / OHLY07		OH / OHLY08		OH / OHLY10	
		OH171		OH174		OH175		OH177	
		2/01/91		2/01/91		2/01/91		2/01/91	
Anions									
Chloride	mg/L	3200	(8)	58	(.4)	1300	(4)	NA	
Nitrate-Nitrite as N	mg/L	NA		1.1	(.04)	ND	(.04)	NA	
Sulfate	mg/L	4700	(20)	1300	(1)	2600	(10)	NA	
Elements by ICPEs or AA									
Aluminum	mg/L	.26 @	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Antimony	mg/L	ND	(.1)	ND	(.1)	ND	(.1)	ND	(.1)
Arsenic	mg/L	.323	(.005)	.0075 @	(.005)	.0174 @	(.005)	.0199 @	(.005)
Barium	mg/L	.019 @	(.01)	.029 @	(.01)	.036 @	(.01)	.038 @	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	1.77 @	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	4.2 @	(1)	463	(1)	562	(1)	24.7	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	ND	(.003)	ND	(.003)	ND	(.003)	ND	(.003)
Magnesium	mg/L	ND	(1)	ND	(1)	45.8	(1)	ND	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	.011 @	(.01)	ND	(.01)
Molybdenum	mg/L	2.03	(.05)	.371	(.05)	.707	(.05)	1.08	(.05)
Nickel	mg/L	.028 @	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	5980	(3)	228	(3)	1070	(3)	1890	(3)
Selenium	mg/L	.0078 @	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	346	(1)	40.7	(1)	42.6	(1)	158	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	1250	(1)	49.3	(1)	692	(1)	355	(1)
Strontium	mg/L	.764	(.003)	2.48	(.003)	3.93	(.003)	3.06	(.003)
Thallium	mg/L	ND	(.1)	ND	(.1)	ND	(.1)	ND	(.1)

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

Table G-6

(Continued)

Parameter	Units	Site ID / Location ID			
		Sample ID		Log Date	
		OH / OHLY04 OH171	OH / OHLY07 OH174	OH / OHLY08 OH175	OH / OHLY10 OH177
		2/01/91	2/01/91	2/01/91	2/01/91

Elements by ICPES or AA, cont.					
Tin	mg/L	ND	ND	ND	ND
Vanadium	mg/L	.521	.027 @	ND	.035 @
Zinc	mg/L	ND	ND	ND	ND
		(.6)	(.6)	(.6)	(.6)
		(.02)	(.02)	(.02)	(.02)
		(.02)	(.02)	(.02)	(.02)
Field measurements					
Conductivity	umhos/cm	23000	7000	2140	6500
Redox (Eh)	mV	-331.5	-7.8	-190.8	-230.2
TDS	mg/L	NA	2620	NA	NA
Temperature	degrees C	11.5	12.5	6.7	9.5
Total Alkalinity	meq/L	48.16	3.27	.83	13.76
pH	pH units	13.15	7.54	10.68	11.46
		(5)	(5)	(5)	(5)
		( )	( )	( )	( )
		( )	(2)	( )	( )
		(.03)	(.03)	(.03)	(.03)
		( )	( )	( )	( )

Table G-6

(Continued)

Parameter	Units	Site ID / Location ID							
		OH / OHLY11		OH / OHLY12		OH / OHLY14		OH / OHLY15	
		OH178		OH179		OH181		OH182	
		2/01/91		2/01/91		2/01/91		2/01/91	
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Anions									
Chloride	mg/L	NA		230	(.4)	620	(2)	270	(1)
Nitrate-Nitrite as N	mg/L	NA		ND	(.04)	2.5	(.04)	2.4	(.04)
Sulfate	mg/L	NA		900	(1)	2600	(5)	2200	(2.5)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Antimony	mg/L	ND	(.1)	ND	(.1)	ND	(.1)	ND	(.1)
Arsenic	mg/L	ND	(.005)	ND	(.005)	.0353	(.005)	.0317	(.005)
Barium	mg/L	.027 @	(.01)	.036 @	(.01)	.023 @	(.01)	.02 @	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	459	(1)	218	(1)	366	(1)	204	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	ND	(.003)	ND	(.003)	ND	(.003)	ND	(.003)
Magnesium	mg/L	ND	(1)	ND	(1)	1.55 @	(1)	1.99 @	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	.91	(.05)	.417	(.05)	1.32	(.05)	.859	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	619	(3)	438	(3)	832	(3)	398	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	57.8	(1)	42.3	(1)	43.8	(1)	41	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	273	(1)	100	(1)	663	(1)	733	(1)
Strontium	mg/L	4.41	(.003)	4.36	(.003)	4.59	(.003)	3.07	(.003)
Thallium	mg/L	ND	(.1)	ND	(.1)	ND	(.1)	ND	(.1)

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

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Table G-6

(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID				Log Date			
		OH / OHLY11		OH / OHLY12		OH / OHLY14		OH / OHLY15	
		OH178		OH179		OH181		OH182	
		2/01/91		2/01/91		2/01/91		2/01/91	
Elements by ICPEs or AA, cont.									
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	.042 @	(.02)	ND	(.02)	.082 @	(.02)	.02 @	(.02)
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	3320	(5)	1820	(5)	4800	(5)	3600	(5)
Redox (Eh)	mV	-129.1	( )	-199.1	( )	-82.7	( )	20.1	( )
TDS	mg/L	NA		NA		5813	(2)	NA	
Temperature	degrees C	7.3	( )	3.8	( )	6.5	( )	4.5	( )
Total Alkalinity	meq/L	1.24	(.03)	2.28	(.03)	.72	(.03)	.75	(.03)
pH	pH units	9.7	( )	10.84	( )	8.67	( )	6.78	( )

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

C1-10

Table G-6

(Continued)

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
Parameter	Units	OH / OHLY17 OH184		OH / OHNT01 OHNT-1 N		OH / OHNT04 OHNT-4 N		OH / OHNT05 OHNT-5 N	
		2/01/91		3/01/91		3/01/91		3/01/91	

Anions									
Chloride	mg/L	520	(1)	NA		NA		NA	
Nitrate-Nitrite as N	mg/L	ND	(.04)	NA		NA		NA	
Sulfate	mg/L	2000	(2.5)	670	(.5)	490	(.5)	800	(.5)
Sulfate	mg/L	2000	(2.5)	670	(.5)	490	(.5)	800	(.5)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	NA		NA		NA	
Antimony	mg/L	ND	(.1)	NA		NA		NA	
Arsenic	mg/L	ND	(.005)	NA		NA		NA	
Barium	mg/L	.033 @	(.01)	NA		NA		NA	
Beryllium	mg/L	ND	(.002)	NA		NA		NA	
Boron	mg/L	ND	(.6)	NA		NA		NA	
Cadmium	mg/L	ND	(.001)	NA		NA		NA	
Calcium	mg/L	336	(1)	NA		NA		NA	
Chromium	mg/L	.011 @	(.01)	NA		NA		NA	
Cobalt	mg/L	ND	(.01)	NA		NA		NA	
Copper	mg/L	ND	(.02)	NA		NA		NA	
Iron	mg/L	ND	(.04)	NA		NA		NA	
Lead	mg/L	ND	(.003)	NA		NA		NA	
Magnesium	mg/L	ND	(1)	NA		NA		NA	
Manganese	mg/L	ND	(.01)	NA		NA		NA	
Molybdenum	mg/L	1.46	(.05)	NA		NA		NA	
Nickel	mg/L	ND	(.02)	NA		NA		NA	
Potassium	mg/L	1000	(3)	NA		NA		NA	
Selenium	mg/L	ND	(.005)	NA		NA		NA	
Silicon	mg/L	49.8	(1)	NA		NA		NA	
Silver	mg/L	ND	(.01)	NA		NA		NA	

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

C1-11

Table G-6

(Continued)

Parameter	Units	Site ID / Location ID Sample ID Preparation Method Log Date			
		OH / OHLY17 OH184	OH / OHNT01 OHNT-1 N	OH / OHNT04 OHNT-4 N	OH / OHNT05 OHNT-5 N
		2/01/91	3/01/91	3/01/91	3/01/91
Sodium	mg/L	412	NA	NA	NA
Strontium	mg/L	4.6	NA	NA	NA
Thallium	mg/L	ND	NA	NA	NA
Tin	mg/L	ND	NA	NA	NA
Vanadium	mg/L	ND	NA	NA	NA
Zinc	mg/L	ND	NA	NA	NA
Field measurements					
Conductivity	umhos/cm	4800	-240	-218.6	-189.2
Redox (Eh)	mV	-185.1	NA	NA	NA
TDS	mg/L	4412	NA	NA	NA
Temperature	degrees C	8.6	NA	NA	NA
Total Alkalinity	meq/L	3.84	NA	NA	NA
pH	pH units	10.2	11.21	11.18	11.01

Table G-6

(Continued)

		Site ID / Location ID
		Sample ID
		Preparation Method
		Log Date
Parameter	Units	OH / OHNT08 OHNT-8 N 3/01/91
-----	-----	-----
Anions		
Sulfate	mg/L	480 (.5)
Field measurements		
Conductivity	umhos/cm	-219 (5)
pH	pH units	11.3 ()

Table G-7

Chemical Characteristics of Deionized Water Leachates of Ohio Soils, Event 7

Parameter	Units	Site ID / Location ID							
		Sample ID				Log Date			
		OH / OHBLNK		OH / OHMW01		OH / OHMW03		OH / OHMW03	
		BLANK-7	5/25/91	OH201	5/25/91	OH203	5/25/91	OH203D Dup of OH203	5/25/91
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Anions									
Chloride	mg/L	.73	(.026)	190	(.52)	48	(.52)	52	(.52)
Fluoride	mg/L	ND	(.1)	.96	(.1)	.36 @	(.1)	.35 @	(.1)
Sulfate	mg/L	ND	(.05)	570	(.5)	740	(1)	810	(1)
Elements by ICPES or AA									
Aluminum	mg/L	ND	(.2)	.28 @	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.004)	.0078 @	(.004)	ND	(.004)	ND	(.04)
Barium	mg/L	ND	(.01)	.013 @	(.01)	.028 @	(.01)	.027 @	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	.98 @	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	ND	(1)	4.2 @	(1)	180	(1)	190	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	.19 @	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	ND	(.012)	ND	(.012)	ND	(.012)	.0197 @	(.012)
Magnesium	mg/L	ND	(1)	1.5 @	(1)	160	(1)	160	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	.19	(.01)	.2	(.01)
Molybdenum	mg/L	ND	(.05)	ND	(.05)	ND	(.05)	ND	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	ND	(3)	14 @	(3)	5.6 @	(3)	5.7 @	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.5)
Silicon	mg/L	ND	(1)	4.3 @	(1)	5.7	(1)	5.8	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	ND	(1)	570	(1)	97	(1)	99	(1)
Strontium	mg/L	ND	(.003)	.19	(.003)	.58	(.003)	.55	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)

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

C1-1

Table G-7
(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID				Log Date			
		OH / OHBLNK		OH / OHMW01		OH / OHMW03		OH / OHMW03	
		BLANK-7		OH201		OH203		OH203D Dup of OH203	
		5/25/91		5/25/91		5/25/91		5/25/91	
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Elements by ICPEs or AA, cont.									
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	27	(5)	2050	(5)	1750	(5)	1670	(5)
Redox (Eh)	mV	68.6	()	-130	()	16	()	29.4	()
TDS	mg/L	ND	(10)	1582	(10)	1670	(10)	NA	
Temperature	degrees C	28.4	()	13.4	()	14.8	()	13.6	()
Total Alkalinity	meq/L	ND	(.04)	7.9	(.04)	9.92	(.04)	NA	
pH	pH units	6.45	()	9.61	()	6.95	()	6.87	()

Table G-7

(Continued)

		Site ID / Location ID							
		Sample ID							
		Log Date							
		OH / OHMW04		OH / OHMW05		OH / OHMW06		OH / OHMW07	
		OH204		OH205		OH206		OH207	
Parameter	Units	5/24/91		5/25/91		5/25/91		5/25/91	

Anions									
Chloride	mg/L	220	(.52)	160	(.52)	270	(.52)	6.6	(.026)
Fluoride	mg/L	1.1	(.1)	1	(.1)	.18 @	(.1)	.28 @	(.1)
Sulfate	mg/L	86	(.05)	250	(.25)	520	(1)	250	(.25)
Elements by ICPES or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	.0629	(.004)	.012 @	(.004)	.00416 @	(.004)	.0135 @	(.004)
Barium	mg/L	ND	(.01)	.042 @	(.01)	.058	(.01)	.066	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	.88 @	(.6)	1 @	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	5.6	(1)	24	(1)	180	(1)	110	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	.014 @	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	.07 @	(.04)	ND	(.04)	.068 @	(.04)
Lead	mg/L	ND	(.012)	ND	(.012)	ND	(.012)	ND	(.012)
Magnesium	mg/L	1.9 @	(1)	14	(1)	96	(1)	ND	(1)
Manganese	mg/L	.017 @	(.01)	ND	(.01)	2.3	(.01)	ND	(.01)
Molybdenum	mg/L	.1 @	(.05)	ND	(.05)	ND	(.05)	ND	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	.03 @	(.02)	ND	(.02)
Potassium	mg/L	4.8 @	(3)	6.8 @	(3)	7.6 @	(3)	11 @	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	2.3 @	(1)	3.3 @	(1)	4.2 @	(1)	4.3 @	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	510	(1)	480	(1)	150	(1)	130	(1)
Strontium	mg/L	.14	(.003)	.63	(.003)	1.3	(.003)	.65	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)

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

C1-3

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Table G-7
(Continued)

Parameter	Units	Site ID / Location ID							
		OH / OHMW04		OH / OHMW05		OH / OHMW06		OH / OHMW07	
		OH204		OH205		OH206		OH207	
		5/24/91		5/25/91		5/25/91		5/25/91	
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Elements by ICPEs or AA, cont.									
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	1690	(5)	1600	(5)	1670	(5)	1480	(5)
Redox (Eh)	mV	-66.4	( )	-28	( )	22	( )	-233	( )
TDS	mg/L	1222	(10)	1346	(10)	1440	(10)	910	(10)
Temperature	degrees C	14.1	( )	12.5	( )	12.3	( )	12.7	( )
Total Alkalinity	meq/L	15.28	(.04)	14.32	(.04)	6.56	(.04)	3.22	(.04)
pH	pH units	8.96	( )	7.88	( )	7.01	( )	11.44	( )

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Table G-7

(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID				Log Date			
		OH / OHMW08		OH / OHLY01		OH / OHLY02		OH / OHLY08	
		OH208		OH209		OH210		OH216	
		5/25/91		5/27/91		5/27/91		5/27/91	
Anions									
Chloride	mg/L	3.5	(.026)	120	(.52)	900	(2.6)	1300	(2.6)
Fluoride	mg/L	.29 @	(.1)	.13 @	(.1)	.31 @	(.1)	.37 @	(.1)
Sulfate	mg/L	410	(.5)	2000	(2.5)	3900	(5)	1900	(5)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.004)	.0572 @	(.04)	.0884 @	(.04)	.0676 @	(.04)
Barium	mg/L	.014 @	(.01)	.027 @	(.01)	.03 @	(.01)	.028 @	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	80	(1)	190	(1)	200	(1)	260	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	ND	(.012)	.0263 @	(.012)	.0241 @	(.012)	.0154 @	(.012)
Magnesium	mg/L	45	(1)	ND	(1)	ND	(1)	6.7	(1)
Manganese	mg/L	.066	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	.054 @	(.05)	.57	(.05)	.92	(.05)	.91	(.05)
Nickel	mg/L	.3	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	7.1 @	(3)	340	(3)	2300	(30)	1500	(30)
Selenium	mg/L	ND	(.5)	ND	(.5)	ND	(.5)	ND	(.5)
Silicon	mg/L	4.7 @	(1)	71	(1)	ND	(1)	28	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	120	(1)	640	(1)	610	(1)	570	(1)
Strontium	mg/L	1.8	(.003)	2.8	(.003)	1.4	(.003)	1.8	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	.077 @	(.02)	.24	(.02)	.036 @	(.02)

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

C1-5

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Table G-7

(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID				Log Date			
		OH / OHMW08		OH / OHLY01		OH / OHLY02		OH / OHLY08	
		OH208		OH209		OH210		OH216	
-----	-----	5/25/91		5/27/91		5/27/91		5/27/91	
Elements by ICPES or AA, cont.									
Zinc	mg/L	ND	(.02)	.022 @	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	880	(5)	3725	(5)	8500	(5)	7000	(5)
Redox (Eh)	mV	2.6	( )	173.9	( )	130.4	( )	-234.6	( )
TDS	mg/L	848	(10)	3700	(10)	8794	(10)	6148	(10)
Temperature	degrees C	12.2	( )	21.8	( )	18.7	( )	16.4	( )
Total Alkalinity	meq/L	4.76	(.04)	2	(.04)	1.1	(.04)	5.28	(.04)
pH	pH units	7.43	( )	9.35	( )	9.48	( )	11.8	( )

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Table G-7
(Continued)

Parameter	Units	Elements by ICPEs or AA				Anions			
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Aluminum		ND	(.2)	ND	ND	ND	(.2)	ND	(.2)
Arsenic		ND	(.04)	ND	ND	ND	(.04)	ND	(.04)
Barium		mg/L	(.01)	.034 @	ND	mg/L	(.01)	.036 @	.028 @
Beryllium		mg/L	(.002)	ND	ND	ND	(.002)	ND	ND
Boron		mg/L	(.6)	ND	ND	ND	(.6)	ND	ND
Cadmium		mg/L	(.001)	ND	ND	ND	(.001)	ND	ND
Calcium		mg/L	(1)	490	ND	42	(1)	400	(1)
Chromium		mg/L	(.01)	ND	ND	(.01)	ND	ND	(.01)
Cobalt		mg/L	(.01)	ND	ND	(.01)	ND	ND	(.01)
Copper		mg/L	(.02)	ND	ND	(.02)	ND	ND	(.02)
Iron		mg/L	(.04)	ND	ND	(.04)	ND	ND	(.04)
Lead		mg/L	(.012)	.0154 @	ND	(.012)	.0285 @	ND	(.012)
Magnesium		mg/L	(1)	ND	ND	(1)	ND	ND	(1)
Manganese		mg/L	(.01)	ND	ND	(.01)	ND	ND	(.01)
Molybdenum		mg/L	(.05)	1.2	.11 @	(.05)	1.1	ND	.73
Nickel		mg/L	(.02)	ND	ND	(.02)	ND	ND	ND
Potassium		mg/L	(3)	850	ND	(3)	2300	660	(3)
Selenium		mg/L	(.5)	ND	ND	(.5)	ND	ND	ND
Silicon		mg/L	(1)	60	22	(1)	85	44	(1)
Silver		mg/L	(.01)	ND	ND	(.01)	ND	ND	(.01)
Sodium		mg/L	(1)	280	20	(1)	460	230	(1)
Strontium		mg/L	(.003)	4	2	(.003)	3.1	4.2	(.003)
Tin		mg/L	(.6)	ND	ND	(.6)	ND	ND	(.6)
Vanadium		mg/L	(.02)	.052 @	ND	(.02)	.084 @	.074 @	(.02)

Chloride		mg/L	(2.6)	670	45	(.26)	810	360	(2.6)
Fluoride		mg/L	(.1)	ND	.27 @	(.1)	.25 @	ND	(.1)
Sulfate		mg/L	(5)	2000	410	(.5)	340	1900	(5)

OH / OHLY11	OH / OHLY12	OH / OHLY13	OH / OHLY14	OH / OHLY15	OH / OHLY16	OH / OHLY17	OH / OHLY18	OH / OHLY19	OH / OHLY20
OH219	OH220	OH221	OH222	OH223	OH224	OH225	OH226	OH227	OH228
5/27/91	5/27/91	5/23/91	5/27/91	5/27/91	5/27/91	5/27/91	5/27/91	5/27/91	5/27/91

Site ID / Location ID									
Sample ID									
Log Date									

Table G-7

(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID				Log Date			
		OH / OHLY11		OH / OHLY12		OH / OHLY13		OH / OHLY14	
		OH219		OH220		OH221		OH222	
-----	----	5/27/91		5/27/91		5/23/91		5/27/91	
Elements by ICPEs or AA, cont.									
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	4700	(5)	990	(5)	8300	(5)	3900	(5)
Redox (Eh)	mV	118.5	()	163.9	()	-233.9	()	-93.9	()
TDS	mg/L	4902	(10)	932	(10)	NA		1934	(10)
Temperature	degrees C	18.9	()	22.6	()	22	()	17.8	()
Total Alkalinity	meq/L	1.22	(.04)	1.62	(.04)	8.84	(.04)	.66	(.04)
pH	pH units	9.27	()	9.96	()	11.6	()	8.91	()

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

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Table G-7

(Continued)

		Site ID / Location ID					
		Sample ID					
		Log Date					
		OH / OHLY14		OH / OHLY15		OH / OHLY17	
		OH222D Dup of OH222		OH223		OH225	
		5/23/91		5/27/91		5/27/91	
Parameter	Units						

Anions							
Chloride	mg/L	340	(.26)	89	(.26)	260	(.52)
Fluoride	mg/L	.11 @	(.1)	ND	(.1)	.14 @	(.1)
Sulfate	mg/L	1800	(5)	1200	(5)	1200	(1)
Elements by ICPEs or AA							
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.04)	.0676 @	(.04)	ND	(.04)
Barium	mg/L	.024 @	(.01)	.035 @	(.01)	.038 @	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	360	(1)	180	(1)	260	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	ND	(.012)	.0197 @	(.012)	ND	(.012)
Magnesium	mg/L	1.5 @	(1)	ND	(1)	ND	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	.65	(.05)	.26	(.05)	.055 @	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	610	(3)	250	(3)	440	(3)
Selenium	mg/L	ND	(.5)	ND	(.5)	ND	(.5)
Silicon	mg/L	37	(1)	66	(1)	38	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	250	(1)	290	(1)	170	(1)
Strontium	mg/L	4.1	(.003)	2.1	(.003)	3.3	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	.055 @	(.02)	.03 @	(.02)	ND	(.02)

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

(Continued)

Elements by ICPEs or AA, cont.

Conductivity	unhos/cm
Redox (Eh)	mV
TDS	mg/L
Temperature	degrees C
Total Alkalinity	meq/L
pH	pH units

C1-10

Table G-8

Chemical Characteristics of Deionized Water Leachates of Ohio Soils, Event 8

Site ID / Location ID									
Sample ID									
Log Date									
		OH / OHBLNK		OH / OHMW01		OH / OHMW02		OH / OHMW02	
		BLANK-8		OH230		OH231		OH256 Dup of OH231	
Parameter	Units	8/24/91		8/24/91		8/24/91		8/24/91	
-----	-----	-----		-----		-----		-----	
Anions									
Chloride	mg/L	.42	(.026)	240	(.52)	57	(.26)	59	(.26)
Fluoride	mg/L	ND	(.1)	1.1	(.1)	.39 @	(.1)	.36 @	(.1)
Sulfate	mg/L	ND	(.05)	690	(.5)	870	(.5)	900	(1)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.004)	ND	(.004)	ND	(.004)	ND	(.004)
Barium	mg/L	ND	(.01)	.02 @	(.01)	.044 @	(.01)	.044 @	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	1 @	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	ND	(1)	7.7	(1)	190	(1)	200	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	.053 @	(.04)	.04 @	(.04)
Lead	mg/L	.003 @	(.003)	.0058 @	(.003)	ND	(.003)	ND	(.003)
Magnesium	mg/L	ND	(1)	5.2	(1)	130	(1)	140	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	.17	(.01)	.18	(.01)
Molybdenum	mg/L	ND	(.05)	ND	(.05)	ND	(.05)	ND	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	ND	(3)	9.5 @	(3)	7.7 @	(3)	7.9 @	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	ND	(1)	2.7 @	(1)	6.2	(1)	6.6	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	ND	(1)	690	(1)	200	(1)	200	(1)
Strontium	mg/L	ND	(.003)	.39	(.003)	1.2	(.003)	1.2	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)

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

Table G-8
(Continued)

Parameter -----	Units -----	Site ID / Location ID Sample ID Log Date							
		OH / OHBLNK BLANK-8 8/24/91		OH / OHMW01 OH230 8/24/91		OH / OHMW02 OH231 8/24/91		OH / OHMW02 OH256 Dup of OH231 8/24/91	
		-----	-----	-----	-----	-----	-----	-----	-----
Elements by ICPES or AA, cont.									
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	2.6	(5)	2400	(5)	1975	(5)	2000	(5)
Redox (Eh)	mV	43	( )	-82.8	( )	9.1	( )	7.5	( )
TDS	mg/L	ND	(1)	1822	(1)	1824	(1)	NA	
Temperature	degrees C	27.1	( )	14.5	( )	17	( )	17.3	( )
Total Alkalinity	meq/L	ND	(.03)	14	(.03)	10.48	(.03)	10.52	(.03)
pH	pH units	6.48	( )	8.52	( )	6.93	( )	6.96	( )

Table G-8

(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID		Sample ID		Sample ID		Sample ID	
		Log Date		Log Date		Log Date		Log Date	
		OH / OHMW03		OH / OHMW04		OH / OHMW05		OH / OHMW06	
		OH232		OH233		OH234		OH235	
		8/24/91		8/24/91		8/24/91		8/24/91	
Anions									
Chloride	mg/L	97	(.26)	250	(.52)	160	(.26)	274	(.026)
Fluoride	mg/L	.4 @	(.1)	1.1	(.1)	1.1	(.1)	.21 @	(.1)
Sulfate	mg/L	820	(.5)	80	(.5)	120	(.5)	750	(.5)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.004)	ND	(.004)	ND	(.004)	ND	(.004)
Barium	mg/L	.029 @	(.01)	ND	(.01)	.035 @	(.01)	.066	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	.82 @	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	190	(1)	6.7	(1)	21	(1)	220	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	.011 @	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	.077 @	(.04)	.092 @	(.04)	.11 @	(.04)
Lead	mg/L	.0045 @	(.003)	ND	(.003)	.0032 @	(.003)	.0043 @	(.003)
Magnesium	mg/L	160	(1)	3.1 @	(1)	13	(1)	120	(1)
Manganese	mg/L	.21	(.01)	ND	(.01)	ND	(.01)	2.8	(.01)
Molybdenum	mg/L	ND	(.05)	ND	(.05)	ND	(.05)	ND	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	.022 @	(.02)
Potassium	mg/L	6.5 @	(3)	4.4 @	(3)	6.9 @	(3)	9.1 @	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	6.9	(1)	2.4 @	(1)	3.7 @	(1)	5.6	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	100	(1)	450	(1)	430	(1)	190	(1)
Strontium	mg/L	.58	(.003)	.18	(.003)	.53	(.003)	1.6	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)

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

Table G-8

(Continued)

Parameter	Units	Site ID / Location ID							
		OH / OHMW03		OH / OHMW04		OH / OHMW05		OH / OHMW06	
		OH232	8/24/91	OH233	8/24/91	OH234	8/24/91	OH235	8/24/91
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Elements by ICPEs or AA, cont.									
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	1800	(5)	1850	(5)	1650	(5)	2000	(5)
Redox (Eh)	mV	15.8	( )	-74.9	( )	-45.3	( )	16.3	( )
TDS	mg/L	1652	(1)	1324	(1)	1159	(1)	1923	(1)
Temperature	degrees C	17.1	( )	13.3	( )	18	( )	15.3	( )
Total Alkalinity	meq/L	9.72	(.03)	17.16	(.03)	15.16	(.03)	8.08	(.03)
pH	pH units	6.82	( )	8.61	( )	8.09	( )	7.1	( )

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

C1-4

Table G-8

(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID				Log Date			
		OH / OHMW07		OH / OHMW08		OH / OHLY01		OH / OHLY02	
		OH236		OH237		OH238		OH239	
		8/24/91		8/24/91		8/25/91		8/25/91	
Anions									
Chloride	mg/L	6.2	(.026)	3.8	(.026)	91	(.52)	1200	(2.6)
Fluoride	mg/L	.31 @	(.1)	.29 @	(.1)	.19 @	(.1)	.31 @	(.1)
Sulfate	mg/L	280	(.5)	440	(.5)	1600	(1)	4500	(5)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.004)	ND	(.004)	.0055 @	(.004)	ND	(.04)
Barium	mg/L	.053	(.01)	.017 @	(.01)	.052	(.01)	.035 @	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	.7 @	(.6)	.6 @	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	91	(1)	100	(1)	160	(1)	430	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	.018 @	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	.055 @	(.04)	ND	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	.0031 @	(.003)	.0052 @	(.003)	.0035 @	(.003)	ND	(.003)
Magnesium	mg/L	ND	(1)	52	(1)	ND	(1)	ND	(1)
Manganese	mg/L	ND	(.01)	.047 @	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	ND	(.05)	ND	(.05)	.55	(.05)	1.2	(.05)
Nickel	mg/L	ND	(.02)	.32	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	11 @	(3)	7.4 @	(3)	380	(3)	2900	(30)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	7.1	(1)	5.3	(1)	98	(1)	29	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	140	(1)	120	(1)	400	(1)	690	(1)
Strontium	mg/L	.6	(.003)	2.2	(.003)	2.6	(.003)	2.7	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)	.098 @	(.02)	.2	(.02)

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

C1-5

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Table G-8
(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID				Log Date			
		OH / OHMW07		OH / OHMW08		OH / OHLY01		OH / OHLY02	
		OH236		OH237		OH238		OH239	
		8/24/91		8/24/91		8/25/91		8/25/91	
-----	-----	-----		-----		-----		-----	
Elements by ICPEs or AA, cont.									
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	1460	(5)	1240	(5)	3500	(5)	12000	(5)
Redox (Eh)	mV	-261.3	( )	-18	( )	-128.5	( )	-85.8	( )
TDS	mg/L	652	(1)	906	(1)	2899	(1)	NA	
Temperature	degrees C	14	( )	12.8	( )	26	( )	25.7	( )
Total Alkalinity	meq/L	4.84	(.03)	5.64	(.03)	2.16	(.03)	NA	
pH	pH units	12.09	( )	7.63	( )	9.31	( )	8.57	( )

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Table G-8

(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID		Sample ID		Sample ID		Sample ID	
		Log Date		Log Date		Log Date		Log Date	
		OH / OHLY11		OH / OHLY12		OH / OHLY14		OH / OHLY15	
		OH248		OH249		OH251		OH252	
		8/25/91		8/25/91		8/25/91		8/25/91	
-----	-----	-----		-----		-----		-----	
Anions									
Chloride	mg/L	450	(2.6)	61	(.13)	240	(2.6)	200	(.52)
Fluoride	mg/L	ND	(.1)	.21 @	(.1)	.13 @	(.1)	ND	(.1)
Sulfate	mg/L	2100	(5)	560	(1)	1700	(5)	1700	(1)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.004)	.0058 @	(.004)	.012 @	(.004)	.0064 @	(.004)
Barium	mg/L	.031 @	(.01)	.073	(.01)	.051	(.01)	.043 @	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	480	(1)	210	(1)	350	(1)	260	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	ND	(.003)	.0032 @	(.003)	ND	(.003)	ND	(.003)
Magnesium	mg/L	ND	(1)	ND	(1)	ND	(1)	ND	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	.93	(.05)	.15 @	(.05)	.53	(.05)	.48	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	760	(3)	96	(3)	550	(3)	380	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Silicon	mg/L	76	(1)	26	(1)	56	(1)	76	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	240	(1)	25	(1)	170	(1)	320	(1)
Strontium	mg/L	4	(.003)	2.2	(.003)	3.6	(.003)	3.1	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	.062 @	(.02)	ND	(.02)	.071 @	(.02)	.033 @	(.02)

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

Table G-8

(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID		Sample ID		Sample ID		Sample ID	
		Log Date		Log Date		Log Date		Log Date	
		OH / OHLY11	OH / OHLY11	OH / OHLY12	OH / OHLY12	OH / OHLY14	OH / OHLY14	OH / OHLY15	OH / OHLY15
		OH248	OH248	OH249	OH249	OH251	OH251	OH252	OH252
		8/25/91	8/25/91	8/25/91	8/25/91	8/25/91	8/25/91	8/25/91	8/25/91
Elements by ICPEs or AA, cont.									
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	4800	(5)	1300	(5)	3300	(5)	3700	(5)
Redox (Eh)	mV	-137.8	( )	-164.2	( )	-114.9	( )	-129	( )
TDS	mg/L	4680	(1)	1145	(1)	2988	(1)	2889	(1)
Temperature	degrees C	24.7	( )	23.2	( )	24.1	( )	25.1	( )
Total Alkalinity	meq/L	1.8	(.03)	1.28	(.03)	.88	(.03)	1.31	(.03)
pH	pH units	9.51	( )	9.93	( )	9.12	( )	9.35	( )

Table G-8

(Continued)

Parameter	Units	Elements by ICPEs or AA			
		Anions	Cations		
Chloride	mg/L	1800	(5.2)	370	(1.3)
Fluoride	mg/L	.21 @	(.1)	.14 @	(.1)
Sulfate	mg/L	1800	(2.5)	1500	(2.5)
Aluminum	mg/L	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.04)	ND	(.004)
Barium	mg/L	.018 @	(.01)	.052	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)
Calcium	mg/L	16	(1)	240	(1)
Chromium	mg/L	.17	(.01)	.01 @	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)
Lead	mg/L	ND	(.003)	ND	(.003)
Magnesium	mg/L	ND	(1)	ND	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)
Molybdenum	mg/L	1.5	(.05)	.74	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)
Potassium	mg/L	3800	(30)	760	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)
Silicon	mg/L	280	(1)	45	(1)
Silver	mg/L	ND	(.01)	ND	(.01)
Sodium	mg/L	590	(1)	200	(1)
Strontium	mg/L	2.6	(.003)	3.9	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)
Vanadium	mg/L	.033 @	(.02)	.034 @	(.02)
Aluminum	mg/L	ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.04)	ND	(.004)
Barium	mg/L	.018 @	(.01)	.052	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)
Calcium	mg/L	16	(1)	240	(1)
Chromium	mg/L	.17	(.01)	.01 @	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	ND	(.04)
Lead	mg/L	ND	(.003)	ND	(.003)
Magnesium	mg/L	ND	(1)	ND	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)
Molybdenum	mg/L	1.5	(.05)	.74	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)
Potassium	mg/L	3800	(30)	760	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)
Silicon	mg/L	280	(1)	45	(1)
Silver	mg/L	ND	(.01)	ND	(.01)
Sodium	mg/L	590	(1)	200	(1)
Strontium	mg/L	2.6	(.003)	3.9	(.003)
Tin	mg/L	ND	(.6)	ND	(.6)
Vanadium	mg/L	.033 @	(.02)	.034 @	(.02)

Site ID / Location ID
Sample ID
Log Date

OH / OHLY20
OH255
8/25/91

OH / OHLY17
OH254
8/25/91

OH / OHLY16
OH253
8/25/91

Units

Table G-8

(Continued)

Parameter	Units	Site ID / Location ID					
		OH / OHLY16		OH / OHLY17		OH / OHLY20	
		OH253		OH254		OH255	
		8/25/91		8/25/91		8/25/91	
-----	-----	-----	-----	-----	-----	-----	-----
Elements by ICPEs or AA, cont.							
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements							
Conductivity	umhos/cm	13500	(5)	4300	(5)	8500	(5)
Redox (Eh)	mV	-292	()	-197	()	-283	()
TDS	mg/L	609	(1)	NA		2053	(1)
Temperature	degrees C	22.7	()	25.8	()	25.6	()
Total Alkalinity	meq/L	32.24	(.03)	2.16	(.03)	NA	
pH	pH units	12.12	()	10.55	()	11.9	()

Table G-9

Chemical Characteristics of Deionized Water Leachates of Ohio Soils, Event 9

		Site ID / Location ID Sample ID Preparation Method Log Date							
Parameter	Units	OH / OHBLNK BLANK-9 N 11/20/91		OH / OHMW01 OH260 N 11/20/91		OH / OHMW02 OH261 N 11/20/91		OH / OHMW02 OH278 Dup of OH261 N 11/20/91	
		-----		-----		-----		-----	
Anions									
Chloride	mg/L	ND	(.026)	200	(.52)	65	(.52)	67	(.52)
Fluoride	mg/L	ND	(.1)	.78	(.1)	.41 @	(.1)	.32 @	(.1)
Sulfate	mg/L	ND	(.05)	500	(1)	890	(1)	850	(1)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Arsenic	mg/L	NA		ND	(.004)	ND	(.004)	NA	
Barium	mg/L	ND	(.01)	.011 @	(.01)	.053	(.01)	.05	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	.92 @	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	NA		ND	(.001)	ND	(.001)	NA	
Calcium	mg/L	ND	(1)	3.5 @	(1)	190	(1)	180	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	.047 @	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	NA		ND	(.003)	ND	(.003)	NA	
Magnesium	mg/L	ND	(1)	3.4 @	(1)	130	(1)	130	(1)
Manganese	mg/L	ND	(.01)	ND	(.01)	.16	(.01)	.16	(.01)
Molybdenum	mg/L	ND	(.05)	ND	(.05)	ND	(.05)	ND	(.05)
Nickel	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	ND	(3)	25	(3)	7.9 @	(3)	7.8 @	(3)
Selenium	mg/L	NA		ND	(.005)	ND	(.005)	NA	
Silicon	mg/L	ND	(1)	3.2 @	(1)	6.3	(1)	6.3	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	ND	(1)	620	(1)	220	(1)	220	(1)
Strontium	mg/L	ND	(.003)	.22	(.003)	1.3	(.003)	1.3	(.003)

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

C1-1

G-90

Table G-9

(Continued)

		Site ID / Location ID		Sample ID		Preparation Method		Log Date	
Parameter		OH / OHBLINK		OH / OHMW01		OH / OHMW02		OH / OHMW02	
		BLANK-9		OH260		OH261		OH278 Dup of OH261	
		N		N		N		N	
		11/20/91		11/20/91		11/20/91		11/20/91	
Units									
-----		-----		-----		-----		-----	
mg/L		ND		ND		ND		ND	
mg/L		ND		ND		ND		ND	
mg/L		ND		ND		ND		ND	
Tin		ND		ND		ND		ND	
Vanadium		ND		ND		ND		ND	
Zinc		ND		ND		ND		ND	
Field measurements		5.2		2590		2034		NA	
Conductivity		19.5		-165.1		-6.8		NA	
Redox (Eh)		ND		1636		1786		ND	
TDS		19.7		15.7		12.9		NA	
Temperature		.32		11.64		10.6		10.8	
Total Alkalinity		7.41		10.25		7.06		NA	
pH									

G-91

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

C1-2

Table G-9
(Continued)

Parameter	Units	Site ID / Location ID Sample ID Preparation Method Log Date							
		OH / OHMW03 OH262 N 11/20/91		OH / OHMW04 OH263 N 11/20/91		OH / OHMW05 OH264 N 11/21/91		OH / OHMW06 OH265 N 11/21/91	
Anions	mg/L	44	(.26)	230	(.52)	180	(.52)	460	(1.3)
Chloride	mg/L	.38 @	(.1)	1	(.1)	.95	(.1)	.11 @	(.1)
Fluoride	mg/L	820	(.5)	110	(.1)	120	(1)	610	(1)
Sulfate	mg/L								
Elements by ICPEs or AA	mg/L	ND	(.2)	ND	(.2)	ND	(.2)	ND	(.2)
Aluminum	mg/L	ND	(.004)	ND	(.004)	ND	(.004)	ND	(.004)
Arsenic	mg/L	.034 @	(.01)	ND	(.01)	.035 @	(.01)	.063	(.01)
Barium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Beryllium	mg/L	ND	(.6)	1 @	(.6)	1.2 @	(.6)	ND	(.6)
Boron	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Cadmium	mg/L	190	(1)	7.4	(1)	20	(1)	290	(1)
Calcium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Copper	mg/L	ND	(.04)	ND	(.04)	ND	(.04)	.75	(.04)
Iron	mg/L	ND	(.003)	ND	(.003)	ND	(.003)	ND	(.003)
Lead	mg/L	170	(1)	4.4 @	(1)	12	(1)	98	(1)
Magnesium	mg/L	.22	(.01)	ND	(.01)	.02 @	(.01)	.43	(.01)
Manganese	mg/L	ND	(.05)	ND	(.05)	ND	(.05)	ND	(.05)
Molybdenum	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Nickel	mg/L	6.5 @	(3)	5.1 @	(3)	7 @	(3)	12 @	(3)
Potassium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	ND	(.005)
Selenium	mg/L	6.9	(1)	ND	(1)	ND	(1)	4.7 @	(1)
Silicon	mg/L	ND	(.01)	4.1 @	(.01)	4.3 @	(.01)	ND	(.01)
Silver	mg/L	100	(1)	ND	(1)	ND	(1)	180	(1)
Sodium	mg/L	.6	(.003)	570	(1)	480	(1)	1.1	(.003)
Strontium	mg/L			.2	(.003)	.53	(.003)		

C1-3

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

G-92

Table G-9

(Continued)

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
Parameter	Units	OH / OHMW03		OH / OHMW04		OH / OHMW05		OH / OHMW06	
		OH262		OH263		OH264		OH265	
		N		N		N		N	
		11/20/91		11/20/91		11/21/91		11/21/91	
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	1909.7	(5)	2034	(5)	2080	(5)	2740	(5)
Redox (Eh)	mV	-12	( )	-77.1	( )	-52.8	( )	27.4	( )
TDS	mg/L	1690	(1)	1470	(1)	1328	(1)	1680	(1)
Temperature	degrees C	14.8	( )	13.4	( )	12.2	( )	12	( )
Total Alkalinity	meq/L	10	(0.03)	17.28	(0.03)	15.4	(0.03)	3.56	(0.03)
pH	pH units	6.69	( )	8.29	( )	8.11	( )	6.53	( )

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

C1-4

G-93

Table G-9
(Continued)

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
		OH / OHMW07		OH / OHMW08		OH / OHLY01		OH / OHLY11	
		OH266		OH267		OH269		OH271	
		N		N		N		N	
Parameter	Units	11/20/91		11/20/91		11/20/91		11/20/91	

Anions									
Chloride	mg/L	5.9	(.052)	3.9	(.052)	NA		390	(1.3)
Fluoride	mg/L	.28 @	(.1)	.29 @	(.1)	NA		ND	(.1)
Sulfate	mg/L	370	(1)	460	(1)	NA		1700	(2.5)
Elements by ICPES or AA									
Aluminum	mg/L	ND	(.2)	ND	(.2)	.34 @	(.2)	ND	(.2)
Arsenic	mg/L	.0059 @	(.004)	ND	(.004)	ND	(.004)	ND	(.004)
Barium	mg/L	.047 @	(.01)	.017 @	(.01)	.077	(.01)	.041 @	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	77	(1)	110	(1)	130	(1)	490	(1)
Chromium	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Iron	mg/L	.044 @	(.04)	ND	(.04)	ND	(.04)	ND	(.04)
Lead	mg/L	ND	(.003)	.0034 @	(.003)	.0043 @	(.003)	.0032 @	(.003)
Magnesium	mg/L	ND	(1)	54	(1)	ND	(1)	ND	(1)
Manganese	mg/L	ND	(.01)	.048 @	(.01)	ND	(.01)	ND	(.01)
Molybdenum	mg/L	ND	(.05)	ND	(.05)	.78	(.05)	.68	(.05)
Nickel	mg/L	ND	(.02)	.028 @	(.02)	ND	(.02)	ND	(.02)
Potassium	mg/L	9.4 @	(3)	6.9 @	(3)	990	(3)	590	(3)
Selenium	mg/L	ND	(.005)	ND	(.005)	.013 @	(.005)	.0089 @	(.005)
Silicon	mg/L	9	(1)	4.6 @	(1)	6	(1)	55	(1)
Silver	mg/L	ND	(.01)	ND	(.01)	ND	(.01)	ND	(.01)
Sodium	mg/L	160	(1)	120	(1)	300	(1)	160	(1)
Strontium	mg/L	.63	(.003)	2.3	(.003)	2.4	(.003)	3.5	(.003)

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

Table G-9

(Continued)

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
Parameter	Units	OH / OHMW07		OH / OHMW08		OH / OHLY01		OH / OHLY11	
		OH266		OH267		OH269		OH271	
		N		N		N		N	
		11/20/91		11/20/91		11/20/91		11/20/91	
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	.066 @	(.02)
Zinc	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	1210	(5)	1160	(5)	6330	(5)	32500	(5)
Redox (Eh)	mV	-257	( )	-19.3	( )	-294.1	( )	-140.4	( )
TDS	mg/L	526	(1)	814	(1)	3078	(1)	3604	(1)
Temperature	degrees C	13.9	( )	14.1	( )	16	( )	13.8	( )
Total Alkalinity	meq/L	2.8	(0.03)	5.8	(0.03)	NA		1.04	(0.03)
pH	pH units	11.51	( )	7.27	( )	12.14	( )	9.35	( )

G-95

Table G-9

(Continued)

Parameter	Units	Site ID / Location ID				Sample ID				Preparation Method				Log Date			
		OH / OHLY12				OH272				OH / OHLY14				OH / OHLY15			
Anions	Chloride	mg/L	42	(.52)		280	(.52)			110	(.52)			110	(.52)		
	Fluoride	mg/L	.23	@	(.1)	.11	@	(.1)		ND	(.1)			ND	(.1)		
	Sulfate	mg/L	310	(1)		1600	(1)			980	(1)			980	(1)		
Elements by ICPCS or AA																	
Aluminum	mg/L	ND	(.2)			ND	(.2)			ND	(.2)			ND	(.2)		
Arsenic	mg/L	.0044	@	(.004)		.011	@	(.004)		.0078	@	(.004)					
Barium	mg/L	.03	@	(.01)		.043	@	(.01)		.028	@	(.01)					
Beryllium	mg/L	ND	(.002)			ND	(.002)			ND	(.002)			ND	(.002)		
Boron	mg/L	ND	(.6)			ND	(.6)			ND	(.6)			ND	(.6)		
Cadmium	mg/L	ND	(.001)			ND	(.001)			ND	(.001)			ND	(.001)		
Calcium	mg/L	130	(1)			380	(1)			180	(1)			180	(1)		
Chromium	mg/L	ND	(.01)			.016	@	(.01)		.011	@	(.01)					
Cobalt	mg/L	ND	(.01)			ND	(.01)			ND	(.01)			ND	(.01)		
Copper	mg/L	ND	(.02)			ND	(.02)			.053	@	(.02)					
Iron	mg/L	ND	(.04)			ND	(.04)			ND	(.04)			ND	(.04)		
Lead	mg/L	.0032	@	(.003)		.0041	@	(.003)		.0035	@	(.003)					
Magnesium	mg/L	ND	(1)			1.3	@	(1)		ND	(1)			ND	(1)		
Manganese	mg/L	ND	(.01)			ND	(.01)			ND	(.01)			ND	(.01)		
Molybdenum	mg/L	.085	@	(.05)		.71	(.05)			.33	(.05)						
Nickel	mg/L	ND	(.02)			ND	(.02)			ND	(.02)			ND	(.02)		
Potassium	mg/L	33	(3)			560	(3)			280	(3)			2900	(30)		
Selenium	mg/L	ND	(.005)			.011	@	(.005)		ND	(.005)						
Silicon	mg/L	15	(1)			33	(1)			54	(1)			100	(1)		
Silver	mg/L	ND	(.01)			ND	(.01)			ND	(.01)			ND	(.01)		
Sodium	mg/L	11	(1)			150	(1)			180	(1)			550	(10)		
Strontium	mg/L	.97	(.003)			4.1	(.003)			2.5	(.003)			3.6	(.003)		

C1-7

Table G-9

(Continued)

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
Parameter	Units	OH / OHLY12		OH / OHLY14		OH / OHLY15		OH / OHLY16	
		OH272		OH273		OH274		OH275	
		N		N		N		N	
		11/20/91		11/20/91		11/20/91		11/20/91	
Tin	mg/L	ND	(.6)	ND	(.6)	ND	(.6)	ND	(.6)
Vanadium	mg/L	ND	(.02)	.069 @	(.02)	.031 @	(.02)	ND	(.02)
Zinc	mg/L	ND	(.02)	ND	(.02)	.022 @	(.02)	ND	(.02)
Field measurements									
Conductivity	umhos/cm	678	(5)	3400	(5)	2000	(5)	9150	(5)
Redox (Eh)	mV	-173.4	()	-119.5	()	-128.7	()	-293.9	()
TDS	mg/L	NA		2906	(1)	3448	(1)	NA	
Temperature	degrees C	12.7	()	14.6	()	12.7	()	19.4	()
Total Alkalinity	meq/L	NA		.52	(0.03)	.76	(0.03)	NA	
pH	pH units	9.9	()	9.07	()	9.23	()	12.11	()

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

Table G-9
(Continued)

		Site ID / Location ID							
		Sample ID							
		Preparation Method							
		Log Date							
		OH / OHLY17		OH / OHLY20		OH / OHLY21		OH / OHLY24	
		OH276		OH277		OH279		OH280	
		N		N		N		N	
Parameter	Units	11/20/91		11/20/91		11/21/91		11/21/91	
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Anions									
Chloride	mg/L	410	(1.3)	150	(1.3)	140	(.52)	1300	(2.6)
Fluoride	mg/L	.1 @	(.1)	ND	(.1)	.27 @	(.1)	.31 @	(.1)
Sulfate	mg/L	1700	(2.5)	1900	(2.5)	1500	(1)	2400	(5)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.2)	NA		ND	(.2)	ND	(.2)
Arsenic	mg/L	ND	(.004)	NA		.017 @	(.004)	.0078 @	(.004)
Barium	mg/L	.054	(.01)	NA		.048 @	(.01)	.07	(.01)
Beryllium	mg/L	ND	(.002)	NA		ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	NA		7.4	(.6)	ND	(.6)
Cadmium	mg/L	ND	(.001)	NA		ND	(.001)	ND	(.001)
Calcium	mg/L	370	(1)	NA		510	(1)	700	(1)
Chromium	mg/L	.012 @	(.01)	NA		ND	(.01)	.016 @	(.01)
Cobalt	mg/L	ND	(.01)	NA		ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	NA		ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	NA		ND	(.04)	.21	(.04)
Lead	mg/L	ND	(.003)	NA		.003 @	(.003)	ND	(.003)
Magnesium	mg/L	ND	(1)	NA		68	(1)	22	(1)
Manganese	mg/L	ND	(.01)	NA		ND	(.01)	.1	(.01)
Molybdenum	mg/L	.86	(.05)	NA		.26	(.05)	.18 @	(.05)
Nickel	mg/L	ND	(.02)	NA		ND	(.02)	.027 @	(.02)
Potassium	mg/L	680	(3)	NA		180	(3)	860	(3)
Selenium	mg/L	.015 @	(.005)	NA		.021 @	(.005)	.0056 @	(.005)
Silicon	mg/L	16	(1)	NA		24	(1)	34	(1)
Silver	mg/L	ND	(.01)	NA		ND	(.01)	ND	(.01)
Sodium	mg/L	220	(1)	NA		63	(1)	500	(1)
Strontium	mg/L	4.7	(.003)	NA		.82	(.003)	3.6	(.003)

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

Table G-9

(Continued)

		Site ID / Location ID		Sample ID		Preparation Method		Log Date	
Parameter	Units	OH / OHLY17 OH276 N	11/20/91	OH / OHLY20 OH277 N	11/20/91	OH / OHLY21 OH279 N	11/21/91	OH / OHLY24 OH280 N	11/21/91
Tin	mg/L	ND	(.6)	NA	NA	ND	(.6)	ND	(.6)
Vanadium	mg/L	.031 @	(.02)	NA	NA	ND	(.02)	ND	(.02)
Zinc	mg/L	ND	(.02)	NA	NA	ND	(.02)	.023 @	(.02)
Field measurements									
Conductivity	umhos/cm	3700	(5)	NA	NA	2750	(5)	8050	(5)
Redox (Eh)	mV	-228.5	( )	NA	NA	-27.5	( )	-129.5	( )
TDS	mg/L	3676	(1)	1810	(1)	2982	(1)	6348	(1)
Temperature	degrees C	15.4	( )	NA	NA	11.2	( )	15.7	( )
Total Alkalinity	meq/L	1.92	(0.03)	1.64	(0.03)	4.2	(0.03)	NA	( )
pH	pH units	10.93	( )	NA	NA	7.48	( )	9.18	( )

G-99

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

C1-10

Table G-9

(Continued)

		Site ID / Location ID			
		Sample ID		Preparation Method	
		Log Date			
		OH / OHSW01		OH / OHLY05	
		OH281		OH282	
		N		N	
Parameter	Units	11/20/91		11/21/91	
-----	-----	-----		-----	
Anions					
Chloride	mg/L	920	(2.6)	7200	(26)
Fluoride	mg/L	.45 @	(.1)	.34 @	(.1)
Sulfate	mg/L	940	(5)	8000	(10)
Elements by ICPEs or AA					
Aluminum	mg/L	1	(.2)	ND	(.2)
Arsenic	mg/L	.006 @	(.004)	.08 @	(.04)
Barium	mg/L	.041 @	(.01)	.046 @	(.01)
Beryllium	mg/L	ND	(.002)	ND	(.002)
Boron	mg/L	ND	(.6)	1.4 @	(.6)
Cadmium	mg/L	ND	(.001)	.0013 @	(.001)
Calcium	mg/L	68	(1)	150	(1)
Chromium	mg/L	ND	(.01)	.2	(.01)
Cobalt	mg/L	ND	(.01)	ND	(.01)
Copper	mg/L	ND	(.02)	ND	(.02)
Iron	mg/L	ND	(.04)	.05 @	(.04)
Lead	mg/L	ND	(.003)	ND	(.03)
Magnesium	mg/L	ND	(1)	ND	(1)
Manganese	mg/L	ND	(.01)	.01 @	(.01)
Molybdenum	mg/L	1	(.05)	5	(.05)
Nickel	mg/L	ND	(.02)	.023 @	(.02)
Potassium	mg/L	1200	(30)	7600	(30)
Selenium	mg/L	.011 @	(.005)	ND	(.01)
Silicon	mg/L	12	(1)	110	(1)
Silver	mg/L	ND	(.01)	ND	(.01)
Sodium	mg/L	260	(10)	3200	(10)
Strontium	mg/L	1.6	(.003)	6.2	(.003)

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

Table G-9

(Continued)

G-101

		Site ID / Location ID			
		Sample ID			
		Preparation Method			
		Log Date			
Parameter	Units	OH / OHSW01		OH / OHLY05	
		OH281		OH282	
		N		N	
		11/20/91		11/21/91	
Tin	mg/L	ND	(.6)	ND	(.6)
Vanadium	mg/L	.048 @	(.02)	.11	(.02)
Zinc	mg/L	ND	(.02)	ND	(.02)
Field measurements					
Conductivity	umhos/cm	6780	(5)	25000	(5)
Redox (Eh)	mV	-288.3	( )	-256.6	( )
TDS	mg/L	3776	(1)	7806	(1)
Temperature	degrees C	17	( )	15.2	( )
Total Alkalinity	meq/L	11.4	(0.03)	12.4	(0.03)
Total suspended solids	mg/L	ND	(1)	NA	
pH	pH units	12.5	( )	11.55	( )

Table G-10

Chemical Characteristics of Deionized Water Leachates of Ohio Soils, Event 10

		Site ID / Location ID							
		Sample ID				Log Date			
		OH / OHBLNK		OH / OHMW01		OH / OHMW02		OH / OHMW03	
		BLANK-10		OH285		OH286		OH287	
Parameter	Units	2/29/92		2/29/92		2/29/92		2/29/92	
-----	-----	-----		-----		-----		-----	
Anions									
Chloride	mg/L	ND	(0.026)	210	(0.52)	53	(0.52)	85	(0.52)
Fluoride	mg/L	ND	(0.10)	1.3	(0.10)	0.52	(0.10)	0.51	(0.10)
Sulfate	mg/L	ND	(0.050)	380	(1.0)	740	(1.0)	750	(1.0)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(0.20)	ND	(0.20)	ND	(0.20)	ND	(0.20)
Arsenic	mg/L	ND	(0.0040)	0.0048 a	(0.0040)	ND	(0.0040)	ND	(0.0040)
Barium	mg/L	ND	(0.010)	ND	(0.010)	0.057	(0.010)	0.032 a	(0.010)
Beryllium	mg/L	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)
Boron	mg/L	ND	(0.60)	0.96 a	(0.60)	ND	(0.60)	ND	(0.60)
Calcium	mg/L	3.4 a	(1.0)	3.4 a	(1.0)	210	(1.0)	190	(1.0)
Chromium	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Cobalt	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Copper	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Iron	mg/L	ND	(0.050)	ND	(0.050)	ND	(0.050)	ND	(0.050)
Lead	mg/L	ND	(0.0030)	ND	(0.0030)	ND	(0.0030)	ND	(0.0030)
Magnesium	mg/L	ND	(1.0)	2.2 a	(1.0)	140	(1.0)	170	(1.0)
Manganese	mg/L	ND	(0.010)	ND	(0.010)	0.16	(0.010)	0.21	(0.010)
Molybdenum	mg/L	ND	(0.050)	ND	(0.050)	ND	(0.050)	ND	(0.050)
Nickel	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Potassium	mg/L	3.3 a	(3.0)	25	(3.0)	7.6 a	(3.0)	5.6 a	(3.0)
Selenium	mg/L	ND	(0.0050)	ND	(0.0050)	ND	(0.0050)	ND	(0.0050)
Silicon	mg/L	ND	(1.0)	3.5 a	(1.0)	6.0	(1.0)	6.1	(1.0)
Silver	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Sodium	mg/L	1.0 a	(1.0)	550	(1.0)	160	(1.0)	100	(1.0)
Strontium	mg/L	0.025	(0.0030)	0.13	(0.0030)	1.2	(0.0030)	0.60	(0.0030)
Tin	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)
Vanadium	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Zinc	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)

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

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Table G-10

(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID		Log Date					
		OH / OHBLNK		OH / OHMW01		OH / OHMW02		OH / OHMW03	
		BLANK-10		OH285		OH286		OH287	
		2/29/92		2/29/92		2/29/92		2/29/92	
-----	-----	-----		-----		-----		-----	
Field measurements									
Conductivity	umhos/cm	1.1	(5)	2800	(5)	2660	(5)	2640	(5)
Redox (Eh)	mV	2.7	( )	-158.1	( )	10.8	( )	30.8	( )
TDS	mg/L	ND	(1)	1652	(1)	2024	(1)	1902	(1)
Temperature	deg. C	16.8	( )	10.5	( )	10.5	( )	9.3	( )
Total Alkalinity	meq/L	.28	(.03)	10.48	(.03)	10.48	(.03)	9.64	(.03)
pH	pH units	6.88	( )	10.04	( )	7.66	( )	7.34	( )

G-103

Table G-10

(Continued)

		Site ID / Location ID							
		Sample ID							
		Log Date							
		OH / OHMW04		OH / OHMW05		OH / OHMW05		OH / OHMW06	
		OH288		OH289		OH293 Dup of OH289		OH290	
		2/29/92		2/29/92		2/29/92		2/29/92	
Parameter	Units								
-----	-----	-----		-----		-----		-----	
Anions									
Chloride	mg/L	240	(0.52)	250	(0.52)	170	(0.52)	450	(2.6)
Fluoride	mg/L	1.8	(0.10)	1.0 a	(0.40)	1.2	(0.10)	0.12 a	(0.10)
Sulfate	mg/L	57	(0.25)	140	(1.0)	56	(0.25)	530	(1.0)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(0.20)	ND	(0.20)	ND	(0.20)	ND	(0.20)
Arsenic	mg/L	0.014 a	(0.0040)	ND	(0.0040)	ND	(0.0040)	ND	(0.0040)
Barium	mg/L	ND	(0.010)	0.037 a	(0.010)	0.037 a	(0.010)	0.079	(0.010)
Beryllium	mg/L	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)
Boron	mg/L	0.83 a	(0.60)	1.0 a	(0.60)	1.0 a	(0.60)	ND	(0.60)
Calcium	mg/L	7.1	(1.0)	17	(1.0)	21	(1.0)	250	(1.0)
Chromium	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Cobalt	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	0.026 a	(0.010)
Copper	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Iron	mg/L	ND	(0.050)	ND	(0.050)	ND	(0.050)	0.95	(0.050)
Lead	mg/L	ND	(0.0030)	ND	(0.0030)	ND	(0.0030)	ND	(0.0030)
Magnesium	mg/L	2.7 a	(1.0)	10	(1.0)	10	(1.0)	71	(1.0)
Manganese	mg/L	0.021 a	(0.010)	ND	(0.010)	ND	(0.010)	4.9	(0.010)
Molybdenum	mg/L	0.085 a	(0.050)	ND	(0.050)	ND	(0.050)	ND	(0.050)
Nickel	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	0.053 a	(0.020)
Potassium	mg/L	4.7 a	(3.0)	6.5 a	(3.0)	11 a	(3.0)	16	(3.0)
Selenium	mg/L	ND	(0.0050)	ND	(0.0050)	ND	(0.0050)	ND	(0.0050)
Silicon	mg/L	2.7 a	(1.0)	3.3 a	(1.0)	3.8 a	(1.0)	3.8 a	(1.0)
Silver	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Sodium	mg/L	550	(1.0)	430	(1.0)	430	(1.0)	170	(1.0)
Strontium	mg/L	0.18	(0.0030)	0.47	(0.0030)	0.52	(0.0030)	1.0	(0.0030)
Tin	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)
Vanadium	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Zinc	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)

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

Table G-10

(Continued)

Parameter	Site ID / Location ID				
	Sample ID		Log Date		
	OH / OHMW04 OH288 2/29/92	OH / OHMW05 OH289 2/29/92	OH / OHMW05 OH293 Dup of OH289 2/29/92	OH / OHMW06 OH290 2/29/92	
Units	-----	-----	-----	-----	-----
Field measurements					
Conductivity	umhos/cm	2710	2565	2555	2880
Redox (Eh)	mV	-68.9	-50.7	-50.3	34.1
TDS	mg/L	1575	1343	1273	2184
Temperature	deg. C	11.0	10.8	10.9	9.2
Total Alkalinity	meq/L	17.52	15	15.2	2.92
pH	pH units	8.46	8.14	8.13	6.65
		(5)	(5)	(5)	(5)
		(1)	(1)	(1)	(1)
		(1)	(1)	(1)	(1)
		(.03)	(.03)	(.03)	(.03)
		(1)	(1)	(1)	(1)

Table G-10

(Continued)

		Site ID / Location ID							
		Sample ID							
		Log Date							
		OH / OHMW07		OH / OHMW08		OH / OHLY01		OH / OHLY11	
		OH291		OH292		OH294		OH296	
		3/01/92		3/01/92		3/01/92		3/01/92	
Parameter	Units								
-----	-----	-----		-----		-----		-----	
Anions									
Chloride	mg/L	6.3	(0.052)	4.0	(0.052)	45	(0.13)	290	(0.52)
Fluoride	mg/L	0.36	a (0.10)	0.30	a (0.10)	ND	(0.10)	ND	(0.10)
Sulfate	mg/L	330	(1.0)	390	(1.0)	1500	(1.0)	1300	(1.0)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(0.20)	ND	(0.20)	ND	(0.20)	ND	(0.20)
Arsenic	mg/L	0.0073	a (0.0040)	ND	(0.0040)	0.016	a (0.0040)	ND	(0.0040)
Barium	mg/L	0.047	a (0.010)	0.020	a (0.010)	0.024	a (0.010)	0.034	a (0.010)
Beryllium	mg/L	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)
Boron	mg/L	ND	(0.60)	ND	(0.60)	1.4	a (0.60)	ND	(0.60)
Calcium	mg/L	84	(1.0)	99	(1.0)	260	(1.0)	380	(1.0)
Chromium	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Cobalt	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Copper	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Iron	mg/L	ND	(0.050)	ND	(0.050)	ND	(0.050)	ND	(0.050)
Lead	mg/L	ND	(0.0030)	ND	(0.0030)	ND	(0.0030)	ND	(0.0030)
Magnesium	mg/L	ND	(1.0)	49	(1.0)	1.9	a (1.0)	ND	(1.0)
Manganese	mg/L	ND	(0.010)	0.028	a (0.010)	ND	(0.010)	ND	(0.010)
Molybdenum	mg/L	0.055	a (0.050)	ND	(0.050)	0.38	(0.050)	0.55	(0.050)
Nickel	mg/L	ND	(0.020)	0.10	(0.020)	ND	(0.020)	ND	(0.020)
Potassium	mg/L	9.1	a (3.0)	6.8	a (3.0)	270	(3.0)	380	(3.0)
Selenium	mg/L	ND	(0.0050)	ND	(0.0050)	0.0065	a (0.0050)	0.0092	a (0.0050)
Silicon	mg/L	8.7	(1.0)	5.0	(1.0)	43	(1.0)	36	(1.0)
Silver	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Sodium	mg/L	150	(1.0)	110	(1.0)	300	(1.0)	110	(1.0)
Strontium	mg/L	0.67	(0.0030)	2.0	(0.0030)	3.1	(0.0030)	2.7	(0.0030)
Tin	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)
Vanadium	mg/L	ND	(0.020)	ND	(0.020)	0.069	a (0.020)	0.052	a (0.020)
Zinc	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)

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

C1-5

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Table G-10

(Continued)

Parameter	Site ID / Location ID				
	Sample ID				
	Log Date				
	OH / OHMW07	OH / OHMW08	OH / OHLY01	OH / OHLY11	
	OH291	OH292	OH294	OH296	
	3/01/92	3/01/92	3/01/92	3/01/92	
Units					

Field measurements					
Conductivity	2200	1775	3195	3270	(5)
Redox (Eh)	-230.0	-13.9	-105.7	-141.9	(1)
TDS	769	940	2091	3024	(1)
Temperature	11.1	12.0	6.1	8.5	(1)
Total Alkalinity	3.44	5.52	.628	1.04	(.03)
pH	11.25	7.67	9.05	9.55	(1)

Table G-10

(Continued)

Parameter	Units	Site ID / Location ID							
		OH / OHLY12		OH / OHLY14		OH / OHLY15		OH / OHLY17	
		OH297		OH298		OH299		OH301	
		3/01/92		3/01/92		3/01/92		3/01/92	
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Anions									
Chloride	mg/L	21	(0.13)	150	(0.52)	62	(0.13)	200	(0.52)
Fluoride	mg/L	0.18 a	(0.10)	ND	(0.10)	ND	(0.10)	ND	(0.10)
Sulfate	mg/L	260	(0.25)	1400	(1.0)	690	(1.0)	820	(1.0)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(0.20)	ND	(0.20)	ND	(0.20)	ND	(0.20)
Arsenic	mg/L	0.0049 a	(0.0040)	0.019 a	(0.0040)	0.013 a	(0.0040)	ND	(0.0040)
Barium	mg/L	0.031 a	(0.010)	0.033 a	(0.010)	0.026 a	(0.010)	0.035 a	(0.010)
Beryllium	mg/L	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)
Boron	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)
Calcium	mg/L	130	(1.0)	360	(1.0)	150	(1.0)	210	(1.0)
Chromium	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Cobalt	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Copper	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Iron	mg/L	ND	(0.050)	ND	(0.050)	ND	(0.050)	ND	(0.050)
Lead	mg/L	ND	(0.0030)	ND	(0.0030)	ND	(0.0030)	ND	(0.0030)
Magnesium	mg/L	1.9 a	(1.0)	ND	(1.0)	ND	(1.0)	ND	(1.0)
Manganese	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Molybdenum	mg/L	0.069 a	(0.050)	0.39	(0.050)	0.26	(0.050)	0.50	(0.050)
Nickel	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Potassium	mg/L	23	(3.0)	370	(3.0)	190	(3.0)	330	(3.0)
Selenium	mg/L	ND	(0.0050)	0.0057 a	(0.0050)	ND	(0.0050)	0.010 a	(0.0050)
Silicon	mg/L	10	(1.0)	30	(1.0)	48	(1.0)	18	(1.0)
Silver	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Sodium	mg/L	9.7	(1.0)	87	(1.0)	110	(1.0)	110	(1.0)
Strontium	mg/L	0.78	(0.0030)	3.7	(0.0030)	2.0	(0.0030)	2.1	(0.0030)
Tin	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)
Vanadium	mg/L	ND	(0.020)	0.053 a	(0.020)	0.029 a	(0.020)	0.042 a	(0.020)
Zinc	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)

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

Table G-10

(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID				Log Date			
		OH / OHLY12		OH / OHLY14		OH / OHLY15		OH / OHLY17	
		OH297		OH298		OH299		OH301	
		3/01/92		3/01/92		3/01/92		3/01/92	
-----	----	-----		-----		-----		-----	
Field measurements									
Conductivity	umhos/cm	1900	(5)	2520	(5)	2450	(5)	NA	
Redox (Eh)	mV	-164.9	( )	-86.7	( )	-123.7	( )	NA	
TDS	mg/L	595	(1)	2704	(1)	1545	(1)	NA	
Temperature	deg. C	5.5	( )	7.8	( )	8.1	( )	NA	
Total Alkalinity	meq/L	.968	(.03)	.308	(.03)	.78	(.03)	NA	
pH	pH units	10.01	( )	8.66	( )	9.33	( )	NA	

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Table G-10

(Continued)

		Site ID / Location ID					
		Sample ID					
		Log Date					
		OH / OHLY20		OH / OHLY24		OH / OHLY05	
		OH302		OH305		OH311	
Parameter	Units	3/01/92		3/01/92		3/01/92	
-----	-----	-----		-----		-----	
Anions							
Chloride	mg/L	1400	(2.6)	1200	(2.6)	620	(2.6)
Fluoride	mg/L	0.44 a	(0.10)	0.53	(0.10)	0.22 a	(0.10)
Sulfate	mg/L	1900	(5.0)	1900	(5.0)	1900	(5.0)
Elements by ICPEs or AA							
Aluminum	mg/L	ND	(0.20)	ND	(0.20)	ND	(0.20)
Arsenic	mg/L	ND	(0.016)	ND	(0.0080)	ND	(0.0080)
Barium	mg/L	0.083	(0.010)	0.058	(0.010)	0.046 a	(0.010)
Beryllium	mg/L	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)
Boron	mg/L	ND	(0.60)	ND	(0.60)	1.3 a	(0.60)
Calcium	mg/L	180	(1.0)	640	(1.0)	260	(1.0)
Chromium	mg/L	0.018 a	(0.010)	ND	(0.010)	0.024 a	(0.010)
Cobalt	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)
Copper	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)
Iron	mg/L	ND	(0.050)	ND	(0.050)	ND	(0.050)
Lead	mg/L	ND	(0.0030)	ND	(0.0030)	ND	(0.0030)
Magnesium	mg/L	ND	(1.0)	7.2	(1.0)	ND	(1.0)
Manganese	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)
Molybdenum	mg/L	1.2	(0.050)	0.16 a	(0.050)	0.91	(0.050)
Nickel	mg/L	0.020 a	(0.020)	ND	(0.020)	ND	(0.020)
Potassium	mg/L	2400	(3.0)	650	(3.0)	1200	(3.0)
Selenium	mg/L	0.019 a	(0.0050)	ND	(0.0050)	0.019 a	(0.0050)
Silicon	mg/L	2.7 a	(1.0)	28	(1.0)	23	(1.0)
Silver	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)
Sodium	mg/L	560	(1.0)	400	(1.0)	310	(1.0)
Strontium	mg/L	4.1	(0.0030)	3.0	(0.0030)	4.0	(0.0030)
Tin	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)
Vanadium	mg/L	0.022 a	(0.020)	ND	(0.020)	0.053 a	(0.020)
Zinc	mg/L	0.093 a	(0.020)	ND	(0.020)	ND	(0.020)

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

C1-9

Table G-10

(Continued)

Parameter	Units	Site ID / Location ID	
		Sample ID	Log Date
		OH / OHLY20	OH / OHLY24
		OH302	OH305
		3/01/92	3/01/92
			OH / OHLY05
			OH311
			3/01/92
Field measurements			
Conductivity	umhos/cm	8900	5175
Redox (Eh)	mV	-275.8	-231.2
TDS	mg/L	8674	5554
Temperature	deg. C	13.4	11.7
Total Alkalinity	meq/L	26.44	4.32
pH	pH units	11.74	11.14
		(5)	(5)
		( )	( )
		(1)	(1)
		( )	( )
		(.03)	(.03)
		( )	( )

Table G-11

Chemical Characteristics of Deionized Water Leachates of Ohio Soils, Event 11

		Site ID / Location ID							
		Sample ID							
		Log Date							
Parameter	Units	OH / OHBLNK BLANK-11 5/24/92		OH / OHMW01 OH312 5/24/92		OH / OHMW02 OH313 5/24/92		OH / OHMW03 OH314 5/24/92	
Anions									
Chloride	mg/L	0.79	(0.026)	200	(0.52)	51	(0.26)	49	(0.26)
Fluoride	mg/L	ND	(0.10)	1.1	(0.10)	0.41 a	(0.10)	0.40 a	(0.10)
Sulfate	mg/L	3.0	(0.050)	500	(0.50)	830	(0.50)	780	(0.50)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(0.20)	ND	(0.20)	ND	(0.20)	ND	(0.20)
Arsenic	mg/L	ND	(0.0040)	ND	(0.0040)	ND	(0.0040)	ND	(0.0040)
Barium	mg/L	ND	(0.010)	0.018 a	(0.010)	0.047 a	(0.010)	0.028 a	(0.010)
Beryllium	mg/L	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)
Boron	mg/L	ND	(0.60)	1.1 a	(0.60)	ND	(0.60)	ND	(0.60)
Calcium	mg/L	ND	(1.0)	3.9 a	(1.0)	200	(1.0)	200	(1.0)
Chromium	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Cobalt	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Copper	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Iron	mg/L	ND	(0.050)	0.061 a	(0.050)	ND	(0.050)	0.11 a	(0.050)
Lead	mg/L	ND	(0.0060)	ND	(0.0060)	ND	(0.0060)	0.013 a	(0.0060)
Magnesium	mg/L	ND	(1.0)	2.9 a	(1.0)	140	(1.0)	170	(1.0)
Manganese	mg/L	ND	(0.010)	ND	(0.010)	0.17	(0.010)	0.21	(0.010)
Molybdenum	mg/L	ND	(0.050)	ND	(0.050)	ND	(0.050)	ND	(0.050)
Nickel	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Potassium	mg/L	ND	(3.0)	13 a	(3.0)	7.6 a	(3.0)	5.5 a	(3.0)
Selenium	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Silicon	mg/L	ND	(1.0)	3.0 a	(1.0)	5.9	(1.0)	6.1	(1.0)
Silver	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Sodium	mg/L	ND	(1.0)	620	(1.0)	190	(1.0)	100	(1.0)
Strontium	mg/L	ND	(0.0030)	0.17	(0.0030)	1.3	(0.0030)	0.61	(0.0030)
Tin	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)
Vanadium	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Zinc	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)

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

C1-1

G-112

Table G-11

(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID				Log Date			
		OH / OHBLNK		OH / OHMW01		OH / OHMW02		OH / OHMW03	
		BLANK-11		OH312		OH313		OH314	
		5/24/92		5/24/92		5/24/92		5/24/92	
Field measurements									
Conductivity	umhos/cm	ND	(5)	2370	(5)	1750	(5)	1650	(5)
Redox (Eh)	mV	18.3	( )	ND	( )	16.9	( )	ND	( )
TDS	mg/L	ND	(1)	1625	(1)	1804	(1)	1834	(1)
Temperature	deg. C	15.1	( )	11.3	( )	10.8	( )	10.0	( )
Total Alkalinity	meq/L	.1 @	(.03)	11.3	(.03)	10.4	(.03)	9.7	(.03)
pH	pH units	7.35	( )	9.83	( )	7.03	( )	6.94	( )

G-113

Table G-11

(Continued)

		Site ID / Location ID							
		Sample ID							
		Log Date							
		OH / OHMW04		OH / OHMW04		OH / OHMW05		OH / OHMW06	
		OH315		OH321 Dup of OH315		OH316		OH317	
Parameter	Units	5/24/92		5/24/92		5/24/92		5/24/92	

Anions									
Chloride	mg/L	260	(0.52)	260	(0.52)	180	(0.52)	520	(2.6)
Fluoride	mg/L	1.2	(0.10)	1.1	(0.10)	1.0	(0.10)	0.11 a	(0.10)
Sulfate	mg/L	300	(0.50)	300	(0.50)	210	(0.50)	550	(0.50)

Elements by ICPEs or AA									
Aluminum	mg/L	ND	(0.20)	ND	(0.20)	ND	(0.20)	ND	(0.20)
Arsenic	mg/L	ND	(0.0040)	ND	(0.0040)	ND	(0.0040)	ND	(0.0040)
Barium	mg/L	ND	(0.010)	ND	(0.010)	0.041 a	(0.010)	0.049 a	(0.010)
Beryllium	mg/L	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)
Boron	mg/L	1.0 a	(0.60)	0.96 a	(0.60)	1.0 a	(0.60)	ND	(0.60)
Calcium	mg/L	4.6 a	(1.0)	4.3 a	(1.0)	13	(1.0)	260	(1.0)
Chromium	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Cobalt	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	0.027 a	(0.010)
Copper	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Iron	mg/L	ND	(0.050)	ND	(0.050)	ND	(0.050)	4.6	(0.050)
Lead	mg/L	ND	(0.0060)	ND	(0.0060)	ND	(0.0060)	ND	(0.0060)
Magnesium	mg/L	2.3 a	(1.0)	2.2 a	(1.0)	8.4	(1.0)	80	(1.0)
Manganese	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	4.2	(0.010)
Molybdenum	mg/L	ND	(0.050)	ND	(0.050)	ND	(0.050)	ND	(0.050)
Nickel	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	0.036 a	(0.020)
Potassium	mg/L	5.0 a	(3.0)	5.1 a	(3.0)	7.0 a	(3.0)	15	(3.0)
Selenium	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Silicon	mg/L	3.0 a	(1.0)	2.9 a	(1.0)	3.5 a	(1.0)	4.8 a	(1.0)
Silver	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Sodium	mg/L	530	(1.0)	510	(1.0)	440	(1.0)	180	(1.0)
Strontium	mg/L	0.13	(0.0030)	0.12	(0.0030)	0.43	(0.0030)	1.1	(0.0030)
Tin	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)
Vanadium	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Zinc	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)

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

C1-3

G-114

Table G-11

(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID				Log Date			
		OH / OHMW04		OH / OHMW04		OH / OHMW05		OH / OHMW06	
		OH315		OH321 Dup of OH315		OH316		OH317	
		5/24/92		5/24/92		5/24/92		5/24/92	
Field measurements									
Conductivity	umhos/cm	1760	(5)	1760	(5)	1450	(5)	1810	(5)
Redox (Eh)	mV	116.5	( )	ND	( )	ND	( )	17.3	( )
TDS	mg/L	1325	(1)	1321	(1)	1234	(1)	1974	(1)
Temperature	deg. C	10.8	( )	11.1	( )	10.1	( )	9.9	( )
Total Alkalinity	meq/L	14.6	(.03)	14.6	(.03)	13.2	(.03)	3.4	(.03)
pH	pH units	8.74	( )	8.75	( )	8.29	( )	6.48	( )

Table G-11

(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID				Log Date			
		OH / OHMW07		OH / OHMW08		OH / OHLY01		OH / OHLY11	
		OH318		OH319		OH322		OH324	
		5/24/92		5/24/92		5/24/92		5/24/92	
Anions									
Chloride	mg/L	13	(0.26)	4.9	(0.026)	27	(0.26)	430	(1.3)
Fluoride	mg/L	0.30 a	(0.10)	0.28 a	(0.10)	0.10 a	(0.10)	ND	(0.10)
Sulfate	mg/L	220	(0.50)	350	(0.50)	1700	(2.5)	1700	(2.5)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(0.20)	ND	(0.20)	ND	(0.20)	ND	(0.20)
Arsenic	mg/L	ND	(0.0040)	ND	(0.0040)	0.0099 a	(0.0040)	ND	(0.0040)
Barium	mg/L	0.056	(0.010)	0.016 a	(0.010)	0.027 a	(0.010)	0.033 a	(0.010)
Beryllium	mg/L	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)
Boron	mg/L	ND	(0.60)	ND	(0.60)	2.8 a	(0.60)	ND	(0.60)
Calcium	mg/L	110	(1.0)	68	(1.0)	410	(1.0)	440	(1.0)
Chromium	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Cobalt	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Copper	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Iron	mg/L	ND	(0.050)	ND	(0.050)	ND	(0.050)	ND	(0.050)
Lead	mg/L	ND	(0.0060)	0.0060 a	(0.0060)	ND	(0.0060)	ND	(0.0060)
Magnesium	mg/L	ND	(1.0)	43	(1.0)	4.8 a	(1.0)	ND	(1.0)
Manganese	mg/L	ND	(0.010)	0.031 a	(0.010)	ND	(0.010)	ND	(0.010)
Molybdenum	mg/L	0.051 a	(0.050)	ND	(0.050)	0.35	(0.050)	0.84	(0.050)
Nickel	mg/L	ND	(0.020)	0.026 a	(0.020)	ND	(0.020)	ND	(0.020)
Potassium	mg/L	8.0 a	(3.0)	6.1 a	(3.0)	290	(3.0)	690	(3.0)
Selenium	mg/L	ND	(0.010)	ND	(0.010)	0.027 a	(0.010)	0.024 a	(0.010)
Silicon	mg/L	4.9 a	(1.0)	4.2 a	(1.0)	42	(1.0)	43	(1.0)
Silver	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Sodium	mg/L	110	(1.0)	100	(1.0)	220	(1.0)	200	(1.0)
Strontium	mg/L	0.60	(0.0030)	1.3	(0.0030)	4.7	(0.0030)	3.5	(0.0030)
Tin	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)
Vanadium	mg/L	ND	(0.020)	ND	(0.020)	0.035 a	(0.020)	0.058 a	(0.020)
Zinc	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)

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

C1-5

G-116

Table G-11

(Continued)

Parameter	Units	Site ID / Location ID							
		OH / OHMW07		OH / OHMW08		OH / OHLY01		OH / OHLY11	
		OH318		OH319		OH322		OH324	
		5/24/92		5/24/92		5/24/92		5/24/92	
Field measurements									
Conductivity	umhos/cm	1560	(5)	960	(5)	2750	(5)	3500	(5)
Redox (Eh)	mV	ND	( )	ND	( )	ND	( )	ND	( )
TDS	mg/L	624	(1)	733	(1)	3137	(1)	3918	(1)
Temperature	deg. C	11.7	( )	11.4	( )	12.3	( )	10.8	( )
Total Alkalinity	meq/L	6.1	(.03)	4	(.03)	.9	(.03)	1.2	(.03)
pH	pH units	11.99	( )	8.38	( )	8.31	( )	9.78	( )

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

C1-6

G-117

Table G-11

(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID				Log Date			
		OH / OHLY12		OH / OHLY14		OH / OHLY15		OH / OHLY20	
		OH325	5/24/92	OH326	5/24/92	OH327	5/24/92	OH329	5/24/92
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Anions									
Chloride	mg/L	NA		160	(0.26)	72	(0.26)	NA	
Fluoride	mg/L	NA		ND	(0.10)	ND	(0.10)	NA	
Sulfate	mg/L	NA		1500	(2.5)	890	(1.0)	NA	
Elements by ICPES or AA									
Aluminum	mg/L	ND	(0.20)	ND	(0.20)	ND	(0.20)	1.4	(0.20)
Arsenic	mg/L	0.0040	a (0.0040)	0.016	a (0.0040)	0.0092	a (0.0040)	ND	(0.0040)
Barium	mg/L	0.070	(0.010)	0.028	a (0.010)	0.036	a (0.010)	0.053	(0.010)
Beryllium	mg/L	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)
Boron	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)
Calcium	mg/L	160	(1.0)	440	(1.0)	220	(1.0)	120	(1.0)
Chromium	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Cobalt	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Copper	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Iron	mg/L	ND	(0.050)	ND	(0.050)	ND	(0.050)	2.1	(0.050)
Lead	mg/L	ND	(0.0060)	ND	(0.0060)	ND	(0.0060)	ND	(0.0060)
Magnesium	mg/L	ND	(1.0)	ND	(1.0)	ND	(1.0)	ND	(1.0)
Manganese	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	0.068	(0.010)
Molybdenum	mg/L	0.11	a (0.050)	0.44	(0.050)	0.28	(0.050)	0.33	(0.050)
Nickel	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Potassium	mg/L	38	(3.0)	330	(3.0)	240	(3.0)	650	(3.0)
Selenium	mg/L	0.020	a (0.010)	0.020	a (0.010)	0.014	a (0.010)	ND	(0.010)
Silicon	mg/L	29	(1.0)	32	(1.0)	55	(1.0)	4.7	a (1.0)
Silver	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Sodium	mg/L	12	(1.0)	84	(1.0)	110	(1.0)	180	(1.0)
Strontium	mg/L	1.2	(0.0030)	4.1	(0.0030)	2.9	(0.0030)	2.3	(0.0030)
Tin	mg/L	ND	(0.60)	ND	(0.60)	ND	(0.60)	ND	(0.60)
Vanadium	mg/L	ND	(0.020)	0.056	a (0.020)	0.023	a (0.020)	ND	(0.020)
Zinc	mg/L	0.028	a (0.020)	ND	(0.020)	ND	(0.020)	0.025	a (0.020)

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

C1-7

G-118

(Continued)

X) = Detection Limit	ND = Not Detected	NA = Not Analyzed	3 = < 5X Det. Limit
			Ct-8

Table G-12

Chemical Characteristics of Deionized Water Leachates of Ohio Soils, Event 12

		Site ID / Location ID							
		Sample ID							
		Log Date							
Parameter	Units	OH / OHBLNK		OH / OHMW01		OH / OHMW02		OH / OHMW03	
		BLANK-12		OH331		OH332		OH333	
-----	-----	8/24/92		8/24/92		8/24/92		8/24/92	

Anions									
Chloride	mg/L	0.16	(0.026)	190	(5.2)	44	(0.26)	46	(0.26)
Fluoride	mg/L	ND	(0.10)	1.1	(0.10)	0.44 a	(0.10)	0.44 a	(0.10)
Sulfate	mg/L	ND	(0.050)	820	(10)	940	(10)	930	(10)
Elements by ICPEs or AA									
Aluminum	mg/L	0.11 a	(0.10)	ND	(0.10)	ND	(0.10)	ND	(0.10)
Arsenic	mg/L	ND	(0.0050)	ND	(0.010)	ND	(0.0050)	ND	(0.0050)
Barium	mg/L	ND	(0.010)	0.026 a	(0.010)	0.042 a	(0.010)	0.028 a	(0.010)
Beryllium	mg/L	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)
Boron	mg/L	ND	(0.10)	1.2	(0.10)	0.34 a	(0.10)	0.18 a	(0.10)
Calcium	mg/L	ND	(0.20)	10.9	(0.20)	193	(0.20)	197	(0.20)
Chromium	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Cobalt	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Copper	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Iron	mg/L	0.45 a	(0.10)	0.26 a	(0.10)	0.22 a	(0.10)	0.34 a	(0.10)
Lead	mg/L	ND	(0.0050)	ND	(0.010)	ND	(0.10)	ND	(0.050)
Magnesium	mg/L	ND	(0.20)	6.0	(0.20)	142	(0.20)	172	(0.20)
Manganese	mg/L	ND	(0.010)	ND	(0.010)	0.18	(0.010)	0.21	(0.010)
Molybdenum	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Nickel	mg/L	ND	(0.040)	ND	(0.040)	ND	(0.040)	ND	(0.040)
Potassium	mg/L	ND	(5.0)	8.9 a	(5.0)	7.2 a	(5.0)	5.7 a	(5.0)
Selenium	mg/L	ND	(0.0050)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Silicon	mg/L	0.257 a	(0.234)	3.878	(0.234)	5.887	(0.234)	6.728	(0.234)
Silver	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Sodium	mg/L	ND	(5.0)	780	(5.0)	146	(5.0)	99.5	(5.0)
Strontium	mg/L	ND	(0.050)	0.41	(0.050)	1.2	(0.050)	0.60	(0.050)
Tin	mg/L	ND	(0.10)	ND	(0.10)	ND	(0.10)	ND	(0.10)
Vanadium	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Zinc	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)

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

Table G-12
(Continued)

Parameter	Units	Site ID / Location ID			
		OH / OHBLNK	OH / OHMW01	OH / OHMW02	OH / OHMW03
		BLANK-12	OH331	OH332	OH333
		8/24/92	8/24/92	8/24/92	8/24/92
Field measurements					
Conductivity	umhos/cm	5.5 a	2170	1600	1800
Redox (Eh)	mV	NA	98.4	-9.5	-0.4
TDS	mg/L	ND	2193	1906	1869
Temperature	deg. C	28.1	14.8	14.0	16.8
Total Alkalinity	meq/L	5	14.4	10.76	10.36
pH	pH units	6.99	8.72	7.11	6.96
			(0.03)	(0.03)	(0.03)
			(5)	(5)	(5)
			(1)	(1)	(1)
			(0.03)	(0.03)	(0.03)
			(5)	(5)	(5)

Table G-12

(Continued)

		Site ID / Location ID							
		Sample ID							
		Log Date							
		OH / OHMW04		OH / OHMW05		OH / OHMW06		OH / OHMW06	
		OH334		OH335		OH336		OH340 Dup of OH336	
Parameter	Units	8/24/92		8/24/92		8/24/92		8/24/92	
-----	-----	-----		-----		-----		-----	
Anions									
Chloride	mg/L	240	(1.3)	170	(0.52)	420	(1.3)	420	(1.3)
Fluoride	mg/L	1.1	(0.10)	1.0	(0.10)	0.14 a	(0.10)	0.13 a	(0.10)
Sulfate	mg/L	87	(0.50)	160	(1.0)	550	(0.50)	560	(0.50)
Elements by ICPEs or AA									
Aluminum	mg/L	0.12 a	(0.10)	0.13 a	(0.10)	0.12 a	(0.10)	ND	(0.10)
Arsenic	mg/L	0.0057 a	(0.0050)	ND	(0.0050)	ND	(0.0050)	ND	(0.0050)
Barium	mg/L	ND	(0.010)	0.041 a	(0.010)	0.048 a	(0.010)	0.050	(0.010)
Beryllium	mg/L	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)
Boron	mg/L	0.99	(0.10)	1.0	(0.10)	0.20 a	(0.10)	0.23 a	(0.10)
Calcium	mg/L	9.4	(0.20)	18.7	(0.20)	258	(0.20)	258	(0.20)
Chromium	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Cobalt	mg/L	ND	(0.010)	ND	(0.010)	0.026 a	(0.010)	0.027 a	(0.010)
Copper	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Iron	mg/L	0.54	(0.10)	0.28 a	(0.10)	5.1	(0.10)	3.6	(0.10)
Lead	mg/L	ND	(0.0050)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Magnesium	mg/L	4.6	(0.20)	10.2	(0.20)	86.7	(0.20)	89.6	(0.20)
Manganese	mg/L	0.017 a	(0.010)	0.019 a	(0.010)	3.4	(0.010)	3.4	(0.010)
Molybdenum	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Nickel	mg/L	ND	(0.040)	ND	(0.040)	ND	(0.040)	ND	(0.040)
Potassium	mg/L	ND	(5.0)	6.4 a	(5.0)	20.0 a	(5.0)	19.8 a	(5.0)
Selenium	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.0050)	ND	(0.0050)
Silicon	mg/L	3.504	(0.234)	4.625	(0.234)	5.7	(0.234)	5.887	(0.234)
Silver	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Sodium	mg/L	566	(5.0)	507	(5.0)	171	(5.0)	184	(5.0)
Strontium	mg/L	0.20 a	(0.050)	0.49	(0.050)	1.0	(0.050)	1.1	(0.050)
Tin	mg/L	ND	(0.10)	ND	(0.10)	ND	(0.10)	ND	(0.10)
Vanadium	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Zinc	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)

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

Table G-12

(Continued)

		Site ID / Location ID							
		Sample ID							
		Log Date							
		OH / OHMW04		OH / OHMW05		OH / OHMW06		OH / OHMW06	
		OH334		OH335		OH336		OH340 Dup of OH336	
Parameter	Units	8/24/92		8/24/92		8/24/92		8/24/92	
-----	-----	-----		-----		-----		-----	
Field measurements									
Conductivity	umhos/cm	1740	(5)	1550	(5)	1900	(5)	1920	(5)
Redox (Eh)	mV	-71.1	( )	-60.1	( )	25.9	( )	26.0	( )
TDS	mg/L	1495	(1)	1378	(1)	1951	(1)	1945	(1)
Temperature	deg. C	15.3	( )	15.4	( )	17.5	( )	17.9	( )
Total Alkalinity	meq/L	16.68	(0.03)	15.36	(0.03)	3.84	(0.03)	4.32	(0.03)
pH	pH units	8.17	( )	7.97	( )	6.46	( )	6.46	( )

Table G-12

(Continued)

		Site ID / Location ID							
		Sample ID							
		Log Date							
		OH / OHMW07		OH / OHMW08		OH / OHLY01		OH / OHLY11	
		OH337		OH338		OH341		OH343	
		8/24/92		8/24/92		8/30/92		8/30/92	
Parameter	Units	-----		-----		-----		-----	

Anions									
Chloride	mg/L	7.9	(0.026)	4.2	(0.026)	8.3	(0.026)	180	(1.3)
Fluoride	mg/L	0.31 a	(0.10)	0.29 a	(0.10)	0.44 a	(0.10)	ND	(0.10)
Sulfate	mg/L	250	(0.25)	340	(0.50)	1100	(5.0)	1400	(2.5)
Elements by ICPEs or AA									
Aluminum	mg/L	0.10 a	(0.10)	0.13 a	(0.10)	ND	(0.10)	ND	(0.10)
Arsenic	mg/L	ND	(0.0050)	ND	(0.0050)	0.022 a	(0.0050)	ND	(0.010)
Barium	mg/L	0.054	(0.010)	0.024 a	(0.010)	0.044 a	(0.010)	0.035 a	(0.010)
Beryllium	mg/L	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)
Boron	mg/L	0.30 a	(0.10)	0.41 a	(0.10)	6.3	(0.10)	ND	(0.10)
Cadmium	mg/L	NA		NA		ND	(0.00050)	ND	(0.00050)
Calcium	mg/L	95.0	(0.20)	87.2	(0.20)	551	(0.20)	454	(0.20)
Chromium	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	0.011 a	(0.010)
Cobalt	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Copper	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Iron	mg/L	0.37 a	(0.10)	0.39 a	(0.10)	ND	(0.10)	ND	(0.10)
Lead	mg/L	ND	(0.010)	ND	(0.050)	ND	(0.050)	ND	(0.010)
Magnesium	mg/L	0.21 a	(0.20)	44.8	(0.20)	54.8	(0.20)	ND	(0.20)
Manganese	mg/L	ND	(0.010)	0.15	(0.010)	ND	(0.010)	ND	(0.010)
Molybdenum	mg/L	0.046 a	(0.020)	0.039 a	(0.020)	0.15	(0.020)	0.63	(0.020)
Nickel	mg/L	ND	(0.040)	ND	(0.040)	ND	(0.040)	ND	(0.040)
Potassium	mg/L	8.0 a	(5.0)	6.1 a	(5.0)	56.8	(5.0)	448	(5.0)
Selenium	mg/L	ND	(0.010)	ND	(0.0050)	ND	(0.20)	ND	(0.020)
Silicon	mg/L	6.401	(0.234)	6.167	(0.234)	36.628	(0.234)	46.3	(0.234)
Silver	mg/L	ND	(0.010)	ND	(0.010)	0.014 a	(0.010)	ND	(0.010)
Sodium	mg/L	122	(5.0)	104	(5.0)	19.5 a	(5.0)	120	(5.0)
Strontium	mg/L	0.60	(0.050)	1.6	(0.050)	0.95	(0.050)	3.9	(0.050)
Tin	mg/L	ND	(0.10)	ND	(0.10)	ND	(0.10)	ND	(0.10)
Vanadium	mg/L	ND	(0.010)	ND	(0.010)	0.015 a	(0.010)	0.070	(0.010)

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

C1-5

G-124

Table G-12

(Continued)

Parameter -----	Units -----	Site ID / Location ID Sample ID Log Date							
		OH / OHMW07 OH337 8/24/92		OH / OHMW08 OH338 8/24/92		OH / OHLY01 OH341 8/30/92		OH / OHLY11 OH343 8/30/92	
		-----	-----	-----	-----	-----	-----	-----	-----
Elements by ICPEs or AA, cont.									
Zinc	mg/L	ND	(0.020)	ND	(0.020)	0.023	Ⓜ (0.020)	ND	(0.020)
Field measurements									
Conductivity	umhos/cm	1160	(5)	800	(5)	1725	(5)	3125	(5)
Redox (Eh)	mV	-277.7	( )	-66.0	( )	-25.4	( )	-168.9	( )
TDS	mg/L	682	(1)	851	(1)	2617	(1)	3391	(1)
Temperature	deg. C	14.5	( )	14.4	( )	19.7	( )	20.7	( )
Total Alkalinity	meq/L	5.04	(0.03)	5.12	(0.03)	8.24	(0.03)	1.2	(0.03)
pH	pH units	11.75	( )	8.12	( )	7.20	( )	9.00	( )

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

C1-6

Table G-12

(Continued)

		Site ID / Location ID							
		Sample ID							
		Log Date							
		OH / OHLY12		OH / OHLY14		OH / OHLY15		OH / OHLY17	
		OH344		OH345		OH346		OH347	
		8/30/92		8/30/92		8/30/92		8/30/92	
Parameter	Units								
-----	-----	-----		-----		-----		-----	
Anions									
Chloride	mg/L	20	(0.26)	100	(0.26)	54	(0.26)	NA	
Fluoride	mg/L	0.26	a (0.10)	0.11	a (0.10)	0.10	a (0.10)	NA	
Sulfate	mg/L	470	(0.50)	1400	(5.0)	930	(1.0)	NA	
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(0.10)	ND	(0.10)	ND	(0.10)	ND	(0.10)
Arsenic	mg/L	0.0056	a (0.0050)	0.019	a (0.010)	0.012	a (0.0050)	ND	(0.010)
Barium	mg/L	0.065	(0.010)	0.032	a (0.010)	0.039	a (0.010)	0.041	a (0.010)
Beryllium	mg/L	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)	ND	(0.0020)
Boron	mg/L	0.52	(0.10)	0.15	a (0.10)	ND	(0.10)	ND	(0.10)
Cadmium	mg/L	ND	(0.0010)	ND	(0.00050)	ND	(0.0010)	ND	(0.0010)
Calcium	mg/L	223	(0.20)	508	(0.20)	254	(0.20)	214	(0.20)
Chromium	mg/L	ND	(0.010)	ND	(0.010)	0.012	a (0.010)	ND	(0.010)
Cobalt	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Copper	mg/L	ND	(0.020)	ND	(0.020)	ND	(0.020)	ND	(0.020)
Iron	mg/L	ND	(0.10)	ND	(0.10)	0.16	a (0.10)	0.19	a (0.10)
Lead	mg/L	ND	(0.0050)	ND	(0.010)	ND	(0.050)	ND	(0.025)
Magnesium	mg/L	1.7	(0.20)	0.53	a (0.20)	0.29	a (0.20)	0.29	a (0.20)
Manganese	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Molybdenum	mg/L	0.11	(0.020)	0.44	(0.020)	0.30	(0.020)	0.56	(0.020)
Nickel	mg/L	ND	(0.040)	ND	(0.040)	ND	(0.040)	ND	(0.040)
Potassium	mg/L	30.0	(5.0)	301	(5.0)	246	(5.0)	384	(5.0)
Selenium	mg/L	ND	(0.0050)	ND	(0.10)	ND	(0.010)	ND	(0.020)
Silicon	mg/L	22.472	(0.234)	38.170	(0.234)	55.597	(0.234)	22.566	(0.234)
Silver	mg/L	ND	(0.010)	ND	(0.010)	ND	(0.010)	ND	(0.010)
Sodium	mg/L	11.0	a (5.0)	74.9	(5.0)	93.8	(5.0)	114	(5.0)
Strontium	mg/L	1.0	(0.050)	4.4	(0.050)	3.5	(0.050)	2.7	(0.050)
Tin	mg/L	ND	(0.10)	ND	(0.10)	ND	(0.10)	ND	(0.10)
Vanadium	mg/L	0.018	a (0.010)	0.071	(0.010)	0.040	a (0.010)	0.061	(0.010)

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

C1-7

G-126

Table G-12

(Continued)

		Site ID / Location ID							
		Sample ID							
		Log Date							
Parameter	Units	OH / OHLY12		OH / OHLY14		OH / OHLY15		OH / OHLY17	
		OH344		OH345		OH346		OH347	
		8/30/92		8/30/92		8/30/92		8/30/92	
-----	-----	-----		-----		-----		-----	
Elements by ICPEs or AA, cont.									
Zinc	mg/L	0.023	a (0.020)	0.030	a (0.020)	0.023	a (0.020)	ND	(0.020)
Field measurements									
Conductivity	umhos/cm	1050	(5)	2625	(5)	1925	(5)	2300	(5)
Redox (Eh)	mV	-144.3	( )	-85.6	( )	-123.7	( )	-223.3	( )
TDS	mg/L	983	(1)	3030	(1)	1973	(1)	NA	
Temperature	deg. C	21.5	( )	20.5	( )	20.7	( )	20.2	( )
Total Alkalinity	meq/L	1.04	(0.03)	.52	(0.03)	.64	(0.03)	NA	
pH	pH units	9.28	( )	8.31	( )	8.95	( )	10.67	( )

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

Table G-12

(Continued)

Parameter	Units	Site ID / Location ID							
		Sample ID		Sample ID		Sample ID		Sample ID	
		Log Date		Log Date		Log Date		Log Date	
		OH / OHLY24		OH / OHLY21		OH / OHLY25		OH / OHLY26	
		OH349		OH350		OH351		OH352	
		8/30/92		8/30/92		8/30/92		8/30/92	
Anions									
Chloride	mg/L	870	(2.6)	29	(0.13)	450	(2.6)	2700	(13)
Fluoride	mg/L	0.36 a	(0.10)	0.17 a	(0.10)	1.1	(0.10)	1.1	(0.10)
Sulfate	mg/L	1700	(5.0)	1800	(5.0)	660	(1.0)	1600	(5.0)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(0.10)	ND	(2.0)	ND	(0.10)	0.51 a	(0.50)
Arsenic	mg/L	0.016 a	(0.0050)	0.068 a	(0.030)	ND	(0.0050)	ND	(0.020)
Barium	mg/L	0.033 a	(0.010)	ND	(2.0)	0.034 a	(0.010)	ND	(0.050)
Beryllium	mg/L	ND	(0.0020)	ND	(0.050)	ND	(0.0020)	ND	(0.010)
Boron	mg/L	0.23 a	(0.10)	11.1	(0.10)	ND	(0.10)	ND	(0.50)
Cadmium	mg/L	ND	(0.00050)	ND	(0.0030)	ND	(0.0010)	ND	(0.0010)
Calcium	mg/L	664	(0.20)	746	(100)	197	(0.20)	24.2	(1.0)
Chromium	mg/L	ND	(0.010)	ND	(0.20)	ND	(0.010)	ND	(0.050)
Cobalt	mg/L	ND	(0.010)	ND	(0.50)	ND	(0.010)	ND	(0.050)
Copper	mg/L	ND	(0.020)	ND	(0.25)	ND	(0.020)	ND	(0.10)
Iron	mg/L	0.12 a	(0.10)	ND	(1.0)	ND	(0.10)	ND	(0.50)
Lead	mg/L	ND	(0.010)	ND	(0.030)	ND	(0.050)	ND	(0.020)
Magnesium	mg/L	40.6	(0.20)	60.4 a	(50.0)	52.9	(0.20)	ND	(1.0)
Manganese	mg/L	0.067	(0.010)	ND	(0.50)	0.21	(0.010)	ND	(0.050)
Molybdenum	mg/L	0.091 a	(0.020)	0.72	(0.020)	0.46	(0.020)	2.0	(0.10)
Nickel	mg/L	ND	(0.040)	ND	(0.50)	ND	(0.040)	ND	(0.20)
Potassium	mg/L	595	(5.0)	238	(10.0)	223	(5.0)	3790	(25.0)
Selenium	mg/L	ND	(0.10)	ND	(0.030)	ND	(0.010)	ND	(0.50)
Silicon	mg/L	30.041	(0.234)	41.908	(4.999)	41.908	(0.234)	338.72	(1.168)
Silver	mg/L	ND	(0.010)	ND	(0.050)	ND	(0.010)	ND	(0.050)
Sodium	mg/L	401	(5.0)	235 a	(100)	239	(5.0)	679	(25.0)
Strontium	mg/L	2.8	(0.050)	5.7	(0.050)	0.78	(0.050)	1.5	(0.25)
Tin	mg/L	ND	(0.10)	ND	(0.10)	ND	(0.10)	ND	(0.50)
Vanadium	mg/L	ND	(0.010)	ND	(0.50)	ND	(0.010)	0.059 a	(0.050)

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

Table G-12

(Continued)

		Site ID / Location ID							
		Sample ID				Log Date			
		OH / OHLY24		OH / OHLY21		OH / OHLY25		OH / OHLY26	
Parameter	Units	OH349		OH350		OH351		OH352	
		8/30/92		8/30/92		8/30/92		8/30/92	
-----	-----	-----		-----		-----		-----	
Elements by ICPEs or AA, cont.									
Zinc	mg/L	ND	(0.020)	ND	(0.50)	0.027	a (0.020)	ND	(0.10)
Field measurements									
Conductivity	umhos/cm	3590	(5)	3400	(5)	2350	(5)	11000	(5)
Redox (Eh)	mV	-118.2	( )	-62.0	( )	-109.9	( )	-362.0	( )
TDS	mg/L	5259	(1)	4028	(1)	2321	(1)	9894	(1)
Temperature	deg. C	15.2	( )	20.2	( )	17.0	( )	17.4	( )
Total Alkalinity	meq/L	1.04	(0.03)	1.68	(0.03)	1.12	(0.03)	29.32	(0.03)
pH	pH units	8.84	( )	7.87	( )	8.69	( )	12.04	( )

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

C1-10

G-129

Table G-12
(Continued)

		Site ID / Location ID	
		Sample ID	
		Log Date	
		OH / OHLY27	
		OH353	
		8/30/92	
Parameter	Units		

Anions			
Chloride	mg/L	7100	(26)
Fluoride	mg/L	0.45 a	(0.10)
Sulfate	mg/L	9800	(50)
Elements by ICPEs or AA			
Aluminum	mg/L	ND	(2.0)
Arsenic	mg/L	ND	(0.025)
Barium	mg/L	ND	(0.20)
Beryllium	mg/L	ND	(0.040)
Boron	mg/L	ND	(2.0)
Cadmium	mg/L	ND	(0.0050)
Calcium	mg/L	282	(4.0)
Chromium	mg/L	ND	(0.20)
Cobalt	mg/L	ND	(0.20)
Copper	mg/L	ND	(0.40)
Iron	mg/L	ND	(2.0)
Lead	mg/L	0.041 a	(0.010)
Magnesium	mg/L	ND	(4.0)
Manganese	mg/L	ND	(0.20)
Molybdenum	mg/L	2.0	(0.40)
Nickel	mg/L	ND	(0.80)
Potassium	mg/L	14000	(100)
Selenium	mg/L	ND	(1.0)
Silicon	mg/L	131.283	(4.672)
Silver	mg/L	ND	(0.20)
Sodium	mg/L	3550	(100)
Strontium	mg/L	12.6	(1.0)
Tin	mg/L	ND	(2.0)
Vanadium	mg/L	ND	(0.20)

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

Table G-12
(Continued)

Site ID / Location ID
Sample ID
Log Date

Parameter	Units	OH / OHLY27 OH353 8/30/92	
-----	-----	-----	
Elements by ICPES or AA, cont.			
Zinc	mg/L	ND	(0.40)
Field measurements			
Conductivity	umhos/cm	32000	(5)
Redox (Eh)	mV	-266.5	()
TDS	mg/L	34440	(1)
Temperature	deg. C	16.2	()
Total Alkalinity	meq/L	7.76	(0.03)
pH	pH units	11.45	()

APPENDIX H

FIELD SAMPLE LOG

2-1-11

Table H-1

Field Sample Log

Sample ID	Location	Interval	Date	Sample Type	Description
89OHMW1-1	DG N cell	0-1'	6/13/89	Soil	mod yellowish brn (10YR 5/4), moist, cohesive clysm.
89OHMW1-2	DG N cell	1-2'	6/13/89	Soil/Gley	dk yellowish orange (10YR 6/6), moist, soft, plastic, aggregate of clysm, siltstn and fine SS, disseminated pebbles & coarse sand, v mottled.
89OHMW1-3	DG N cell	2-3'	6/13/89	Soil/Gley	lt olive gray clysm (5YR 6/1), moist, soft, plastic, mottled interlayered with above material.
89OHMW1-4	DG N cell	3-4'	6/13/89	Soil/Gley	lt olive gray clysm (5YR 6/1), moist, soft, plastic, mottled interlayered with above material.
89OHMW1-5	DG N cell	4-5'	6/13/89	Soil/Gley	lt olive gray clysm (5YR 6/1), moist, soft, plastic, mottled interlayered with above material.
89OHMW1-6	DG N cell	5-6'	6/13/89	Soil/Gley	aggregate of clysm and siltstn, med bluish gray (5B 5/1), mottled, some secondary mineralization (dendritic).
89OHMW1-7	DG N cell	6-7'	6/13/89	Soil	lt olive gray (5Y 6/1), v. moist, soft, plastic clysm.
89OHMW1-8	DG N cell	7-8'	6/13/89	Soil	lt olive gray (5Y 6/1), v. moist, soft, plastic clysm.
89OHMW1-9	DG N cell	8-9'	6/13/89	Soil	lt olive gray (5Y 6/1), v. moist, soft, plastic clysm.
89OHMW1-10	DG N cell	9-10'	6/13/89	Soil	lt olive gray (5Y 6/1), v. moist, soft, plastic clysm.
89OHMW1-11	DG N cell	10-11'	6/13/89	Soil	aggregate of lt olive gray (5Y 6/1), clysm(hard, brittle), dark shale(fractured, brittle) and mdsn with shale clasts.
89OHMW4-1	DG S cell	0-1'	6/13/89	Soil	mod yellowish brn (10YR 5/4), moist, cohesive clysm.
89OHMW4-2	DG S cell	1-2'	6/13/89	Soil/Gley	dk yellowish orange (10YR 6/6), moist, soft, plastic, aggregate of clysm, siltstn and fine SS, disseminated pebbles & coarse sand, v. mottled.
89OHMW4-3	DG S cell	2-3'	6/13/89	Soil	grayish orange (10YR 7/4), banded, variegated, fine-med grained SS(arenite).
89OHMW4-4	DG S cell	3-4'	6/13/89	Soil	interlayered SS (arenite, as above) and grayish orange (10YR 7/4) clysm.
89OHMW4-5	DG S cell	4-5'	6/13/89	Soil	grayish orange (10YR 7/4) clysm.
89OHMW4-6	DG S cell	5-6'	6/13/89	Soil	grayish orange (10YR 7/4) moist, soft, plastic, clysm.
89OHMW4-7	DG S cell	6-7'	6/13/89	Soil	grayish orange (10YR 7/4) moist, soft, plastic, clysm.
89OHMW4-8	DG S cell	7-8'	6/13/89	Soil	v. pale orange (10YR 8/2) mdsn.
89OHMW4-9	DG S cell	8-9'	6/13/89	Soil	dusky yellow (5Y 6/4) banded, clysm.
89OHMW4-10	DG S cell	9-10'	6/13/89	Soil	dusky yellow (5Y 6/4) banded, clysm.
89OHMW4-11	DG S cell	10-11'	6/13/89	Soil	dusky yellow (5Y 6/4) banded, clysm.

Table H-1

(Continued)

Sample ID	Location	Interval	Date	Sample Type	Description
89OHMW4-12	DG S cell	11-12'	6/13/89	Soil	dusky yellow (5Y 6/4) banded, clystn.
89OHMW4-13	DG S cell	12-13'	6/13/89	Soil	lt olive gray (5Y 5/2) clystn.
89OHMW7-1	UG	2-3'	6/13/89	Soil	yellowish gray (5Y 7/2) poorly sorted sandy sltstn.
89OHMW7-2	UG	3-4'	6/13/89	Soil	yellowish gray (5Y 7/2) poorly sorted sandy sltstn.
89OHMW7-3	UG	4-6'	6/13/89	Soil	yellowish gray (5Y 7/2) poorly sorted sandy sltstn.
89OHMW7-4	UG	6-7'	6/13/89	Soil	yellowish gray (5Y 7/2) poorly sorted sandy sltstn.
89OHMW7-5	UG	7-8'	6/13/89	Soil	yellowish gray (5Y 7/2) poorly sorted sandy sltstn.
89OHMW7-6	UG	8-10'	6/13/89	Soil	yellowish gray (5Y 7/2) poorly sorted sandy sltstn.
89OHMW7-7	UG	10-11'	6/13/89	Soil	yellowish gray (5Y 7/2) poorly sorted sandy sltstn.
89OHMW7-8	UG	11-12'	6/13/89	Soil	yellowish gray (5Y 7/2), aggregate of clystn, poorly sorted sandy sltstn.
89OHMW7-9	UG	12-14'	6/13/89	Soil	yellowish gray (5Y 7/2), aggregate of clystn, poorly sorted sandy sltstn.
89OHMW7-10	UG	14-15'	6/13/89	Soil	v. light gray (N8) clayey, poorly sorted-sandy sltstn.
89OHMW7-11	UG	15-16'	6/13/89	Soil	v. light gray (N8) clayey, poorly sorted-sandy sltstn.
89OHMW7-12	UG	16-18'	6/13/89	Soil	v. light gray (N8) clayey, poorly sorted-sandy sltstn.
89OHMW7-13	UG	18-19'	6/13/89	Soil	v. light gray (N8) clayey, poorly sorted-sandy sltstn.
89OHMW7-14	UG	19-20'	6/13/89	Soil	v. light gray (N8) clayey, poorly sorted-sandy sltstn.
89OHMW7-15	UG	20-21'	6/13/89	Soil	v. light gray (N8) clayey, poorly sorted-sandy sltstn.
89OHMW7-16	UG	22-24'	6/13/89	Soil	v. light gray (N8) clayey, poorly sorted-sandy sltstn.
89OHMW7-17	UG	24-25'	6/13/89	Soil	v. light gray (N8) clayey, poorly sorted-sandy sltstn.
89OHMW7-18	UG	25-26'	6/13/89	Soil	v. light gray (N8) clayey, poorly sorted-sandy sltstn.
89OHMW7-19	UG	26-28'	6/13/89	Soil	v. light gray (N8) clayey, poorly sorted-sandy sltstn.
89OHMW7-20	UG	28-29'	6/13/89	Soil	v. light gray (N8) clayey, poorly sorted-sandy sltstn.
89OHMW7-21	UG	29-30'	6/13/89	Soil	v. light gray (N8) clayey, poorly sorted-sandy sltstn.
89OHMW7-22	UG	30-32'	6/13/89	Soil	olive gray (5Y 4/1) silty clystn.
89OHMW7-23	UG	32-33'	6/13/89	Soil	lt gray (N7) sandy clystn.
89OHMW7-24	UG	33-34'	6/13/89	Soil	lt gray (N7) sandy clystn.
89OHMW7-25	UG	36-37'	6/13/89	Soil	lt gray (N7) sandy clystn.
89OHMW7-26	UG	37-40'	6/13/89	Soil	lt gray (N7) poorly sorted-sandy clystn.

Table H-1

(Continued)

Sample ID	Location	Interval	Date	Sample Type	Description
89OHNT2-1	N cell	0-1'	6/14/89	Flyash	interlayered grayish blk (N2), slightly moist, soft, friable and hard, indurated materials.
89OHNT2-2	N cell	1-2'	6/14/89	Flyash	interlayered grayish blk (N2), slightly moist, soft, friable and hard, indurated materials.
89OHNT2-3	N cell	2-3'	6/14/89	Flyash	med gray (N5), slightly moist, unconsolidated.
89OHNT2-4	N cell	3-4'	6/14/89	Flyash	med gray (N5), dry, hard, consolidated, interlayered.
89OHNT2-5	N cell	4-5'	6/14/89	Flyash	med gray (N5), dry, hard, consolidated, interlayered.
89OHNT2-6	N cell	5-6'	6/14/89	Flyash	lt gray (N7), dry, hard, consolidated.
89OHNT2-7	N cell	6-7'	6/14/89	Flyash	lt gray (N7), dry, hard, consolidated.
89OHNT2-8	N cell	7-8'	6/14/89	Flyash	dk gray (N3), moist, hard.
89OHNT3-1	N cell	0-1'	6/14/89	Flyash	grayish blk (N2), v. moist-wet, soft, plastic.
89OHNT3-2	N cell	1-2'	6/14/89	Flyash	grayish blk (N2), wet, plastic.
89OHNT3-3	N cell	2-3'	6/14/89	Flyash	grayish blk (N2), wet, plastic.
89OHNT3-4	N cell	3-4'	6/14/89	Flyash	grayish blk (N2), v. moist, soft, friable.
89OHNT3-5	N cell	4-5'	6/14/89	Flyash	grayish blk (N2), v. moist, soft, friable.
89OHNT3-6	N cell	5-6'	6/14/89	Flyash	grayish blk (N2), v. moist, soft, friable.
89OHNT3-7	N cell	6-7'	6/14/89	Flyash	grayish blk (N2), v. moist, soft, friable.
89OHNT3-8	N cell	7-8'	6/14/89	Flyash	grayish blk (N2), v. moist, soft, friable.
89OHNT3-8.5	N cell	8-8.5'	6/14/89	Flyash	grayish blk (N2), v. moist, soft, friable.
89OHNT4-1	N cell	0-1'	6/14/89	Flyash	dk gray (N3), v. moist, soft, plastic, massive, greasy, clay-silt sized particles.
89OHNT4-2	N cell	1-2'	6/14/89	Flyash	dk gray (N3), v. moist, soft, plastic, massive, greasy, clay-silt sized particles.
89OHNT4-3	N cell	2-3'	6/14/89	Flyash	dk gray (N3), v. moist, soft, plastic, massive, greasy, clay-silt sized particles.
89OHNT4-4	N cell	3-4'	6/14/89	Flyash	dk gray (N3), v. moist, soft, plastic, massive, greasy, clay-silt sized particles, interlayered with hard particles.
89OHNT4-5	N cell	4-5'	6/14/89	Flyash	dk gray (N3), v. moist, soft, plastic, massive, greasy, clay-silt sized particles, interlayered with hard particles.
89OHNT4-6	N cell	5-6'	6/14/89	Flyash	med gray (N5), slightly moist, semi-consolidated.
89OHNT4-7.5	N cell	7-7.5'	6/14/89	Flyash	med gray (N5), slightly moist, consolidated.
89OHNT5-1	S cell	0-1'	6/14/89	Flyash	med gray (N5), moist, soft, friable, clay-silt sized particles.

Table H-1

(Continued)

Sample ID	Location	Interval	Date	Sample Type	Description
89OHNT5-2	S cell	1-2'	6/14/89	Flyash	dk gray (N3), moist, soft, friable, clay-silt sized particles.
89OHNT5-3	S cell	2-3'	6/14/89	Flyash	dk gray (N3), moist, soft, plastic, clay-silt sized particles.
89OHNT5-4	S cell	3-4'	6/14/89	Flyash	dk gray (N3), v. moist, hard, consolidated, clay-silt sized particles.
89OHNT5-5	S cell	4-5'	6/14/89	Flyash	dk gray (N3), v. moist, soft, semi-consolidated, plastic.
89OHNT5-6	S cell	5-6'	6/14/89	Flyash	dk gray (N3), v. moist, soft, semi-consolidated, plastic.
89OHNT5-7	S cell	6-7'	6/14/89	Flyash	dk gray (N3), v. moist, soft, semi-consolidated, plastic.
				Soil	dk yellowish brn (10Y 4/2), moist aggregated clystn, sltstn & poorly sorted sand, cohesive, friable, disseminated organic debris and rock fragments.
90FEBOH1-1	N cell	0-1'	2/5/90	Flyash	dk gray (N3), moist, v. hard, brittle, indurated, discrete banding, predominantly clay sized particles.
90FEBOH1-2	N cell	1-2'	2/5/90	Flyash	dk gray (N3), moist, v. hard, brittle, indurated, discrete banding, predominantly clay sized particles, massive.
90FEBOH1-3	N cell	2-3'	2/5/90	Flyash	dk gray (N3), dry, v. hard, brittle, indurated, discrete banding predominantly clay sized particles.
90FEBOH1-4	N cell	3-4'	2/5/90	Flyash	dk gray (N3), dry, v. hard, brittle, indurated, discrete banding predominantly clay sized particles.
90FEBOH1-5	N cell	4-5'	2/5/90	Flyash	grayish blk(N2), moist, hard, consolidated, discrete banding, predominantly clay sized particles.
90FEBOH1-6	N cell	5-6'	2/5/90	Flyash	dk gray (N3), moist, friable, discrete banding.
90FEBOH1-7	N cell	6-7'	2/5/90	Flyash	dk gray (N3), dry, hard, massive, discrete banding.
90FEBOH1-8	N cell	7-8'	2/5/90	Flyash	dk gray (N3), dry, hard, massive, discrete banding.
90FEBOH1-9	N cell	8-9'	2/5/90	Soil/Ash	dk gray (N3), dry, hard, massive, discrete banding/mod olive brown (SY 4/4), v. moist, soft, sandy clystn, disseminated SS clasts.
90FEBOH1-10	N cell	9-10'	2/5/90	Soil	olive gray (5Y 4/1), moist, friable, poorly sorted-sandy clystn.
90FEBOH1-11	N cell	10-11'	2/5/90	Soil	olive gray (5Y 4/1), moist, plastic, silty clystn, disseminated claystn clasts.
90FEBOH2-1	N cell	0-1'	2/5/90	Flyash	med dk gray (N4), slightly moist, v. hard, brittle, indurated, predominantly clay sized particles.
90FEBOH2-2	N cell	1-2'	2/5/90	Flyash	med dk gray (N4), slightly moist, v. hard, brittle, indurated, predominantly silt sized particles.
90FEBOH2-3	N cell	2-3'	2/5/90	Flyash	dk gray (N3), hard, solid, massive, predominantly silt sized particles, parting along horizontal planes.

Table H-1

(Continued)

Sample ID	Location	Interval	Date	Sample Type	Description
90FEBOH2-4	N cell	3-4'	2/5/90	Flyash	med lt gray (N6), dry, v. hard, indurated, brittle, pseudo-amygdaloidal, predominantly clay sized particles.
90FEBOH2-5	N cell	4-5'	2/5/90	Flyash	med gray(N3), moist, hard, consolidated, predominantly silt sized particles.
90FEBOH2-6	N cell	5-6'	2/5/90	Flyash	med gray(N5), slightly moist, hard, consolidated, predominantly silt sized particles.
90FEBOH2-7	N cell	6-7'	2/5/90	Flyash	med dk gray (N4), slightly moist, v. hard, indurated, discreet parting along horizontal planes, scattered white calcareous inclusions, clay-silt sized particles.
90FEBOH2-8	N cell	7-8'	2/5/90	Flyash	med dk gray (N4), slightly moist, v. hard, indurated, discreet parting along horizontal planes, scattered white calcareous inclusions, clay-silt sized particles.
90FEBOH2-9	N cell	8-9'	2/5/90	Soil/Ash	med dk gray (N4), slightly moist, v. hard, indurated, discreet parting along horizontal planes, scattered white calcareous inclusions, clay-silt sized particles/dk yellowish orange (10 YR 6/6), moist, hard, indurated, banding, well sorted
90FEBOH2-10	N cell	9-10'	2/5/90	Soil	grayish orange (10YR 7/4), moist, friable, poorly sorted sandy clystn.
90FEBOH2-11	N cell	10-11'	2/5/90	Soil	dk yellowish brn (10YR 4/2), moist, friable, aggregate of poorly sorted sandy clystn and hard reddish clay clasts.
90FEBOH3-1	S cell	0-.5'	2/5/90	Flyash	med gray (N5), v. hard, indurated, predominantly silt-sized particles, discreet parting along horizontal planes.
90FEBOH3-2	S cell	1-2'	2/5/90	Flyash	med gray (N5), v. hard, indurated, predominantly silt-sized particles, discreet parting along horizontal planes.
90FEBOH3-3	S cell	2-3'	2/5/90	Flyash	med gray (N5), v. hard, indurated, predominantly silt-sized particles, discreet parting along horizontal planes.
90FEBOH3-4	S cell	3-4'	2/5/90	Flyash	med gray (N5), v. hard, indurated, predominantly silt-sized particles, discreet parting along horizontal planes.
90FEBOH3-5	S cell	4-5'	2/5/90	Flyash	med dk. gray (N3), moist, v. hard, indurated, brittle, fractured, micro-crystalline gypsum (authigenic) in fractures and as coatings.
90FEBOH3-6	S cell	5-6'	2/5/90	Flyash	med gray (N5), moist, hard, consolidated, predominantly silt sized particles.
90FEBOH3-7	S cell	6-7'	2/5/90	Soil/Gley	mod yellowish brn (10YR 5/4), moist, silty clystn.
90FEBOH3-8	S cell	7-8'	2/5/90	Soil	mod yellowish brn (10YR 5/4), moist, silty clystn, some mottling.
90FEBOH4-1	S cell	0-1'	2/5/90	Flyash	dk gray (N3), slightly moist, hard, consolidated, brittle, massive.

Table H-1

(Continued)

Sample ID	Location	Interval	Date	Sample Type	Description
90FEBOH4-2	S cell	1-2'	2/5/90	Flyash	dk gray (N3), slightly moist, v. hard, consolidated, brittle, massive.
90FEBOH4-3	S cell	2-3'	2/5/90	Flyash	dk gray (N3), moist, v. hard, indurated, brittle, massive.
90FEBOH4-4	S cell	3-4'	2/5/90	Flyash	dk gray (N3), moist, v. hard, indurated, brittle, massive.
90FEBOH4-5	S cell	4-5'	2/5/90	Flyash	med dk gray (N4), dry, v. hard, indurated, brittle, massive.
90FEBOH4-6	S cell	5-6'	2/5/90	Flyash	med dk gray (N4), dry, v. hard, indurated, brittle, massive.
90FEBOH4-7	S cell	6-7'	2/5/90	Soil	med yellowish brn (10YR 5/4), moist, plastic, silty claystn some mottling.
90FEBOH4-8	S cell	7-8'	2/5/90	Soil/Gley	med yellowish brn (10YR 5/4), moist, plastic, silty claystn.
90MAYOH1-1	N cell	0-1'	5/31/90	Flyash	lt gray (N7), moist, soft, consolidated, friable, clay-silt sized particles.
90MAYOH1-2	N cell	1-2'	5/31/90	Flyash	lt gray (N7), dry, soft, consolidated, friable, clay-silt sized particles.
90MAYOH1-3	N cell	2-3'	5/31/90	Flyash	med gray (N5), dry, hard, indurated, brittle, discreet parting along horizontal planes, silt sized particles, occasional white calcareous inclusions (<1mm).
90MAYOH1-4	N cell	3-4'	5/31/90	Flyash	med gray (N5), slightly moist, v. hard, consolidated, brittle, luster mottling, clay-silt sized particles.
90MAYOH1-5	N cell	4-5'	5/31/90	Flyash	med gray (N5), dry, hard, consolidated, vesicular, predominantly silt sized particles.
90MAYOH1-6	N cell	5-6'	5/31/90	Flyash	med gray (N5), dry, hard, consolidated, vesicular, predominantly silt sized particles.
90MAYOH1-7	N cell	6-7'	5/31/90	Flyash	med gray (N5), dry, hard, consolidated, vesicular, predominantly silt sized particles.
90MAYOH1-8	N cell	7-8'	5/31/90	Flyash	v. lt gray (N8), dry, soft, consolidated, friable, clay-silt sized particles, low bulk density.
90MAYOH1-9	N cell	8-9'	5/31/90	Soil	grayish orange (10YR 7/4), dry, v. hard, indurated, banding, fine-med SS.
90MAYOH1-10	N cell	9-10'	5/31/90	Soil	grayish orange (10YR 7/4), dry, v. hard, indurated, banding, SS (arenite).
90MAYOH2-1	N cell	0-1'	5/31/90	Flyash	grayish blk (N2), slightly moist, semi-hard, consolidated, predominantly clay sized particles.
90MAYOH2-2	N cell	1-2'	5/31/90	Flyash	med gray (N5), s.moist, soft, consolidated, friable, luster mottling, fracture surfaces display resinous luster (aphanocrystalline), low bulk density.

Table H-1

(Continued)

Sample ID	Location	Interval	Date	Sample Type	Description
90MAYOH2-3	N cell	2-3'	5/31/90	Flyash	med gray (N5), dry, v. hard, indurated, brittle, luster mottling, vitreous fracture coating, disseminated white calcareous inclusions, fractured surfaces display resinous luster(aphanocrystalline).
90MAYOH2-4	N cell	3-4'	5/31/90	Flyash	med gray (N5), dry, hard, indurated, brittle, luster mottling, vitreous fracture coating, disseminated white calcareous inclusions, fractured surfaces display resinous luster(aphanocrystalline).
90MAYOH2-5	N cell	4-5'	5/31/90	Flyash	dk gray (N3), dry, v. hard, indurated, brittle, fractured surfaces display resinous luster(aphanocrystalline).
90MAYOH2-6	N cell	5-6'	5/31/90	Flyash	med dk gray (N4), dry, v. hard, brittle, luster mottling, clay-silt sized particles.
90MAYOH2-7	N cell	6-7'	5/31/90	Flyash	med dk gray (N4), dry, v. hard, brittle, luster mottling, clay-silt sized particles.
90MAYOH2-8	N cell	7-8'	5/31/90	Flyash	dk gray (N3), dry, hard, consolidated, massive, discreet parting along horizontal planes, predominantly silt sized particles.
90MAYOH2-9	N cell	8-9'	5/31/90	Flyash	med dk gray (N4), slightly moist, semi-hard, massive, friable, clay-silt sized particles.
90MAYOH2-10	N cell	9-10'	5/31/90	Soil	mod yellowish brn (10YR 5/4), moist, soft, friable, aggregated SS and clystn clasts.
90MAYOH2-11	N cell	10-11'	5/31/90	Soil	dusky yellow (5YR 6/4), moist, soft, friable, aggregated, weathered SS and clystn clasts.
90MAYOH3-1	S cell	0-1'	5/31/90	Flyash	gray (N5), dry, hard, massive, occasional white calcareous inclusions (<1mm), clay-silt sized particles.
90MAYOH3-2	S cell	1-2'	5/31/90	Flyash	grayish blk (N2), v. hard, indurated, brittle, dry, massive, predominantly clay sized particles.
90MAYOH3-3	S cell	2-3'	5/31/90	Flyash	dk gray (N3), dry, v. hard, indurated, brittle, secondary mineralization (gypsum microcrystals) in fractures, fracture surfaces display resinous luster(aphanocrystalline), vesicular(pseudo-amygdales).
90MAYOH3-4	S cell	3-4'	5/31/90	Flyash	dk gray (N3), dry, v. hard, indurated, brittle, massive, occasional white inclusions, predominantly clay sized particles.
90MAYOH3-5	S cell	4-5'	5/31/90	Flyash	dk gray (N3), dry, v. hard, indurated, brittle, massive, occasional white inclusions, clay-silt sized particles.
90MAYOH3-6	S cell	5-6'	5/31/90	Flyash	med dk gray (N4), s. moist, semi-hard, massive, predominantly silt sized particles.
90MAYOH3-7	S cell	6-7'	5/31/90	Flyash	med gray (N5), dry, semi-hard, friable, massive, predominantly silt sized particles.

Table H-1

(Continued)

Sample ID	Location	Interval	Date	Sample Type	Description
90MAYOH3-9	S cell	7-8'	5/31/90	Soil/Gley	mottled, ranges from med lt gray (N6) - dusky yellow (5Y 6/4), v. moist, soft, plastic, aggregated clystn and sltstn clasts, scattered organic debris.
90MAYOH3-10	S cell	8-9'	5/31/90	Soil/Gley	mottled, ranges from med lt gray (N6) - dusky yellow (5Y 6/4), v. moist, soft, plastic, aggregated clystn and sltstn clasts, scattered organic debris.
90MAYOH4-1	S cell	0-1'	5/31/90	Flyash	med gray (N5), moist, hard, consolidated, secondary mineralization (gypsum microcrystals) in fractures, clay-silt sized particles.
90MAYOH4-2	S cell	1-2'	5/31/90	Flyash	med gray (N5), slightly moist, v. hard, brittle, secondary mineralization (gypsum microcrystals) in fractures, clay-silt sized particles.
90MAYOH4-3	S cell	2-3'	5/31/90	Flyash	med gray (N5), dry, v. hard, indurated, brittle, fracture surfaces display resinous luster (aphanocrystalline), secondary mineralization (gypsum micro-crystals) in fractures, luster mottling, vesicular (pseudo-amygdaloidal), white calcareous in
90MAYOH4-4	S cell	3-4'	5/31/90	Flyash	med lt gray (N6), dry, v. hard, indurated, brittle, variegated, vesicular, disseminated white calcareous inclusions, predominantly clay sized particles.
90MAYOH4-5	S cell	4-5'	5/31/90	Flyash	dk gray (N3), dry, v. hard, indurated, brittle, fracture surfaces display resinous luster (aphanocrystalline), secondary mineralization in fractures (gypsum microcrystals).
90MAYOH4-6	S cell	5-6'	5/31/90	Flyash	med lt gray (N6), hard, dry, low bulk density, disseminated white calcareous inclusions, clay-silt sized particles.
90MAYOH4-7	S cell	6-7'	5/31/90	Flyash/Soil	med lt gray (N6), hard, dry, low bulk density, disseminated white calcareous inclusions, clay-silt sized particles/grayish orange (10YR 7/4), moist, soft, weathered SS, (fine-med grained).
90MAYOH4-8	S cell	7-8'	5/31/90	Soil	med lt gray (N6), hard, dry, low bulk density, disseminated white calcareous inclusions, clay-silt sized particles/grayish orange (10YR 7/4), moist, soft, weathered SS, (fine-med grained).
90MAYOH4-9	S cell	8-9'	5/31/90	Soil	grayish orange (10YR 7/4), moist, friable, poorly sorted sandy clystn pebbles.
90MAYOH4-10	S cell	9-10'	5/31/90	Soil	grayish orange (10YR 7/4), moist, friable, sandy clystn.
90AUGOH3-1	N cell	0-1'	8/6/90	Flyash	interlayered dk gray (N3), soft (moist, friable) and hard ash, clay-silt sized particles.
90AUGOH3-2	N cell	1-2'	8/6/90	Flyash	med bluish gray (5B 5/1), dry, v. hard, indurated, brittle, predominantly silt sized particles.

Table H-1

(Continued)

Sample ID	Location	Interval	Date	Sample Type	Description
90AUGOH3-3	N cell	2-3'	8/6/90	Flyash/Bottom Ash	med gray (N5), dry, hard, indurated, brittle, occasional white calcareous inclusions.
90AUGOH3-4	N cell	3-4'	8/6/90	Flyash	med bluish gray (5B 5/1), dry, v. hard, indurated, brittle, predominantly silt sized particles.
90AUGOH3-5	N cell	4-5'	8/6/90	Flyash	med bluish gray (5B 5/1), dry, hard, porous, low bulk density, predominantly silt sized particles.
90AUGOH3-6	N cell	5-6'	8/6/90	Flyash	med bluish gray (5B 5/1), dry, hard, porous, low bulk density, predominantly silt sized particles.
90AUGOH3-7	N cell	6-7'	8/6/90	Flyash	med dk gray (N4), moist, consolidated, vesicular, clay-silt sized particles.
90AUGOH3-8	N cell	7-8'	8/6/90	Flyash	med lt gray (N6), dry, v. hard, indurated, brittle, clay-silt sized particles.
90AUGOH3-9	N cell	8-9'	8/6/90	Flyash	dk gray (N3), moist, semi-hard, consolidated, clay-silt sized particles.
90AUGOH3-10	N cell	9-10'	8/6/90	Flyash	lt gray (N), hard, dry, consolidated, predominantly silt sized particles.
90AUGOH3-10	N cell	9-10'	8/6/90	Soil	yellowish gray (5Y 7/2), dry, clayey, SS (med fine-med).
90AUGOH3-11	N cell	10-11'	8/6/90	Soil	yellowish gray (5Y 7/2), dry, clayey, SS (med fine-med).
90AUGOH3-12	N cell	11-12'	8/6/90	Soil	interlayered SS (as above) and dry, med gray (N5) clystn.
90AUGOH3-13	N cell	12-13'	8/6/90	Soil	lt olive gray (5Y 5/2), dry, poorly sorted-sandy clystn.
90AUGOH3-14	N cell	13-14'	8/6/90	Soil	lt olive gray (5Y 5/2), dry, poorly sorted-sandy clystn.
90AUGOH3-15	N cell	14-15'	8/6/90	Soil/Gley	coarse sandy mdstn, dry, mottling ranging from dark yellowish orange (10YR 6/6) - med gray (N5).
90AUGOH3-16	N cell	15-16'	8/6/90	Soil	lt olive gray (5Y 5/2), dry, sandy clystn.
91AUGOH2-1	S cell	0-1'	8/29/91	Soil	olive gray (5Y 3/2) aggregate, slightly moist-dry, cohesive, friable, white patches (calcareous coatings), clay clasts & lenses, scattered coarse sand, some mottling, minor organic debris.
91AUGOH2-2	S cell	1-2'	8/29/91	Flyash	dk gray (N3), v. moist, soft, consolidated, friable, massive, clay-silt sized particles.
91AUGOH2-3	S cell	2-3'	8/29/91	Flyash	light bluish gray (5B 5/1), v. dry, hard, consolidated, fractured, clay-silt sized particles.
91AUGOH2-4	S cell	3-4'	8/29/91	Flyash	dk gray (N3), slightly moist, hard, brittle, massive, clay-silt sized particles.
91AUGOH2-5	S cell	4-5'	8/29/91	Flyash	med gray (N5), dry, massive, v. hard, v. clay-silt sized particles, pseudo-miarolitic (gypsum lined solution cavities) 0.5-2 mm.

Table H-1

(Continued)

Sample ID	Location	Interval	Date	Sample Type	Description
91AUGOH2-6	S cell	5-6'	8/29/91	Flyash	med dk gray (N4), dry, hard, massive, predominantly clay sized particles.
91AUGOH2-7	S cell	6-7'	8/29/91	Flyash	med dk gray (N4), slightly moist, hard, indurated, brittle.
91AUGOH2-8	S cell	7-8'	8/29/91	Flyash	med dk gray (N4), slightly moist, hard, indurated, brittle.
91AUGOH2-9	S cell	8-8.5'	8/29/91	Flyash	drk gray (N3), moist, consolidated, friable, massive, clay-silt sized particles.
91AUGOH2-10	S cell	8.5-9'	8/29/91	Ash/Soil	drk gray (N3), moist, consolidated, friable, massive, clay-silt sized particles./mod. yellowish brown (10YR 5/4), v. moist, plastic, sandy clystn (gley), mottling.
91AUGOH2-11	S cell	9-10'	8/29/91	Soil/Gley	drk gray (N3), moist, consolidated, friable, massive, clay-silt sized particles./mod. yellowish brown (10YR 5/4), v. moist, plastic, sandy clystn (gley), mottling.
91AUGOH2-12	S cell	10-11'	8/29/91	Soil	med yellowish brn (10YR 5/4), moist, friable, interlayered weathered shale and v. moist, dark organic shale.
91AUGOH2-13	S cell	11-12'	8/29/91	Soil	med yellowish brn (10YR 5/4), moist, friable, interlayered weathered shale and v. moist, dark organic shale.
91AUGOH2-14	S cell	12-13'	8/29/91	Soil	lt olive gray (5Y 5/2), weathered shale, parting, soft, brittle, mottled.
91AUGOH2-15	S cell	13-14'	8/29/91	Soil	olive gray (5Y 4/1), moist, X-bedded shales and mdstns.
91AUGOH2-16	S cell	14-15'	8/29/91	Soil	lt olive gray (5Y 5/2), v. moist, soft, fissile, weathered shale, parting, variegated.
91AUGOH2-17	S cell	15-16'	8/29/91	Soil	lt olive gray (5Y 5/2), moist, weathered shale, soft, brittle, greasy.
91AUGOH2-18	S cell	16-17'	8/29/91	Soil	olive gray (5Y 4/1), moist, weathered, interbedded with v. hard, brittle, fissile shale.
91AUGOH2-19	S cell	17-18'	8/29/91	Soil	olive gray (5Y 4/1), moist, weathered shale, soft, laminar, mottling.
91AUGOH3-1	S cell	0-1'	8/29/91	Soil	olive gray (5Y 3/2) aggregate, slightly moist-dry, cohesive, friable, white patches(calcareous coatings), clay clasts & lenses, scattered coarse sand, some mottling, minor organic debris.
91AUGOH3-2	S cell	1-2'	8/29/91	Soil	olive gray (5Y 3/2) aggregate, v. moist, cohesive, friable, white patches(calcareous coatings), clay clasts & lenses, scattered coarse sand, some mottling, minor organic debris.
91AUGOH3-3	S cell	2-3'	8/29/91	Flyash	dk gray (N3), v. moist, soft, consolidated, friable, massive, clay-silt sized particles.
91AUGOH3-4	S cell	3-4'	8/29/91	Flyash	dk gray (N3), moist, hard, brittle, massive, fractured, clay-silt sized particles

Table H-1

(Continued)

Sample ID	Location	Interval	Date	Sample Type	Description
91AUGOH3-5	S cell	4-5'	8/29/91	Flyash	med gray (N5), dry, v. hard, indurated, massive, clay-silt sized particles.
91AUGOH3-6	S cell	5-6'	8/29/91	Flyash	med dk gray (N4), dry, hard, massive, predominantly clay sized particles.
91AUGOH3-7	S cell	6-7'	8/29/91	Flyash	med dk gray (N4), slightly moist, hard, indurated, brittle.
91AUGOH3-8	S cell	7-8'	8/29/91	Flyash	med dk gray (N4), slightly moist, hard, indurated, brittle.
91AUGOH3-9	S cell	8-8.5'	8/29/91	Flyash	drk gray (N3), moist, consolidated, friable, massive, clay-silt sized particles.
91AUGOH3-10	S cell	8.5-9'	8/29/91	Ash/Soil	drk gray (N3), moist, consolidated, friable, massive, clay-silt sized particles/mod. yellowish brown (10YR 5/4), v. moist, plastic, sandy clystn (gley), mottling.
91AUGOH3-11	S cell	9-10'	8/29/91	Soil/Gley	drk gray (N3), moist, consolidated, friable, massive, clay-silt sized particles/mod. yellowish brown (10YR 5/4), v. moist, plastic, sandy clystn (gley), mottling.
91AUGOH3-12	S cell	10-11'	8/29/91	Soil	interlayered olive gray (5Y 4/1) shale (slightly moist, hard, fissile) and med dk gray (N4) mdstn.
91AUGOH3-13	S cell	11-12'	8/29/91	Soil	No Recovery.
91AUGOH3-14	S cell	12-13'	8/29/91	Soil	med gray (N5), moist, cohesive, clystn & sltstn, mottling.
91AUGOH3-15	S cell	13-14'	8/29/91	Soil	med gray (N5), moist, cohesive, clystn & sltstn, mottling.
91AUGOH3-16	S cell	14-15'	8/29/91	Soil	fractured, interlayered dk weathered shales & dry, olive gray (5Y 4/1) mdstns.
91AUGOH3-17	S cell	15-16'	8/29/91	Soil	interlayered olive gray (5Y 4/1), moist, weathered shale and v. hard, brittle shale.
91AUGOH3-18	S cell	16-17'	8/29/91	Soil	grayish black (N2) moist, fissile, v. hard, brittle, shale.
91AUGOH3-19	S cell	17-18'	8/29/91	Soil	olive gray (5Y 3/2), dry, v. hard, indurated, brittle, fissile shale.
91AUGOH4-1	S cell	0-1'	8/29/91	Soil	olive gray (5Y 3/2) aggregate, slightly moist-dry, cohesive, friable, white patches (calcareous coatings), clay clasts & lenses, scattered coarse sand, some mottling, minor organic debris.
91AUGOH4-2	S cell	1-2'	8/29/91	Soil	olive gray (5Y 3/2) aggregate, v. moist, cohesive, friable, white patches (calcareous coatings), clay clasts & lenses, scattered coarse sand, some mottling, minor organic debris.
91AUGOH4-3	S cell	2-3'	8/29/91	Flyash	dk gray (N3), v. moist, consolidated, massive, soft, friable, clay-silt sized particles.
91AUGOH4-4	S cell	3-4'	8/29/91	Flyash	dk gray (N3), moist, massive, v. hard, brittle, indurated, clay-silt sized particles.

Table H-1

(Continued)

Sample ID	Location	Interval	Date	Sample Type	Description
91AUGOH4-5	S cell	4-5'	8/29/91	Flyash	dk gray (N3), moist, soft, unconsolidated, clay-silt sized particles.
91AUGOH4-6	S cell	5-6'	8/29/91	Flyash	dk gray (N3), moist, soft, unconsolidated, clay-silt sized particles.
91AUGOH4-7	S cell	6-7'	8/29/91	Flyash	med dk gray (N4), moist, semi-hard, consolidated, fractured.
91AUGOH4-8	S cell	7-8'	8/29/91	Flyash	med gray (N5), slightly moist, v. soft, friable, massive, predominantly silt-sized particles.
91AUGOH4-9	S cell	8-8.5'	8/29/91	Flyash	med gray (N5), slightly moist, v. soft, friable, massive, predominantly silt-sized particles.
91AUGOH4-9	S cell	8.5-9'	8/29/91	Soil	mod. yellowish brn (10YR 5/4), v. moist, plastic, sandy clystn.
91AUGOH4-10	S cell	9-10'	8/29/91	Soil	mod. yellowish brn (10YR 5/4), v. moist, plastic, sandy clystn.
91AUGOH4-11	S cell	10-11'	8/29/91	Soil/Gley	interlayered olive gray (5Y 4/1), slightly moist, hard, fissile shale and med dk gray(N4) mdstn, mottling.
91AUGOH4-12	S cell	11-12'	8/29/91	Soil/Gley	interlayered olive gray (5Y 4/1), slightly moist, hard, fissile shale and med dk gray(N4) mdstn, mottling.
91AUGOH4-13	S cell	12-13'	8/29/91	Soil/Gley	interlayered med gray (N5) and mod reddish brn (10YR 4/6), moist, cohesivemdstns, rock fragments, mottling.
91AUGOH4-14	S cell	13-14'	8/29/91	Soil	interlayered med gray (N5) and mod reddish brn (10YR 4/6), moist, cohesivemdstns, rock fragments, mottling.
91AUGOH4-15	S cell	14-15'	8/29/91	Soil	interlayered med gray (N5) and mod reddish brn (10YR 4/6), moist, cohesivemdstns, rock fragments, mottling.
91AUGOH4-16	S cell	15-16'	8/29/91	Soil	interlayered med gray (N5) and mod reddish brn (10YR 4/6), moist, cohesivemdstns, rock fragments, mottling.
91AUGOH4-17	S cell	16-17'	8/29/91	Soil/Gley	interlayered med gray (N5) and mod reddish brn (10YR 4/6), moist, cohesivemdstns, rock fragments, mottling.
91AUGOH4-18	S cell	17-18'	8/29/91	Soil	grayish black(N2) shale, moist, fissile, v. hard, brittle.
91AUGOH5-1	N cell	0-1'	8/29/91	Soil	dusky yellowish brn (10YR 2/2), dry, friable, poorly sorted sandy clayey loam, SS clasts.
91AUGOH5-2	N cell	1-2'	8/29/91	Soil	dusky yellowish brn (10YR 2/2), wet, friable, poorly sorted sandy clayey loam, SS clasts.
91AUGOH5-3	N cell	2-3'	8/29/91	Flyash	med gray (N5), v. moist, friable, solid, clay-silt sized particles.
91AUGOH5-4	N cell	3-4'	8/29/91	Flyash	med gray (N5), moist, friable, solid, clay-silt sized particles.
91AUGOH5-5	N cell	4-5'	8/29/91	Flyash	med gray (N5), moist, semi-hard, friable, massive, clay-silt sized particles.
91AUGOH5-6	N cell	5-6'	8/29/91	Flyash	med dk gray (N4), wet, friable, clay-silt sized particles.
91AUGOH5-7	N cell	6-7'	8/29/91	Flyash	med dk gray (N4), wet, unconsolidated, clay-silt sized particles.

Table H-1

(Continued)

Sample ID	Location	Interval	Date	Sample Type	Description
91AUGOH5-8	N cell	7-8'	8/29/91	Flyash	med dk gray (N4), wet, unconsolidated, clay-silt sized particles.
91AUGOH5-9	N cell	8-9'	8/29/91	Flyash	med dk gray (N4), wet, unconsolidated, clay-silt sized particles.
91AUGOH5-10	N cell	9-10'	8/29/91	Flyash	med dk gray (N4), wet, unconsolidated, clay-silt sized particles.
91AUGOH5-11	N cell	10-11'	8/29/91	Soil	grayish orange (10YR 7/4), hard, cohesive, well sorted, fine-m. fine grained SS (arenite).
91AUGOH5-12	N cell	11-12'	8/29/91	Soil	mod. yellowish bm (10YR 5/4), v. moist, plastic, sandy clystn.
91AUGOH5-13	N cell	12-13'	8/29/91	Soil	No Recovery.
91AUGOH5-14	N cell	13-14'	8/29/91	Soil	mod. yellowish bm (10YR 5/4), v. moist, plastic, sandy clystn.
91AUGOH5-15	N cell	14-15'	8/29/91	Soil	mod. yellowish bm (10YR 5/4), v. moist, plastic, sandy clystn.
91AUGOH5-16	N cell	15-16'	8/29/91	Soil	mod. yellowish bm (10YR 5/4), v. moist, plastic, sandy clystn.
91AUGOH5-17	N cell	16-17'	8/29/91	Soil	mod. yellowish bm (10YR 5/4), v. moist, plastic, sandy clystn.
91AUGOH5-18	N cell	17-18'	8/29/91	Soil	olive gray (5Y 4/1), moist, friable mdstn and sltstn.
91AUGOH6-1	N cell	0-1'	8/29/91	Soil	dusky yellowish bm (10YR 2/2), moist, soft, plastic, poorly sorted-sandy clayey loam, SS clasts.
91AUGOH6-2	N cell	1-2'	8/29/91	Soil	dusky yellowish bm (10YR 2/2), wet, soft, plastic, poorly sorted-sandy clayey loam, SS clasts.
91AUGOH6-3	N cell	2-3'	8/29/91	Flyash	med dk gray (N4), slightly moist-dry, hard, massive, consolidated, clay-silt sized particles.
91AUGOH6-4	N cell	3-4'	8/29/91	Flyash	med dk gray (N4), slightly moist-dry, hard, massive, friable, clay-silt sized particles.
91AUGOH6-5	N cell	4-5'	8/29/91	Flyash	med dk gray (N4), dry, v. hard, indurated, brittle, massive, clay-silt sized particles.
91AUGOH6-6	N cell	5-6'	8/29/91	Flyash	dk gray (N3), dry, v. hard, indurated, brittle, massive, clay-silt sized particles, discrete parting along horizontal planes.
91AUGOH6-7	N cell	6-7'	8/29/91	Flyash	dk gray (N3), slightly moist, hard, massive, predominantly clay-silt sized particles.
91AUGOH6-8	N cell	7-8'	8/29/91	Flyash	med gray (N5), dry, hard, brittle, consolidated, discrete parting.
91AUGOH6-9	N cell	8-9'	8/29/91	Flyash	med. gray (N5), dry, hard, brittle, consolidated, discrete parting.
91AUGOH6-10	N cell	9-10'	8/29/91	Flyash	med. gray (N5), dry, hard, brittle, consolidated, discrete parting.
91AUGOH6-11	N cell	10-11'	8/29/91	Flyash	dk gray (N3), slightly moist, hard, massive.
91AUGOH6-12	N cell	11-12'	8/29/91	Flyash	dk gray (N3), slightly moist, hard, massive.
91AUGOH6-13	N cell	12-13'	8/29/91	Soil	grayish orange (10YR 7/4), hard, cohesive, well sorted, fine-m fine grained SS (arenite).

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(Continued)

Sample ID	Location	Interval	Date	Sample Type	Description
91AUGOH6-14	N cell	13-14'	8/29/91	Soil	olive gray (5Y 4/1), moist, friable, mdstn and sltstn.
91AUGOH6-15	N cell	14-15'	8/29/91	Soil/Gley	olive gray (5Y 3/2), moist, cohesive, mottled clystn.
91AUGOH6-16	N cell	15-16'	8/29/91	Soil/Gley	olive gray (5Y 3/2), moist, cohesive, mottled clystn.
91AUGOH6-17	N cell	16-17'	8/29/91	Soil/Gley	olive gray (5Y 3/2), moist, cohesive, mottled clystn.
91AUGOH6-18	N cell	17-18'	8/29/91	Soil/Gley	olive gray (5Y 3/2), moist, cohesive, mottled clystn, thin interlayered hard laminae of olive gray (5Y 4/1) shale.
91AUGOH7-1	N cell	0-1'	8/29/91	Soil	dusky yellowish brn (10YR 2/2), moist, soft, plastic, poorly sorted-sandy clayey loam, SS clasts.
91AUGOH7-2	N cell	1-2'	8/29/91	Soil	dusky yellowish brn (10YR 2/2), wet, soft, plastic, poorly sorted-sandy clayey loam, SS clasts.
91AUGOH7-3	N cell	2-3'	8/29/91	Flyash	med dk gray (N4), moist, soft, consolidated, fractured, clay-silt sized particles.
91AUGOH7-4	N cell	3-4'	8/29/91	Flyash	med dk gray (N4), wet, consolidated, friable, fractured, clay-silt sized particles.
91AUGOH7-5	N cell	4-5'	8/29/91	Flyash	med dk gray (N4), wet, consolidated, friable, fractured, clay-silt sized particles.
91AUGOH7-6	N cell	5-6'	8/29/91	Flyash	med dk gray (N4), wet, consolidated, friable, fractured, clay-silt sized particles.
91AUGOH7-7	N cell	6-7'	8/29/91	Flyash	med dk gray (N4), wet, consolidated, friable, fractured, clay-silt sized particles.
91AUGOH7-8	N cell	7-8'	8/29/91	Flyash	med dk gray (N4), wet, consolidated, friable, fractured, clay-silt sized particles.
91AUGOH7-9	N cell	8-9'	8/29/91	Flyash	med dk gray (N4), wet, consolidated, friable, fractured, clay-silt sized particles.
91AUGOH7-10	N cell	9-10'	8/29/91	Flyash	med dk gray (N4), wet, consolidated, friable, fractured, clay-silt sized particles.
91AUGOH7-11	N cell	10-11'	8/29/92	Flyash/Soil	med dk gray (N4), wet, consolidated, friable, fractured, clay-silt sized particles/dk greenish gray (5GY 4/1), v. moist, cohesive, crumbly, hard weathered shale clasts in a clay matrix.
91AUGOH7-12	N cell	11-12'	8/29/91	Soil	dk greenish gray (5GY 4/1), v. moist, cohesive, crumbly, hard weathered shale clasts in a clay matrix.
91AUGOH7-13	N cell	12-13'	8/29/91	Soil	olive gray (5Y 4/1), v. moist, plastic, consolidated, coarse sandy mdstn.
91AUGOH7-14	N cell	13-14'	8/29/91	Soil	dk greenish gray (5GY 4/1), moist, cohesive mdstn with disseminated gravel.

Table H-1

(Continued)

Sample ID	Location	Interval	Date	Sample Type	Description
91AUGOH7-15	N cell	14-15'	8/29/91	Soil	olive gray (5Y 4/1), v. moist, semi-soft, plastic, interlayered sltstn and clystn, variegated SS.
91AUGOH7-16	N cell	15-16'	8/29/91	Soil	olive gray (5Y 4/1), v. moist, semi-soft, plastic, interlayered sltstn and clystn, variegated SS.
91AUGOH7-17	N cell	16-17'	8/29/91	Soil	olive gray (5Y 4/1), moist, friable, mdstn and sltstn.
91AUGOH7-18	N cell	17-18'	8/29/91	Soil/Gley	olive gray (5Y 4/1), moist, friable, mdstn and sltstn, thin interlayered hard laminae of olive gray (5Y 4/1) shale.
91AUGOH7-19	N cell	18-19'	8/29/91	Soil/Gley	olive gray (5Y 4/1), moist, friable, mdstn and sltstn, thin interlayered hard laminae of olive gray (5Y 4/1) shale.
91AUGOH8-1	N cell	0-1'	8/29/91	Soil	dusky yellowish brn (10YR 2/2), moist, soft, plastic, poorly sorted-sandy, clayey loam, SS clasts.
91AUGOH8-2	N cell	1-2'	8/29/91	Soil	dusky yellowish brn (10YR 2/2), wet, soft, plastic, poorly sorted-sandy, clayey loam, SS clasts.
91AUGOH8-3	N cell	2-3'	8/29/91	Flyash	black (N1), wet, v. hard, indurated, brittle, massive, predominantly clay-silt sized particles.
91AUGOH8-4	N cell	3-4'	8/29/91	Flyash	med dk gray (N4), v. moist, friable, consolidated, clay-silt sized particles.
91AUGOH8-5	N cell	4-5'	8/29/91	Flyash	med dk gray (N4), moist, hard, consolidated, clay-silt sized particles.
91AUGOH8-6	N cell	5-6'	8/29/91	Flyash	grayish blk (N2), moist, hard, consolidated, clay-silt sized particles.
91AUGOH8-7	N cell	6-7'	8/29/91	Flyash	grayish blk (N2), moist, friable, massive, clay-silt sized particles.
91AUGOH8-8	N cell	7-8'	8/29/91	Flyash	grayish blk (N2), moist, friable, massive, clay-silt sized particles.
91AUGOH8-9	N cell	8-9'	8/29/91	Flyash	med dk gray (N4), moist, hard, massive, clay-silt sized particles.
91AUGOH8-10	N cell	9-10'	8/29/91	Soil/Gley	olive brn (5Y 5/6), moist, cohesive, friable, mottled clystn, scattered clay clasts & lenses.
91AUGOH8-11	N cell	10-11'	8/29/91	Soil	olive brn (5Y 5/6), moist, cohesive, friable, mottled clystn, scattered clay clasts & lenses, interlayered with olive brn (5Y 5/6) wet, hard, Fe-stained, micaceous SS, weathered.
91AUGOH8-12	N cell	11-12'	8/29/91	Soil	olive brn (5Y 5/6), moist, cohesive, friable, mottled clystn, scattered clay clasts & lenses, interlayered with olive brn (5Y 5/6) wet, hard, Fe-stained, micaceous SS, weathered.
91AUGOH8-13	N cell	12-13'	8/29/91	Soil/Gley	olive gray (5Y 3/2), moist, cohesive, friable, mottled clystn.
91AUGOH8-14	N cell	13-14'	8/29/91	Soil/Gley	olive gray (5Y 3/2), moist, cohesive, friable, mottled clystn.
91AUGOH8-15	N cell	14-15'	8/29/91	Soil/Gley	olive gray (5Y 3/2), moist, cohesive, friable, mottled clystn.

Table H-1

(Continued)

Sample ID	Location	Interval	Date	Sample Type	Description
91AUGOH8-16	N cell	15-16'	8/29/91	Soil/Gley	olive gray (5Y 3/2), moist, cohesive, friable, mottled clystn., thin interlayered hard laminae of olive gray (5Y 4/1) shale.
91AUGOH8-17	N cell	16-17'	8/29/91	Soil/Gley	olive gray (5Y 3/2), moist, cohesive, friable, mottled clystn., thin interlayered hard laminae of olive gray (5Y 4/1) shale.
91AUGOH8-18	N cell	17-18'	8/29/91	Soil/Gley	olive gray (5Y 3/2), moist, cohesive, friable, mottled clystn., thin interlayered hard laminae of olive gray (5Y 4/1) shale.
92AUGOH1-0.5	S cell	0'-0.5'	8/29/92	Soil	dk yellowish brn (10Y 4/2), moist aggregated clystn, sltstn & poorly sorted sand, cohesive, friable, disseminated organic debris and rock fragments.
92AUGOH1-1	S cell	0.5'-1'	8/29/92	Soil	dk yellowish brn (10Y 4/2), moist aggregated clystn, sltstn & poorly sorted sand, cohesive, friable, disseminated organic debris and rock fragments.
92AUGOH1-1.5	S cell	1'-1.5'	8/29/92	Soil	dk yellowish brn (10Y 4/2), moist aggregated clystn, sltstn & poorly sorted sand, cohesive, friable, disseminated organic debris and rock fragments.
92AUGOH1-2	S cell	1.5'-2'	8/29/92	Soil/Ash	dk yellowish brn (10Y 4/2), moist aggregated clystn, sltstn & poorly sorted sand, cohesive, friable, disseminated organic debris and rock fragments/med dk gray (N4), moist, soft, friable, massive, low bulk density, clay-silt sized partic
92AUGOH1-2.5	S cell	2'-2.5'	8/29/92	Flyash	med dk gray (N4), moist, soft, friable, massive, low bulk density, clay-silt sized particles.
92AUGOH1-3	S cell	2.5'-3'	8/29/92	Flyash	med dk gray (N4), moist, soft, friable, massive, low bulk density, clay-silt sized particles.
92AUGOH1-3.5	S cell	3'-3.5'	8/29/92	Flyash	med dk gray (N4), moist, soft, friable, massive, low bulk density, clay-silt sized particles.
92AUGOH1-4	S cell	3.5'-4'	8/29/92	Flyash	dk gray (N3), consolidated, slightly moist, v. hard, brittle, fractured, parting along horizontal planes, fracture surfaces display resinous luster(aphanocrystalline).
92AUGOH1-4.5	S cell	4'-4.5'	8/29/92	Flyash	grayish blk (N2), v. hard, dry, massive, fracture surfaces display resinousluster (aphanocrystalline), luster mottling.
92AUGOH1-5	S cell	4.5'-5'	8/29/92	Flyash	grayish blk (N2), v. hard, dry, massive, fracture surfaces display resinousluster (aphanocrystalline), luster mottling, vesicular.
92AUGOH1-5.5	S cell	5'-5.5'	8/29/92	Flyash	grayish blk (N2), v. hard, dry, massive, fracture surfaces display resinousluster (aphanocrystalline), luster mottling, vesicular.
92AUGOH1-6	S cell	5.5'-6'	8/29/92	Flyash	grayish blk (N2), v. hard, dry, massive, fracture surfaces display resinousluster (aphanocrystalline), luster mottling, vesicular.

Table H-1

(Continued)

Sample ID	Location	Interval	Date	Sample Type	Description
92AUGOH1-6.5	S cell	6'-6.5'	8/29/92	Flyash	dk gray (N3), v. moist, soft, consolidated, friable, clay-silt sized particles.
92AUGOH1-7	S cell	6.5'-7'	8/29/92	Flyash	dk gray (N3), v. moist, soft, consolidated, friable, clay-silt sized particles.
92AUGOH1-7.5	S cell	7'-7.5'	8/29/92	Flyash	dk gray (N3), moist, semi-consolidated, friable, vesicular(pseudo-amygdaloidal), clay-silt sized particles.
92AUGOH1-8	S cell	7.5'-8'	8/29/92	Flyash	dk gray (N3), dry, hard, consolidated, vesicular, disseminated white calcareous inclusions(<1mm).
92AUGOH1-8.5	S cell	8'-8.5'	8/29/92	Flyash	dk gray (N3), dry, hard, consolidated, vesicular, disseminated white calcareous inclusions(<1mm).
92AUGOH1-9	S cell	8.5'-9'	8/29/92	Flyash	dk gray (N3), moist, semi-hard, consolidated, friable, massive, clay-silt sized particles.
92AUGOH1-9.5	S cell	9'-9.5'	8/29/92	Flyash	dk gray (N3), moist, semi-hard, consolidated, friable, massive, clay-silt sized particles/lt olive gray (5Y 5/2), v.moist, soft, plastic, mottled (gley).
92AUGOH1-10	S cell	9.5'-10'	8/29/92	Soil/Gley	lt olive gray (5Y 5/2), moist, cohesive, friable, mottled, white calcareous fracture fillings (marbling).
92AUGOH1-10.5	S cell	10'-10.5'	8/29/92	Soil/Gley	lt olive gray (5Y 5/2), moist, cohesive, friable, mottled, white calcareous fracture fillings (marbling).
92AUGOH1-11	S cell	10.5'-11'	8/29/92	Soil	olive gray (5Y 4/1), v. moist, fissile, soft weathered shale.
92AUGOH1-11.5	S cell	11'-11.5'	8/29/92	Soil	olive gray (5Y 4/1), s. moist, hard, fissile shale.
92AUGOH1-12	S cell	11.5'-12'	8/29/92	Soil	interlayered olive gray (5Y 4/1), slightly moist, hard, fissile shale and med dk gray(N4) mdstn.
92AUGOH1-12.5	S cell	12'-12.5'	8/29/92	Soil/Gley	med gray (N5), moist, cohesive, peds (blocky) clystn & sltstn, fracture fillings, mottled, color ranges from med gray (N5) - olive gray (5Y 4/1).
92AUGOH1-13	S cell	12.5'-13'	8/29/92	Soil/Gley	med gray (N5), moist, cohesive, peds (blocky) clystn & sltstn, fracture fillings, mottled, color ranges from med gray (N5) - olive gray (5Y 4/1), pseudo-miarolitic (euhedral gypsum >4mm).
92AUGOH1-13.5	S cell	13'-13.5'	8/29/92	Soil/Gley	med gray (N5), moist, cohesive, peds (blocky) clystn & sltstn, fracture fillings, mottled, color ranges from med gray (N5) - olive gray (5Y 4/1), pseudo-miarolitic (euhedral gypsum >4mm).
92AUGOH1-14	S cell	13.5'-14'	8/29/92	Soil/Gley	med gray (N5), moist, friable, peds (blocky) clystn & sltstn, fracture fillings, mottled, color ranges from med gray (N5) - olive gray (5Y 4/1), pseudo-miarolitic (euhedral gypsum >4mm), occasional pyrite (stellated) as fracture filling.

Table H-1

(Continued)

Sample ID	Location	Interval	Date	Sample Type	Description
92AUGOH1-14.5	S cell	14'-14.5'	8/29/92	Soil	med gray (N5), moist, friable, peds (blocky) clystn & sltstn, fracture fillings, mottled, color ranges from med gray (N5) - olive gray (5Y 4/1), pseudo-miarolitic (euhedral gypsum >4mm), occasional pyrite (stellated) as fracture filling, i
92AUGOH1-15	S cell	14.5'-15'	8/29/92	Soil	med gray (N5), moist, friable, peds (blocky) clystn & sltstn, fracture fillings, mottled, color ranges from med gray (N5) - olive gray (5Y 4/1), pseudo-miarolitic (euhedral gypsum >4mm), occasional pyrite (stellated) as fracture filling, i
92AUGOH1-15.5	S cell	15'-15.5'	8/29/92	Soil	fractured, interlayered dk weathered shales & dry, olive gray (5Y 4/1) mdstns.
92AUGOH1-16	S cell	15.5'-16'	8/29/92	Soil	dk weathered shale, fissile, semi-hard, fractured.
92AUGOH1-16.5	S cell	16'-16.5'	8/29/92	Soil	med gray (N5) weathered shale, fissile, semi-hard, silt & clay filled fractures.
92AUGOH1-17	S cell	16.5'-17'	8/29/92	Soil	med gray (N5) weathered shale, fissile, semi-hard, silt & clay filled fractures.
92AUGOH1-17.5	S cell	17'-17.5'	8/29/92	Soil	fractured aggregate of med gray (N5) weathered shale, fissile, semi-hard, silt & clay filled fractures.
92AUGOH1-18	S cell	17.5'-18'	8/29/92	Soil	fractured aggregate of med gray (N5) weathered shale, fissile, semi-hard, silt & clay filled fractures.
92AUGOH1-18.5	S cell	18'-18.5'	8/29/92	Soil	olive gray (5Y 3/2), dry, v. hard, indurated, brittle, fissile shale.
92AUGOH2-0.5	S cell	0'-0.5'	8/29/92	Soil	dk yellowish brn (10Y 4/2), moist aggregated clystn, sltstn & poorly sorted sand, cohesive, friable, disseminated organic debris and rock fragments.
92AUGOH2-1	S cell	0.5'-1'	8/29/92	Soil	dk yellowish brn (10Y 4/2), moist aggregated clystn, sltstn & poorly sorted sand, cohesive, friable, disseminated organic debris and rock fragments.
92AUGOH2-1.5	S cell	1'-1.5'	8/29/92	Soil	dk yellowish brn (10Y 4/2), moist aggregated clystn, sltstn & poorly sorted sand, cohesive, friable, disseminated organic debris and rock fragments.
92AUGOH2-2	S cell	1.5'-2'	8/29/92	Soil/Ash	dk yellowish brn (10Y 4/2), moist aggregated clystn, sltstn & poorly sorted sand, cohesive, friable, disseminated organic debris and rock fragments/lt gray (N7), wet, soft, friable, massive, clay-silt sized particles.
92AUGOH2-2.5	S cell	2'-2.5'	8/29/92	Flyash	lt gray (N7), wet, soft, friable, massive, clay-silt sized particles.
92AUGOH2-3	S cell	2.5'-3'	8/29/92	Flyash	grayish blk (N2), slightly moist, v. hard, brittle, consolidated, fractured, predominantly clay sized particles.

Table H-1
(Continued)

Sample ID	Location	Interval	Date	Sample Type	Description
92AUGOH2-3.5	S cell	3'-3.5'	8/29/92	Flyash	grayish blk (N2), slightly moist, v. hard, brittle, consolidated, fractured,predominantly clay sized particles.
92AUGOH2-4	S cell	3.5'-4'	8/29/92	Flyash	grayish blk (N2), slightly moist, v. hard, brittle, consolidated, fractured,predominantly clay sized particles.
92AUGOH2-4.5	S cell	4'-4.5'	8/29/92	Flyash	grayish blk (N2), slightly moist, v. hard, brittle, consolidated, fractured,predominantly clay sized particles.
92AUGOH2-5	S cell	4.5'-5'	8/29/92	Flyash	grayish blk (N2), slightly moist, v. hard, brittle, consolidated, fractured,predominantly clay sized particles.
92AUGOH2-5.5	S cell	5'-5.5'	8/29/92	Flyash	grayish blk (N2), slightly moist, v. hard, brittle, consolidated, fractured,predominantly clay sized particles.
92AUGOH2-6	S cell	5.5'-6'	8/29/92	Flyash	grayish blk (N2), slightly moist, v. hard, brittle, consolidated, fractured,predominantly clay sized particles.
92AUGOH2-6.5	S cell	6'-6.5'	8/29/92	Flyash	grayish blk (N2), slightly moist, v. hard, brittle, consolidated, fractured,predominantly clay sized particles.
92AUGOH2-7	S cell	6.5'-7'	8/29/92	Flyash	grayish blk (N2), slightly moist, v. hard, brittle, consolidated, fractured,predominantly clay sized particles.
92AUGOH2-7.5	S cell	7'-7.5'	8/29/92	Flyash	grayish blk (N2), slightly moist, v. hard, brittle, consolidated, fractured,predominantly clay sized particles.
92AUGOH2-8	S cell	7.5'-8'	8/29/92	Flyash	grayish blk (N2), slightly moist, v. hard, brittle, consolidated, fractured,predominantly clay sized particles.
92AUGOH2-8.5	S cell	8'-8.5'	8/29/92	Flyash	grayish blk (N2), slightly moist, v. hard, brittle, consolidated, fractured,predominantly clay sized particles.
92AUGOH2-9	S cell	8.5'-9'	8/29/92	Ash/Soil	grayish blk (N2), slightly moist, v. hard, brittle, consolidated, fractured,predominantly clay sized particles// olive gray (5Y 5/2), v.moist, soft, plastic, mottled(gley).
92AUGOH2-9.5	S cell	9'-9.5'	8/29/92	Soil/Cley	lt olive gray (5Y 5/2), moist, cohesive, friable, mottled.
92AUGOH2-10	S cell	9.5'-10'	8/29/92	Soil	olive gray (5Y 4/1), v. moist, fissile, soft weathered shale.
92AUGOH2-10.5	S cell	10'-10.5'	8/29/92	Soil	olive gray (5Y 4/1), s. moist, hard, fissile shale.
92AUGOH2-11	S cell	10.5'-11'	8/29/92	Soil	interlayered olive gray (5Y 4/1), slightly moist, hard, fissile shale andmed dk gray(N4) mdstn.
92AUGOH2-12	S cell	11.5'-12'	8/29/92	Soil/Cley	med gray (N5), moist, cohesive, clysin & slstin, mottled, color rangedmed gray (N5) - olive gray (5Y 4/1).
92AUGOH2-12.5	S cell	12'-12.5'	8/29/92	Soil/Cley	med gray (N5), moist, cohesive, clysin & slstin, mottled, color rangedmed gray (N5) - olive gray (5Y 4/1).

Table H-1

(Continued)

Sample ID	Location	Interval	Date	Sample Type	Description
92AUGOH2-13	S cell	12.5'-13'	8/29/92	Soil/Gley	med gray (N5), moist, friable, clystn & sltstn, mottled, color ranges med gray (N5) - olive gray (5Y 4/1).
92AUGOH2-13.5	S cell	13'-13.5'	8/29/92	Soil	med gray (N5), moist, friable, clystn & sltstn, mottled, color ranges med gray (N5) - olive gray (5Y 4/1), interlayered dk, fissile shale, variegated.
92AUGOH2-14	S cell	13.5'-14'	8/29/92	Soil	med gray (N5), moist, friable, clystn & sltstn, mottled, color ranges med gray (N5) - olive gray (5Y 4/1), interlayered dk, fissile shale, variegated.
92AUGOH2-14.5	S cell	14'-14.5'	8/29/92	Soil	fractured, interlayered dk weathered shales & dry, olive gray (5Y 4/1) mdstns.
92AUGOH2-15	S cell	14.5'-15'	8/29/92	Soil	dk weathered shale, fissile, semi-hard, fractured.
92AUGOH2-15.5	S cell	15'-15.5'	8/29/92	Soil	med gray (N5) weathered shale, fissile, semi-hard fractures.
92AUGOH2-16	S cell	15.5'-16'	8/29/92	Soil	med gray (N5) weathered shale, fissile, semi-hard fractures.
92AUGOH2-16.5	S cell	16'-16.5'	8/29/92	Soil	med gray (N5) weathered shale, fissile, semi-hard fractures.
92AUGOH2-17	S cell	16.5'-17'	8/29/92	Soil	med gray (N5) weathered shale, fissile, semi-hard fractures.
92AUGOH2-17.5	S cell	17'-17.5'	8/29/92	Soil	olive gray (5Y 3/2), dry, v. hard, indurated, brittle, fissile shale.
92AUGOH2-18	S cell	17.5'-18'	8/29/92	Soil	olive gray (5Y 3/2), dry, v. hard, indurated, brittle, fissile shale.
92AUGOH3-0.5	S cell	0'-0.5'	8/29/92	Soil	dk yellowish brn (10Y 4/2), moist aggregated clystn, sltstn & poorly sorted sand, cohesive, friable, disseminated organic debris and rock fragments.
92AUGOH3-1	S cell	0.5'-1'	8/29/92	Soil	dk yellowish brn (10Y 4/2), moist aggregated clystn, sltstn & poorly sorted sand, cohesive, friable, disseminated organic debris and rock fragments.
92AUGOH3-1.5	S cell	1'-1.5'	8/29/92	Soil	dk yellowish brn (10Y 4/2), moist aggregated clystn, sltstn & poorly sorted sand, cohesive, friable, disseminated organic debris and rock fragments.
92AUGOH3-2	S cell	1.5'-2'	8/29/92	Soil/Ash	dk yellowish brn (10Y 4/2), moist aggregated clystn, sltstn & poorly sorted sand, cohesive, friable, disseminated organic debris and rock fragments/lt gray (N7), wet, soft, friable, massive, clay-silt sized particles.
92AUGOH3-2.5	S cell	2'-2.5'	8/29/92	Flyash	lt gray (N7), wet, soft, friable, massive, clay-silt sized particles.
92AUGOH3-3	S cell	2.5'-3'	8/29/92	Flyash	grayish blk (N2), slightly moist, v. hard, brittle, fractured, predominantly clay sized particles.
92AUGOH3-3.5	S cell	3'-3.5'	8/29/92	Flyash	grayish blk (N2), slightly moist, v. hard, brittle, fractured, predominantly clay sized particles.

Table H-1

(Continued)

Sample ID	Location	Interval	Date	Sample Type	Description
92AUGOH3-4	S cell	3.5'-4'	8/29/92	Flyash	grayish blk (N2), slightly moist, v. hard, brittle, fractured, predominantly clay sized particles.
92AUGOH3-4.5	S cell	4'-4.5'	8/29/92	Flyash	grayish blk (N2), slightly moist, v. hard, brittle, fractured, predominantly clay sized particles.
92AUGOH3-5	S cell	4.5'-5'	8/29/92	Flyash	grayish blk (N2), slightly moist, v. hard, brittle, fractured, predominantly clay sized particles.
92AUGOH3-5.5	S cell	5'-5.5'	8/29/92	Flyash	lt gray (N7), wet, friable, consolidated.
92AUGOH3-6	S cell	5.5'-6'	8/29/92	Flyash	lt gray (N7), wet, friable, consolidated.
92AUGOH3-6.5	S cell	6'-6.5'	8/29/92	Flyash	lt gray (N7), wet, friable, consolidated.
92AUGOH3-7	S cell	6.5'-7'	8/29/92	Flyash	lt gray (N7), wet, friable, consolidated.
92AUGOH3-7.5	S cell	7'-7.5'	8/29/92	Flyash	lt gray (N7), wet, friable, consolidated.
92AUGOH3-8	S cell	7.5'-8'	8/29/92	Flyash	lt gray (N7), wet, friable, consolidated.
92AUGOH3-8.5	S cell	8'-8.5'	8/29/92	Flyash	lt gray (N7), wet, friable, consolidated.
92AUGOH3-9	S cell	8.5'-9'	8/29/92	Flyash/Soil	lt gray (N7), wet, friable, consolidated/lt olive gray (5Y 5/2), v.moist, soft, plastic, mottled
92AUGOH3-9.5	S cell	9'-9.5'	8/29/92	Soil/Gley	lt olive gray (5Y 5/2), moist, cohesive, friable, mottled.
92AUGOH3-9.5	S cell	9'-9.5'	8/29/92	Flyash/Soil	lt olive gray (5Y 5/2), moist, cohesive, friable, mottled/lt olive gray (5Y 5/2), v.moist, soft, plastic, mottled.
92AUGOH3-10	S cell	9.5'-10'	8/29/92	Soil/Gley	lt olive gray (5Y 5/2), moist, cohesive, friable, mottled.
92AUGOH3-10.5	S cell	10'-10.5'	8/29/92	Soil/Gley	lt olive gray (5Y 5/2), moist, cohesive, friable, mottled.
92AUGOH3-11	S cell	10.5'-11'	8/29/92	Soil	olive gray (5Y 4/1), v. moist, fissile, soft weathered shale.
92AUGOH3-11.5	S cell	11'-11.5'	8/29/92	Soil	olive gray (5Y 4/1), s. moist, hard, fissile shale.
92AUGOH3-12	S cell	11.5'-12'	8/29/92	Soil	interlayered olive gray (5Y 4/1), slightly moist, hard, fissile shale and med dk gray(N4) mdstn.
92AUGOH3-12.5	S cell	12'-12.5'	8/29/92	Soil/Gley	med gray (N5) interlayered, moist, cohesive, clystn & sltstn, mottling, rock fragments.
92AUGOH3-13	S cell	12.5'-13'	8/29/92	Soil/Gley	med gray (N5) interlayered, moist, cohesive, clystn & sltstn, mottling, rock fragments.
92AUGOH3-13.5	S cell	13'-13.5'	8/29/92	Soil/Gley	med gray (N5) interlayered, moist, cohesive, clystn & sltstn, mottling, rock fragments.
92AUGOH3-14	S cell	13.5'-14'	8/29/92	Soil	med gray (N5) weathered shale, fissile, semi-hard.
92AUGOH3-14.5	S cell	14'-14.5'	8/29/92	Soil	med gray (N5) weathered shale, fissile, semi-hard, interlayered dk, fissile shale, variegated.

Table H-1
(Continued)

Sample ID	Location	Interval	Date	Sample Type	Description
92AUGOH3-15	S cell	14.5'-15'	8/29/92	Soil	med gray (N5) weathered shale, fissile, semi-hard.
92AUGOH3-15.5	S cell	15'-15.5'	8/29/92	Soil	med gray (N5) weathered shale, fissile, semi-hard.
92AUGOH3-16	S cell	15.5'-16'	8/29/92	Soil	med gray (N5) weathered shale, fissile, semi-hard.
92AUGOH3-16.5	S cell	16'-16.5'	8/29/92	Soil	med gray (N5) weathered shale, fissile, semi-hard.
92AUGOH3-17	S cell	16.5'-17'	8/29/92	Soil	med gray (N5) weathered shale, fissile, semi-hard.
92AUGOH3-17.5	S cell	17'-17.5'	8/29/92	Soil	med gray (N5) weathered shale, fissile, semi-hard.
92AUGOH3-18	S cell	17.5'-18'	8/29/92	Soil	med gray (N5) weathered shale, fissile, semi-hard.
92AUGOH4-0.5	S cell	0'-0.5'	8/29/92	Soil	dk yellowish brn (10Y 4/2), v. moist, cohesive, poorly sorted sandy, clayey loam, organic debris and rock fragments.
92AUGOH4-1	S cell	0.5'-1'	8/29/92	Soil	dk yellowish brn (10Y 4/2), v. moist, friable, poorly sorted sandy, clayey loam, organic debris and rock fragments, variegated.
92AUGOH4-1.5	S cell	1'-1.5'	8/29/92	Soil	olive gray (5Y 3/2) moist aggregate of overlying material.
92AUGOH4-2	S cell	1.5'-2'	8/29/92	Soil	olive gray (5Y 3/2) moist aggregate of overlying material.
92AUGOH4-2.5	S cell	2'-2.5'	8/29/92	Flyash	med dk gray (N4), slightly moist, hard, indurated, brittle, discreet parting along horizontal planes.
92AUGOH4-3	S cell	2.5'-3'	8/29/92	Flyash	med dk gray (N4), slightly moist, hard, indurated, brittle, discreet parting along horizontal planes.
92AUGOH4-3.5	S cell	3'-3.5'	8/29/92	Flyash	med dk gray (N4), slightly moist, hard, indurated, brittle, discreet parting along horizontal planes.
92AUGOH4-4	S cell	3.5'-4'	8/29/92	Flyash	med dk gray (N4), slightly moist, v. hard, indurated, vesicular, lustre mottling, occasional white calcareous inclusions, fracture surfaces display resinous lustre (aphanocrystalline).
92AUGOH4-4.5	S cell	4'-4.5'	8/29/92	Flyash	med dk gray (N4), moist, v. hard, brittle, fracture surfaces display resinous lustre (aphanocrystalline), vesicular, pseudo-microlitic.
92AUGOH4-5	S cell	4.5'-5'	8/29/92	Flyash	grayish blk (N2), dry, v. hard, massive, fracture surfaces display resinous lustre (aphanocrystalline).
92AUGOH4-5.5	S cell	5'-5.5'	8/29/92	Flyash	lt gray (N7), dry, semi-hard, massive, low bulk density, predominantly silt sized.
92AUGOH4-6	S cell	5.5'-6'	8/29/92	Flyash	lt gray (N7), dry, semi-hard, massive, low bulk density, predominantly silt sized.
92AUGOH4-6.5	S cell	6'-6.5'	8/29/92	Flyash	dk gray (N3), v. moist, soft, friable, massive, clay-silt sized particles.

Table H-1

(Continued)

Sample ID	Location	Interval	Date	Sample Type	Description
92AUGOH4-7	S cell	6.5'-7'	8/29/92	Flyash	dk gray (N3), v. moist, soft, friable, massive, clay-silt sized particles.
92AUGOH4-7.5	S cell	7'-7.5'	8/29/92	Flyash	lt gray (N7), dry, hard, consolidated, fractured, luster mottling, disseminated white calcareous inclusions, fractured.
92AUGOH4-8	S cell	7.5'-8'	8/29/92	Flyash	dk gray (N3), slightly moist, semi-hard, solid, disseminated white calcareous inclusions, clay-silt sized particles.
92AUGOH4-8.5	S cell	8'-8.5'	8/29/92	Flyash	dk gray (N3), slightly moist, semi-hard, consolidated, vesicular (pseudo-amygdaloidal), discrete banding, fracture surfaces display resinous luster (aphanocrystalline), calcareous white fracture coatings/fillings.
92AUGOH4-9	S cell	8.5'-9'	8/29/92	Flyash/Soil	dk gray (N3), slightly moist, semi-hard, consolidated, vesicular (pseudo-amygdaloidal), discrete banding, fracture surfaces display resinous luster (aphanocrystalline), calcareous white fracture coatings & fillings/mod yellowish brn (10YR 4
92AUGOH4-9.5	S cell	9'-9.5'	8/29/92	Soil	mod yellowish brn (10YR 4/2), v. moist, soft, plastic, poorly sorted-sandy clystn, disseminated rock fragments.
92AUGOH4-10	S cell	9.5'-10'	8/29/92	Soil	mod yellowish brn (10Y 4/2), moist, friable, interlayered clystn, sltstn and fine SS, disseminated pebbles and rock fragments.
92AUGOH4-10.5	S cell	10'-10.5'	8/29/92	Soil	dk yellowish brn (10Y 4/2), v. moist, soft, plastic, aggregate of coarse clay dark, weathered sltstn & shale clasts.
92AUGOH4-11	S cell	10.5'-11'	8/29/92	Soil/Gley	dk yellowish brn (10Y 4/2), v. moist, soft, plastic, aggregate of coarse clay dark, weathered sltstn & shale clasts, mottling.
92AUGOH4-11.5	S cell	11'-11.5'	8/29/92	Soil/Gley	dk yellowish brn (10Y 4/2), v. moist, soft, plastic, aggregate of coarse clay dark, weathered sltstn & shale clasts, mottling.
92AUGOH4-12	S cell	11.5'-12'	8/29/92	Soil/Gley	dk yellowish brn (10Y 4/2), v. moist, soft, plastic, aggregate of coarse clay dark, weathered sltstn & shale clasts, disseminated coarse sand, mottling.
92AUGOH4-12.5	S cell	12'-12.5'	8/29/92	Soil/Gley	dk yellowish brn (10Y 4/2), v. moist, soft, plastic, aggregate of coarse clay dark, weathered sltstn & shale clasts, disseminated coarse sand, mottling.
92AUGOH4-13	S cell	12.5'-13'	8/29/92	Soil/Gley	dk yellowish brn (10Y 4/2), v. moist, soft, plastic, aggregate of coarse clay dark, weathered sltstn & shale clasts, greater portion of weathered gray shale, disseminated coarse sand, mottling.
92AUGOH4-13.5	S cell	13'-13.5'	8/29/92	Soil	olive gray (5Y 4/1), moist, hard, interlayered mdstn & weathered, fissile shale.

Table H-1

(Continued)

Sample ID	Location	Interval	Date	Sample Type	Description
92AUGOH4-14	S cell	13.5'-14'	8/29/92	Soil	olive gray (5Y 4/1), moist, semi-hard, brittle shale, parting, banding.
92AUGOH4-14.5	S cell	14'-14.5'	8/29/92	Soil	olive gray (5Y 4/1), moist, semi-hard, brittle shale, parting, banding.
92AUGOH4-15	S cell	14.5'-15'	8/29/92	Soil	olive gray (5Y 4/1), moist, semi-hard, brittle shale, parting, banding, interlayered with dark mdstn.
92AUGOH4-15.5	S cell	15'-15.5'	8/29/92	Soil	olive gray (5Y 4/1), moist, interlayered weathered mdstn and hard, brittle shale.
92AUGOH4-16	S cell	15.5'-16'	8/29/92	Soil	olive gray (5Y 4/1), moist, interlayered weathered mdstn and hard, brittle shale.
92AUGOH4-16.5	S cell	16'-16.5'	8/29/92	Soil	olive gray (5Y 4/1), moist, interlayered weathered mdstn and hard, brittle shale.
92AUGOH4-17	S cell	16.5'-17'	8/29/92	Soil	olive gray (5Y 4/1), moist, interlayered weathered mdstn and hard, brittle shale.
92AUGOH4-17.5	S cell	17'-17.5'	8/29/92	Soil	olive gray (5Y 4/1), moist, interlayered weathered mdstn and hard, brittle shale.
92AUGOH4-18	S cell	17.5'-18'	8/29/92	Soil	olive gray (5Y 4/1), moist, interlayered weathered mdstn and hard, brittle shale.
92AUGOH4-18.5	S cell	18'-18.5'	8/29/92	Soil	dk greenish gray (5GY 4/1), slightly moist, v. hard, indurated, fissile shale.
92AUGOH5-0.5	N cell	0'-0.5'	8/29/92	Soil	dk yellowish brn (10Y 4/2), v. moist, cohesive, poorly sorted sandy, clayey loam, disseminated rock fragments, organic debris.
92AUGOH5-1	N cell	0.5'-1'	8/29/92	Soil/Gley	dk yellowish brn (10Y 4/2), v. moist, friable, poorly sorted sandy, clayey loam, disseminated rock fragments, organic debris, mottling.
92AUGOH5-1.5	N cell	1'-1.5'	8/29/92	Soil/Gley	dk yellowish brn (10Y 4/2), v. moist, friable, poorly sorted sandy, clayey loam, disseminated rock fragments, organic debris, mottling.
92AUGOH5-2	N cell	1.5'-2'	8/29/92	Soil/Gley	dk yellowish brn (10Y 4/2), v. moist, friable, poorly sorted sandy, clayey loam, disseminated rock fragments, organic debris, mottling.
92AUGOH5-2.5	N cell	2'-2.5'	8/29/92	Flyash	interlayered med dk gray(N4), v. moist, soft, friable and grayish blk (N2).
92AUGOH5-3	N cell	2.5'-3'	8/29/92	Flyash	med dk gray(N4), v. moist, soft, solid.
92AUGOH5-3.5	N cell	3'-3.5'	8/29/92	Flyash	med dk gray(N4), moist, solid.

Table H-1

(Continued)

Sample ID	Location	Interval	Date	Sample Type	Description
92AUGOH5-4	N cell	3.5'-4'	8/29/92	Flyash	med dk gray(N4), moist, solid.
92AUGOH5-4.5	N cell	4'-4.5'	8/29/92	Flyash	med dk gray(N4), moist, solid.
92AUGOH5-5	N cell	4.5'-5'	8/29/92	Flyash	med dk gray(N4), moist, solid.
92AUGOH5-5.5	N cell	5'-5.5'	8/29/92	Flyash	med dk gray(N4), moist, solid.
92AUGOH5-6	N cell	5.5'-6'	8/29/92	Flyash	med dk gray(N4), moist, solid.
92AUGOH5-6.5	N cell	6'-6.5'	8/29/92	Flyash	med dk gray(N4), moist, solid.
92AUGOH5-7	N cell	6.5'-7'	8/29/92	Flyash	med dk gray(N4), moist, solid.
92AUGOH5-7.5	N cell	7'-7.5'	8/29/92	Flyash	med dk gray(N4), moist, solid.
92AUGOH5-8	N cell	7.5'-8'	8/29/92	Flyash	med dk gray(N4), moist, solid.
92AUGOH5-8.5	N cell	8'-8.5'	8/29/92	Flyash	med dk gray(N4), moist, solid.
92AUGOH5-9	N cell	8.5'-9'	8/29/92	Flyash	med dk gray(N4), moist, solid.
92AUGOH5-9.5	N cell	9'-9.5'	8/29/92	Flyash	med dk gray(N4), moist, solid.
92AUGOH5-10	N cell	9.5'-10'	8/29/92	Flyash	med dk gray(N4), moist, solid.
92AUGOH5-10.5	N cell	10'-10.5'	8/29/92	Flyash	med dk gray(N4), moist, solid.
92AUGOH5-10.5	N cell	10'-10.5'	8/29/92	Flyash	med dk gray(N4), moist, solid.
92AUGOH5-11	N cell	10.5'-11'	8/29/92	Flyash	med dk gray(N4), moist, solid.
92AUGOH5-11.5	N cell	11'-11.5'	8/29/92	Flyash	med dk gray(N4), moist, solid.
92AUGOH5-12	N cell	11.5'-12'	8/29/92	Flyash	med dk gray(N4), moist, solid.
92AUGOH5-12.5	N cell	12'-12.5'	8/29/92	Flyash	med dk gray(N4), moist, solid.
				Soil	dk yellowish orange (10YR 6/6), slightly moist, cohesive, weathered SS(arenite), banding and parting, med fine-med grain size.
92AUGOH5-13	N cell	12.5'-13'	8/29/92	Soil	dk yellowish orange (10YR 6/6), slightly moist, cohesive, weathered SS(arenite), banding and parting, med fine-med grain size.
92AUGOH5-13.5	N cell	13'-13.5'	8/29/92	Soil/Gley	mod yellowish brn (10YR 5/4), moist, friable, aggregate of clystn, mdstn and sltstn clasts, mottled, banding, disseminated pebbles and coarse sand.
92AUGOH5-14	N cell	13.5'-14'	8/29/92	Soil/Gley	lt olive brn (5Y 5/6) slightly moist, friable, aggregate of clystn, mdstn and sltstn clasts, mottled, banding, disseminated pebbles and coarse sand.

Table H-1

(Continued)

Sample ID	Location	Interval	Date	Sample Type	Description
92AUGOH5-14.5	N cell	14'-14.5'	8/29/92	Soil/Gley	lt olive brn (5Y 5/6) slightly moist, friable, aggregate of clystn, mdstn and sltstn clasts, mottled, banding, disseminated pebbles and coarse sand.
92AUGOH5-15	N cell	14.5'-15'	8/29/92	Soil/Gley	lt olive brn (5Y 5/6) slightly moist, friable, aggregate of clystn, mdstn and sltstn clasts, mottled, banding, disseminated pebbles and coarse sand.
92AUGOH5-15.5	N cell	15'-15.5'	8/29/92	Soil/Gley	lt olive brn (5Y 5/6) slightly moist, friable, aggregate of clystn, mdstn and sltstn clasts, mottled, banding, disseminated pebbles and coarse sand.
92AUGOH5-16	N cell	15.5'-16'	8/29/92	Soil	olive gray (5Y 4/1), moist, semi-hard, brittle shale, parting, banding.
92AUGOH5-16.5	N cell	16'-16.5'	8/29/92	Soil	olive gray (5Y 4/1), moist, semi-hard, brittle shale, parting, banding.
92AUGOH5-17	N cell	16.5'-17'	8/29/92	Soil	olive gray (5Y 4/1), moist, semi-hard, brittle shale, parting, banding, interlayered with dark mdstn.
				Soil	olive gray (5Y 4/1), moist, interlayered weathered mdstn and hard, brittle shale.
92AUGOH5-17.5	N cell	17'-17.5'	8/29/92	Soil	olive gray (5Y 4/1), moist, interlayered weathered mdstn and hard, brittle shale.
92AUGOH5-18	N cell	17.5'-18'	8/29/92	Soil	olive gray (5Y 4/1), moist, interlayered weathered mdstn and hard, brittle shale.
92AUGOH5-18.5	N cell	18'-18.5'	8/29/92	Soil	olive gray (5Y 4/1), moist, interlayered weathered mdstn and hard, brittle shale.
92AUGOH5-19	N cell	18.5'-19'	8/29/92	Soil	olive gray (5Y 4/1), moist, interlayered weathered mdstn and hard, brittle shale.
92AUGOH5-19.5	N cell	19'-19.5'	8/29/92	Soil	dk greenish gray (5GY 4/1), slightly moist, v. hard, indurated, fissile
92AUGOH6-0.5	N cell	0'-0.5'	8/29/92	Soil	dk yellowish brn (10Y 4/2), v. moist, cohesive, poorly sorted sandy, clayey loam, disseminated rock fragments, organic debris.
92AUGOH6-1	N cell	0.5'-1'	8/29/92	Soil/Gley	dk yellowish brn (10Y 4/2), v. moist, friable, poorly sorted sandy, clayey loam, disseminated rock fragments, organic debris, mottling.
92AUGOH6-1.5	N cell	1'-1.5'	8/29/92	Soil/Gley	dk yellowish brn (10Y 4/2), v. moist, friable, poorly sorted sandy, clayey loam, disseminated rock fragments, organic debris, mottling.

Table H-1

(Continued)

Sample ID	Location	Interval	Date	Sample Type	Description
92AUGOH6-2	N cell	1.5'-2'	8/29/92	Soil/Flyash	dk yellowish brn (10Y 4/2), v. moist, friable, poorly sorted sandy, clayey loam, disseminated rock fragments, organic debris, mottling/dk gray (N3), wet, v. hard, indurated, brittle, predominantly clay sized particles.
92AUGOH6-2.5	N cell	2'-2.5'	8/29/92	Flyash	dk gray (N3), wet, v. hard, indurated, brittle, predominantly clay sized particles.
92AUGOH6-3	N cell	2.5'-3'	8/29/92	Flyash	dk gray (N3), wet, v. hard, indurated, brittle, predominantly clay sized particles.
92AUGOH6-3.5	N cell	3'-3.5'	8/29/92	Flyash	dk gray (N3), wet, v. hard, indurated, brittle, predominantly clay sized particles.
92AUGOH6-4	N cell	3.5'-4'	8/29/92	Flyash	dk gray (N3), wet, v. hard, indurated, brittle, predominantly clay sized particles.
92AUGOH6-4.5	N cell	4'-4.5'	8/29/92	Flyash	dk gray (N3), wet, v. hard, indurated, brittle, predominantly clay sized particles.
92AUGOH6-5	N cell	4.5'-5'	8/29/92	Flyash	dk gray (N3), wet, v. hard, indurated, brittle, predominantly clay sized particles.
92AUGOH6-5.5	N cell	5'-5.5'	8/29/92	Flyash	dk gray (N3), wet, v. hard, indurated, brittle, predominantly clay sized particles.
92AUGOH6-6	N cell	5.5'-6'	8/29/92	Flyash	dk gray (N3), wet, v. hard, indurated, brittle, predominantly clay sized particles.
92AUGOH6-6.5	N cell	6'-6.5'	8/29/92	Flyash	dk gray (N3), wet, v. hard, indurated, brittle, predominantly clay sized particles.
92AUGOH6-7	N cell	6.5'-7'	8/29/92	Flyash	dk gray (N3), wet, v. hard, indurated, brittle, predominantly clay sized particles.
92AUGOH6-7.5	N cell	7'-7.5'	8/29/92	Flyash	dk gray (N3), wet, v. hard, indurated, brittle, predominantly clay sized particles.
92AUGOH6-8	N cell	7.5'-8'	8/29/92	Flyash	dk gray (N3), wet, v. hard, indurated, brittle, predominantly clay sized particles.
92AUGOH6-8.5	N cell	8'-8.5'	8/29/92	Flyash	dk gray (N3), wet, v. hard, indurated, brittle, predominantly clay sized particles.
92AUGOH6-9	N cell	8.5'-9'	8/29/92	Flyash	dk gray (N3), wet, v. hard, indurated, brittle, predominantly clay sized particles.
92AUGOH6-9.5	N cell	9'-9.5'	8/29/92	Flyash	dk gray (N3), wet, v. hard, indurated, brittle, predominantly clay sized particles.
92AUGOH6-10	N cell	9.5'-10'	8/29/92	Flyash	dk gray (N3), wet, v. hard, indurated, brittle, predominantly clay sized particles.

Table H-1

(Continued)

Sample ID	Location	Interval	Date	Sample Type	Description
92AUGOH6-10.5	N cell	10'-10.5'	8/29/92	Flyash	dk gray (N3), wet, v. hard, indurated, brittle, predominantly clay sized particles.
92AUGOH6-11	N cell	10.5'-11'	8/29/92	Flyash	dk gray (N3), wet, v. hard, indurated, brittle, predominantly clay sized particles.
92AUGOH6-11.5	N cell	11'-11.5'	8/29/92	Flyash	dk gray (N3), wet, v. hard, indurated, brittle, predominantly clay sized particles.
92AUGOH6-12	N cell	11.5'-12'	8/29/92	Flyash	dk gray (N3), wet, v. hard, indurated, brittle, predominantly clay sized particles.
92AUGOH6-12.5	N cell	12'-12.5'	8/29/92	Soil	dk yellowish orange (10YR 6/6), slightly moist, cohesive, weathered SS(arenite), banding and parting, med fine-med grain size.
92AUGOH6-13	N cell	12.5'-13'	8/29/92	Soil	dk yellowish orange (10YR 6/6), slightly moist, cohesive, weathered SS(arenite), banding and parting, med fine-med grain size.
92AUGOH6-13.5	N cell	13'-13.5'	8/29/92	Soil/Gley	mod yellowish brn (10YR 5/4), moist, friable, aggregate of clystn, mdstn and sltstn clasts, mottled, banding, disseminated pebbles and coarse sand.
92AUGOH6-14	N cell	13.5'-14'	8/29/92	Soil/Gley	lt olive brn (5Y 5/6) slightly moist, as above.
92AUGOH6-14.5	N cell	14'-14.5'	8/29/92	Soil/Gley	lt olive brn (5Y 5/6) slightly moist, as above.
92AUGOH6-15	N cell	14.5'-15'	8/29/92	Soil/Gley	lt olive brn (5Y 5/6) slightly moist, as above.
92AUGOH6-15.5	N cell	15'-15.5'	8/29/92	Soil	olive gray (5Y 4/1), moist, semi-hard, brittle shale, parting, banding.
92AUGOH6-16	N cell	15.5'-16'	8/29/92	Soil	olive gray (5Y 4/1), moist, semi-hard, brittle shale, parting, banding.
92AUGOH6-16.5	N cell	16'-16.5'	8/29/92	Soil	olive gray (5Y 4/1), moist, semi-hard, brittle shale, parting, banding, interlayered with dk mdstn.
92AUGOH6-17	N cell	16.5'-17'	8/29/92	Soil	olive gray (5Y 4/1), moist, interlayered weathered mdstn and hard, brittle shale.
92AUGOH6-17.5	N cell	17'-17.5'	8/29/92	Soil	olive gray (5Y 4/1), moist, interlayered weathered mdstn and hard, brittle shale.
92AUGOH6-18	N cell	17.5'-18'	8/29/92	Soil	olive gray (5Y 4/1), moist, interlayered weathered mdstn and hard, brittle shale.
92AUGOH6-18.5	N cell	18'-18.5'	8/29/92	Soil	olive gray (5Y 4/1), moist, interlayered weathered mdstn and hard, brittle shale.

Table H-1
(Continued)

Sample ID	Location	Interval	Date	Sample Type	Description
92AUGOH6-19	N cell	18.5-19'	8/29/92	Soil	olive gray (5Y 4/1), moist, interlayered weathered mdstn and hard, brittle shale.
92AUGOH6-19.5	N cell	19-19.5'	8/29/92	Soil	olive gray (5Y 4/1), moist, interlayered weathered mdstn and hard, brittle shale.
92AUGOH6-19.5	N cell	19.5-20'	8/29/92	Soil	dk greenish gray (5GY 4/1), slightly moist, v. hard, indurated, fissile
92AUGOH7-0.5	N cell	0'-0.5'	8/29/92	Soil	dk yellowish brn (10Y 4/2), v. moist, cohesive, poorly sorted sandy, clayey loam, disseminated rock fragments, organic debris.
92AUGOH7-1	N cell	0.5'-1'	8/29/92	Soil/Gley	dk yellowish brn (10Y 4/2), v. moist, friable, poorly sorted sandy, clayey loam, disseminated rock fragments, organic debris, mottling.
92AUGOH7-1.5	N cell	1'-1.5'	8/29/92	Soil/Gley	dk yellowish brn (10Y 4/2), v. moist, friable, poorly sorted sandy, clayey loam, disseminated rock fragments, organic debris, mottling.
92AUGOH7-2	N cell	1.5'-2'	8/29/92	Flyash	interlayered med dk gray(N4), v. moist, soft, friable and grayish blk (N2), v. hard, indurated, brittle, massive, predominantly clay sized particles.
92AUGOH7-2.5	N cell	2'-2.5'	8/29/92	Flyash	interlayered med dk gray(N4), v. moist, soft, friable and grayish blk (N2), v. hard, indurated, brittle, massive, predominantly clay sized particles.
92AUGOH7-3	N cell	2.5'-3'	8/29/92	Flyash	med dk gray (N4), slightly moist, semi-hard, friable, vesicular(pseudo-amygdaloidal), occasional white calcareous inclusions (<1mm).
92AUGOH7-3.5	N cell	3'-3.5'	8/29/92	Flyash	med dk gray (N4), slightly moist, semi-hard, friable, vesicular(pseudo-amygdaloidal), occasional white calcareous inclusions (<1mm).
92AUGOH7-4	N cell	3.5'-4'	8/29/92	Flyash	med dk gray (N4), slightly moist, semi-hard, friable, vesicular(pseudo-amygdaloidal), occasional white calcareous inclusions (<1mm).
92AUGOH7-4.5	N cell	4'-4.5'	8/29/92	Flyash	med dk gray (N4), moist, soft, consolidated, friable, occasional white calcareous inclusions.
92AUGOH7-5	N cell	4.5'-5'	8/29/92	Flyash	lt gray (N7), dry, semi-hard, massive, low bulk density, predominantly siltsized particles.
92AUGOH7-5.5	N cell	5'-5.5'	8/29/92	Flyash	dk gray (N3), slightly moist, v. hard, indurated, brittle, parting along horizontal planes.

Table H-1

(Continued)

Sample ID	Location	Interval	Date	Sample Type	Description
92AUGOH7-6	N cell	5.5'-6'	8/29/92	Flyash	med gray (N5), slightly moist, v. hard, indurated, brittle, parting along horizontal planes.
92AUGOH7-6.5	N cell	6'-6.5'	8/29/92	Flyash	med gray (N5), slightly moist, v. hard, indurated, brittle, parting along horizontal planes.
92AUGOH7-7	N cell	6.5'-7'	8/29/92	Flyash	med gray(N5), slightly moist semi-hard, friable, clay-silt sized particles.
92AUGOH7-7.5	N cell	7'-7.5'	8/29/92	Flyash	med gray(N5), slightly moist semi-hard, friable, clay-silt sized particles.
92AUGOH7-8	N cell	7.5'-8'	8/29/92	Flyash	dk gray (N3), slightly moist, soft, friable, solid, disseminated white calcareous inclusions (<1mm), clay-silt sized particles.
92AUGOH7-8.5	N cell	8'-8.5'	8/29/92	Flyash	med dk gray (N4), dry, v. hard, indurated, brittle, consolidated, lustermottling, pseudo-miarolitic, occasional white calcareous inclusions.
92AUGOH7-9	N cell	8.5'-9'	8/29/92	Flyash	med dk gray (N4), dry, v. hard, indurated, brittle, consolidated, lustermottling, pseudo-miarolitic, occasional white calcareous inclusions.
92AUGOH7-9.5	N cell	9'-9.5'	8/29/92	Flyash	med dk gray (N4), dry, v. hard, indurated, brittle, consolidated, lustermottling, pseudo-miarolitic, occasional white calcareous inclusions.
92AUGOH7-10	N cell	9.5'-10'	8/29/92	Flyash	med gray (N5), dry, v. hard, indurated, brittle, consolidated, lustermottling, pseudo-miarolitic, occasional white calcareous inclusions.
92AUGOH7-10.5	N cell	10'-10.5'	8/29/92	Flyash	med dk gray (N4), fractured (white fracture coatings), luster mottling.
92AUGOH7-10.5	N cell	10'-10.5'	8/29/92	Soil	grayish yellow (5Y 8/4), hard, indurated, clean SS (arenite), banding, fine-med grained.
92AUGOH7-11	N cell	10.5'-11'	8/29/92	Soil	grayish yellow (5Y 8/4), hard, indurated, clean SS (arenite), banding, fine-med grained.
92AUGOH7-11.5	N cell	11'-11.5'	8/29/92	Soil	grayish yellow (5Y 8/4), hard, indurated, clean SS (arenite), banding, fine-med grained.
92AUGOH7-12	N cell	11.5'-12'	8/29/92	Soil	dk yellowish orange (10YR 6/6), slightly moist, cohesive, weathered SS(arenite), banding and parting, med fine-med grain size.
92AUGOH7-12.5	N cell	12'-12.5'	8/29/92	Soil/Gley	mod yellowish brn (10YR 5/4), moist, friable, aggregate of clystn, mdstn and sltstn, mottled, banding, disseminated pebbles and coarse sand.

Table H-1

(Continued)

Sample ID	Location	Interval	Date	Sample Type	Description
92AUGOH7-13	N cell	12.5'-13'	8/29/92	Soil/Gley	lt olive brn (5Y 5/6), slightly moist, friable, aggregate of clystn, mdstn and sltstn, mottled, banding, disseminated pebbles and coarse sand.
92AUGOH7-13.5	N cell	13'-13.5'	8/29/92	Soil/Gley	lt olive brn (5Y 5/6), slightly moist, friable, aggregate of clystn, mdstn and sltstn, mottled, banding, disseminated pebbles and coarse sand.
92AUGOH7-14	N cell	13.5'-14'	8/29/92	Soil/Gley	lt olive brn (5Y 5/6), slightly moist, friable, aggregate of clystn, mdstn and sltstn, mottled, banding, disseminated pebbles and coarse sand.
92AUGOH7-14.5	N cell	14'-14.5'	8/29/92	Soil/Gley	lt olive brn (5Y 5/6), slightly moist, friable, aggregate of clystn, mdstn and sltstn, mottled, banding, disseminated pebbles and coarse sand.
92AUGOH7-15	N cell	14.5'-15'	8/29/92	Soil/Gley	lt olive brn (5Y 5/6), slightly moist, friable, aggregate of clystn, mdstn and sltstn, mottled, banding, disseminated pebbles and coarse sand.
92AUGOH7-15.5	N cell	15'-15.5'	8/29/92	Soil	med gray (N5), slightly moist, soft, friable sltstn.
92AUGOH7-16	N cell	15.5'-16'	8/29/92	Soil	olive gray (5Y 4/1), moist, poorly sorted-sandy mdstn with rock fragmentsand mdstn clasts.
92AUGOH7-16.5	N cell	16'-16.5'	8/29/92	Soil	olive gray (5Y 4/1), moist, poorly sorted-sandy mdstn with rock fragmentsand mdstn clasts.
92AUGOH7-17	N cell	16.5'-17'	8/29/92	Soil	olive gray (5Y 4/1), moist, poorly sorted-sandy mdstn with rock fragmentsand mdstn clasts.
92AUGOH7-17.5	N cell	17'-17.5'	8/29/92	Soil	olive gray (5Y 4/1), moist, poorly sorted-sandy mdstn with rock fragmentsand mdstn clasts.
92AUGOH7-18	N cell	17.5'-18'	8/29/92	Soil	olive gray (5Y 4/1), moist, poorly sorted-sandy mdstn with rock fragmentsand mdstn clasts.
92AUGOH7-18.5	N cell	18'-18.5'	8/29/92	Soil	olive gray (5Y 4/1), moist, poorly sorted-sandy mdstn with rock fragmentsand mdstn clasts.
92AUGOH7-19	N cell	18.5'-19'	8/29/92	Soil	olive gray (5Y 4/1), moist, poorly sorted-sandy mdstn with rock fragmentsand mdstn clasts.
92AUGOH7-19.5	N cell	19'-19.5'	8/29/92	Soil	olive gray (5Y 4/1), moist, poorly sorted-sandy mdstn with rock fragmentsand mdstn clasts.
92AUGOH8-.5	N cell	0-0.5'	8/29/92	Soil	med brn (5YR 3/4), v. moist, soft, friable, rock fragments, clayey, sandy loam.
92AUGOH8-1	N cell	0.5'-1'	8/29/92	Soil	med brn (5YR 3/4), v. moist, soft, friable, rock fragments, clayey, sandy loam.

Table H-1

(Continued)

Sample ID	Location	Interval	Date	Sample Type	Description
92AUGOH8-1.5	N cell	1-1.5'	8/29/92	Soil	med brn (5YR 3/4), moist, soft, friable, rock fragments, clayey, sandy loam.
92AUGOH8-2	N cell	1.5-2'	8/29/92	Soil	med brn (5YR 3/4), moist, soft, friable, rock fragments, clayey, sandy loam.
92AUGOH8-2.5	N cell	2-2.5'	8/29/92	Soil/Flyash	grayish black (N2), moist, soft, friable, consolidated, rock fragments, clayey, sandy loam.
92AUGOH8-3	N cell	2.5-3'	8/29/92		dk gray (N3), slightly moist, v. hard, brittle, massive, fracture surfaces display resinous luster (aphanocrystalline), disseminated white calcareous inclusions.
92AUGOH8-4	N cell	3.5-4'	8/29/92	Flyash	med dk gray (N4), moist, semi-hard, consolidated, massive, friable.
92AUGOH8-5	N cell	4.5-5'	8/29/92	Flyash	med dk gray, slightly moist, hard, brittle, massive, clay-silt sized particles.
92AUGOH8-5.5	N cell	5-5.5'	8/29/92	Flyash	med dk gray, slightly moist, hard, brittle, massive, clay-silt sized particles, luster mottling.
92AUGOH8-6.5	N cell	6-6.5'	8/29/92	Flyash	dk gray (N3), slightly moist, hard, massive, predominantly silt sized particles.
92AUGOH8-7	N cell	6.5-7'	8/29/92	Flyash	dk gray (N3), slightly moist, hard, massive, predominantly silt sized particles, luster mottling.
92AUGOH8-8.5	N cell	8-8.5'	8/29/92	Flyash	dk gray (N3), slightly moist, hard, consolidated, massive, clay-silt sized particles.
92AUGOH8-9	N cell	8.5-9'	8/29/92	Flyash	dk gray (N3), slightly moist, hard, consolidated, massive, predominantly silt sized particles.
92AUGOH8-9.5	N cell	9-9.5'	8/29/92	Flyash	med dk gray (N4), dry, hard, brittle, massive, vesicular (pseudo-amygdaloidal), pseudo-miarolitic.
92AUGOH8-10.5	N cell	10-10.5'	8/29/92	Flyash	dk gray (N3), dry, v. hard, indurated, luster mottling.
92AUGOH8-11	N cell	10.5-11'	8/29/92	Flyash	dk gray (N3), dry, v. hard, brittle, massive, indurated, luster mottling, clay-silt sized particles.
92AUGOH8-11.5	N cell	11-11.5'	8/29/92	Flyash	dk gray (N3), dry, v. hard, brittle, massive, indurated, luster mottling, clay-silt sized particles.
92AUGOH8-12	N cell	11.5-12'	8/29/92	Flyash	dk gray (N3), moist, semi-soft, friable, massive, predominantly silt sized particles.
92AUGOH8-12.5	N cell	12-12.5	8/29/92	Flyash	dk gray (N3), moist, semi-soft, friable, massive, predominantly silt sized particles.
92AUGOH8-13	N cell	12.5-13'	8/29/92	Soil	dk greenish gray (5GY 4/1), v. moist, cohesive, friable, hard weathered shale clasts in a clay matrix.

Table H-1

(Continued)

Sample ID	Location	Interval	Date	Sample Type	Description
92AUGOH8-13.5	N cell	13-13.5'	8/29/92	Soil	olive gray (5Y 4/1), v. moist, plastic, cohesive, coarse sandy mdstn.
92AUGOH8-14	N cell	13.5-14'	8/29/92	Soil	olive gray (5Y 4/1), v. moist, plastic, cohesive, coarse sandy mdstn.
92AUGOH8-14.5	N cell	14-14.5'	8/29/92	Soil	dk greenish gray (5GY 4/1), moist, cohesive mdstn with disseminated gravel.
92AUGOH8-15	N cell	14.5-15'	8/29/92	Soil	dk greenish gray (5GY 4/1), moist, cohesive mdstn with disseminated gravel.
92AUGOH8-15.5	N cell	15-15.5'	8/29/92	Soil	dk greenish gray (5GY 4/1), moist, cohesive mdstn with disseminated gravel.
92AUGOH8-16	N cell	15.5-16'	8/29/92	Soil	olive gray (5Y 4/1), v. moist, semi-soft, plastic, interlayered sltstn and clystn, variegated SS.
92AUGOH8-16.5	N cell	16-16.5'	8/29/92	Soil	olive gray (5Y 4/1), v. moist, semi-soft, plastic, interlayered sltstn and clystn, variegated SS.
92AUGOH8-17	N cell	16.5-17'	8/29/92	Soil	olive gray (5Y 4/1), v. moist, semi-soft, plastic, interlayered sltstn and clystn, variegated SS.
92AUGOH8-17.5	N cell	17-17.7'	8/29/92	Soil	olive gray (5Y 4/1), v. moist, semi-soft, plastic, interlayered sltstn and clystn, variegated SS.
92AUGOH8-18	N cell	17.5-18'	8/29/92	Soil	olive gray (5Y 4/1), moist, friable, semi-soft, plastic, interlayered sltstn and clystn, SS.
92AUGOH8-18.5	N cell	18-18.5'	8/29/92	Soil	olive gray (5Y 4/1), moist, cohesive, friable, interlayered dirty SS, clystn and sltstn.
92AUGOH8-19	N cell	18.5-19'	8/29/92	Soil	olive gray (5Y 4/1), moist, cohesive, friable, interlayered dirty SS, clystn and sltstn.
92AUGOH8-20	N cell	19.5-20'	8/29/92	Soil	dk greenish gray (5GY 4/1), moist, cohesive, soft, friable, interlayered dirty SS, clystn and sltstn, some fine grained sand.
92AUGOH8-20.5	N cell	20-20.5'	8/29/92	Soil	dk greenish gray (5GY 4/1), moist, cohesive, soft, friable, interlayered dirty SS, clystn and sltstn, some fine grained sand.

APPENDIX I

PHYSICAL PROPERTIES OF OHIO LIMB CORE SAMPLES

Back up

Table I-1
Ohio Physical Data

Sample ID	Cell	Quadrant	Depth, ft	Results	Flag	Units	Measurement
OHMW7-1,2		upgrd	2-4'	140.9		lb/ft3	Field bulk density
OHMW7-4,5		upgrd	6-8'	138.3		lb/ft3	Field bulk density
OHMW7-7		upgrd	10-11'	143.2		lb/ft3	Field bulk density
OHMW7-10		upgrd	14-15'	144.3		lb/ft3	Field bulk density
OHMW7-11		upgrd	15-16'	144.3		lb/ft3	Field bulk density
OHMW7-13,14		upgrd	18-20'	142.5		lb/ft3	Field bulk density
OHMW7-17,18		upgrd	24-26'	133.9		lb/ft3	Field bulk density
OHMW7-20,21		upgrd	28-30'	131.1		lb/ft3	Field bulk density
OHMW7-23,24		upgrd	32-34'	144		lb/ft3	Field bulk density
OHMW7-1,2		upgrd	2-4'	38		%, dry	Liquid limit
OHMW7-4,5		upgrd	6-8'	37		%, dry	Liquid limit
OHMW7-7		upgrd	10-11'	33		%, dry	Liquid limit
OHMW7-8		upgrd	11-12'	33		%, dry	Liquid limit
OHMW7-1,2		upgrd	2-4'	11.1		wt %, dry	Moisture content
OHMW7-4,5		upgrd	6-8'	10.6		wt %, dry	Moisture content
OHMW7-7		upgrd	10-11'	3.3		wt %, dry	Moisture content
OHMW7-8		upgrd	11-12'	13.8		wt %, dry	Moisture content
OHMW7-10		upgrd	14-15'	12		wt %, dry	Moisture content
OHMW7-11		upgrd	15-16'	12		wt %, dry	Moisture content
OHMW7-17,18		upgrd	24-26'	13.6		wt %, dry	Moisture content
OHMW7-20,21		upgrd	28-30'	16		wt %, dry	Moisture content
OHMW7-23,24		upgrd	32-34'	4		wt %, dry	Moisture content
OHMW7-1,2		upgrd	2-4'	17.6		uM	Particle size distr., D50
OHMW7-4,5		upgrd	6-8'	14.8		uM	Particle size distr., D50
OHMW7-7		upgrd	10-11'	19.3		uM	Particle size distr., D50
OHMW7-10		upgrd	14-15'	13.8		uM	Particle size distr., D50
OHMW7-13,14		upgrd	18-20'	13.5		uM	Particle size distr., D50
OHMW7-17,18		upgrd	24-26'	15		uM	Particle size distr., D50
OHMW7-20,21		upgrd	28-30'	11.4		uM	Particle size distr., D50
OHMW7-23,24		upgrd	32-34'	15.5		uM	Particle size distr., D50
OHMW7-1,2		upgrd	2-4'	2.8			Particle spec. gravity
OHMW7-4,5		upgrd	6-8'	2.8			Particle spec. gravity
OHMW7-7		upgrd	10-11'	2.7			Particle spec. gravity
OHMW7-8		upgrd	11-12'	2.7			Particle spec. gravity
OHMW7-10		upgrd	14-15'	2.7			Particle spec. gravity
OHMW7-11		upgrd	15-16'	2.7			Particle spec. gravity
OHMW7-17,18		upgrd	24-26'	2.7			Particle spec. gravity

FP = fractured or permeable   NP = not plastic

Table I-1

(Continued)

Sample ID	Cell	Quadrant	Depth, ft	Results	Flag	Units	Measurement
OHMW7-20,21		upgrd	28-30'	2.7			Particle spec. gravity
OHMW7-1,2		upgrd	2-4'	1.1e-8		cm/s	Permeability
OHMW7-4,5		upgrd	6-8'	9.0e-7		cm/s	Permeability
OHMW7-7		upgrd	10-11'	1.7e-6		cm/s	Permeability
OHMW7-8		upgrd	11-12'	1.7e-6		cm/s	Permeability
OHMW7-10		upgrd	14-15'	5.2e-7		cm/s	Permeability
OHMW7-11		upgrd	15-16'	5.0e-7		cm/s	Permeability
OHMW7-13,14		upgrd	18-20'	1.3e-8		cm/s	Permeability
OHMW7-17,18		upgrd	24-26'	9.4e-6		cm/s	Permeability
OHMW7-20,21		upgrd	28-30'	1.7e-8		cm/s	Permeability
OHMW7-23,24		upgrd	32-34'	3.7e-8		cm/s	Permeability
OHMW7-1,2		upgrd	2-4'	21		%, dry	Plastic limit
OHMW7-4,5		upgrd	6-8'	21		%, dry	Plastic limit
OHMW7-7		upgrd	10-11'	18.7		%, dry	Plastic limit
OHMW7-8		upgrd	11-12'	18.7		%, dry	Plastic limit
OHMW7-12		upgrd	2-4'	17			Plasticity index
OHMW7-1,2		upgrd	2-4'	17.7		m2/g	Surface area
OHMW7-4,5		upgrd	6-8'	18.2		m2/g	Surface area
OHMW7-7		upgrd	10-11'	20		m2/g	Surface area
OHMW7-8		upgrd	11-12'	20		m2/g	Surface area
OHMW7-10		upgrd	14-15'	14.8		m2/g	Surface area
OHMW7-11		upgrd	15-16'	14.8		m2/g	Surface area
OHMW7-13,14		upgrd	18-20'	13.5		m2/g	Surface area
OHMW7-17,18		upgrd	24-26'	15.2		m2/g	Surface area
OHMW7-20,21		upgrd	28-30'	14		m2/g	Surface area
OHMW7-23,24		upgrd	32-34'	9.1		m2/g	Surface area
OHASH-1	N		Silo	22			Confining stress
OHNT 8-2	N	NW	1-2'	22			Confining stress
OHNT 1-4	N	SW	3-4'	22			Confining stress
OHNT 1-6	N	SW	5-6'	22			Confining stress
OHASH-1	N		Silo	129			Dev. stress
OHNT 8-2	N	NW	1-2'	1075			Dev. stress
OHNT 1-4	N	SW	3-4'	190			Dev. stress
OHNT 1-6	N	SW	5-6'	615			Dev. stress

FP = fractured or permeable   NP = not plastic

Table I-1

(Continued)

Sample ID	Cell	Quadrant	Depth, ft	Results	Flag	Units	Measurement
90AUGOH 1-2	N	NE	1-2'	56.2	FP	lb/ft ³	Dry density
90AUGOH 3-2	N	NE	1-2'	43.9		lb/ft ³	Dry density
90FEBOH 2-2	N	NW	1-2'	56.4		lb/ft ³	Dry density
90MAYOH 1-2	N	SE	1-2'	52.6		lb/ft ³	Dry density
90AUGOH 1-4	N	NE	3-4'	59.6		lb/ft ³	Dry density
90AUGOH 3-4	N	NE	3-4'			lb/ft ³	Dry density
90FEBOH 2-3,4	N	NW	2-4'	54.2		lb/ft ³	Dry density
90MAYOH 1-4	N	SE	3-4'	52.9		lb/ft ³	Dry density
90MAYOH 1-5	N	SE	4-5'	46.8		lb/ft ³	Dry density
90AUGOH 1-6	N	NE	5-6'	60.8		lb/ft ³	Dry density
90AUGOH 3-5,6	N	NE	4-6'	64.2		lb/ft ³	Dry density
90FEBOH 2-6	N	NW	5-6'	52.1		lb/ft ³	Dry density
90MAYOH 1-7	N	SE	6-7'	44.3		lb/ft ³	Dry density
90AUGOH 1-8	N	NE	7-8'	65.7		lb/ft ³	Dry density
90AUGOH 3-8	N	NE	7-8'	56.9		lb/ft ³	Dry density
90FEBOH 2-8	N	NW	7-8'	55.8		lb/ft ³	Dry density
90MAYOH 1-8	N	SE	7-8'	47.6		lb/ft ³	Dry density
90MAYOH 1-9	N	SE	8-9'	126.4		lb/ft ³	Dry density
90AUGOH 3-10	N	NE	9-10'	46.8		lb/ft ³	Dry density
90FEBOH 2-10	N	NW	9-10'	130		lb/ft ³	Dry density
90MAYOH 1-10	N	SE	9-10'	102.3		lb/ft ³	Dry density
90AUGOH 3-10,11	N	NE	9-11'	111.1		lb/ft ³	Dry density
90AUGOH 1-10,11	N	NE	9-11'	111.2		lb/ft ³	Dry density
90AUGOH 3-12	N	NE	11-12'	120		lb/ft ³	Dry density
90AUGOH 1-12,13	N	NE	11-13'	124.6		lb/ft ³	Dry density
90AUGOH 1-14	N	NE	13-14'	132.3		lb/ft ³	Dry density
90AUGOH 3-14	N	NE	13-14'	129.8		lb/ft ³	Dry density
90AUGOH 1-16	N	NE	15-16'	130.4		lb/ft ³	Dry density
90AUGOH 3-16	N	NE	15-16'	125		lb/ft ³	Dry density
OHNT 8-1	N	NW	0-1'	87.2		lb/ft ³	Field bulk density
90AUGOH 1-2	N	NE	1-2'	84.1		lb/ft ³	Field bulk density
90AUGOH 3-2	N	NE	1-2'	71.7		lb/ft ³	Field bulk density
90FEBOH 2-2	N	NW	1-2'	73.8		lb/ft ³	Field bulk density
OHNT 1-1,2	N	SW	0-2'	96.8		lb/ft ³	Field bulk density
OHNT 8-3	N	NW	2-3'	72.7		lb/ft ³	Field bulk density
OHNT 1-3	N	SW	2-3'	96.4		lb/ft ³	Field bulk density
90AUGOH 1-4	N	NE	3-4'	89		lb/ft ³	Field bulk density

FP = fractured or permeable   NP = not plastic

Table I-1

(Continued)

Sample ID	Cell	Quadrant	Depth, ft	Results	Flag	Units	Measurement
90AUGOH 3-4	N	NE	3-4'		FP	lb/ft ³	Field bulk density
90FEBOH 2-3,4	N	NW	2-4'	88.3		lb/ft ³	Field bulk density
OHNT 8-5	N	NW	4-5'	80.2		lb/ft ³	Field bulk density
OHNT 1-5	N	SW	4-5'	77.6		lb/ft ³	Field bulk density
90AUGOH 1-6	N	NE	5-6'	87.8		lb/ft ³	Field bulk density
90AUGOH 3-5,6	N	NE	4-6'	88		lb/ft ³	Field bulk density
90FEBOH 2-6	N	NW	5-6'	84.3		lb/ft ³	Field bulk density
OHNT 8-7	N	NW	6-7'	93.7		lb/ft ³	Field bulk density
OHNT 1-7	N	SW	6-7'	89.3		lb/ft ³	Field bulk density
90AUGOH 1-8	N	NE	7-8'	89.8		lb/ft ³	Field bulk density
90AUGOH 3-8	N	NE	7-8'	96.3		lb/ft ³	Field bulk density
90FEBOH 2-8	N	NW	7-8'	72.9		lb/ft ³	Field bulk density
OHNT 4-8	N	NW	7-8'		FP	lb/ft ³	Field bulk density
OHNT 1-8	N	SW	7-8'	134.6		lb/ft ³	Field bulk density
OHNT 2-9	N	SE	8-9'		FP	lb/ft ³	Field bulk density
OHNT 1-9	N	SW	8-9'		FP	lb/ft ³	Field bulk density
90AUGOH 3-10	N	NE	9-10'	88.1		lb/ft ³	Field bulk density
90FEBOH 2-10	N	NW	9-10'	132.5		lb/ft ³	Field bulk density
90AUGOH 3-10,11	N	NE	9-11'	124.8		lb/ft ³	Field bulk density
90AUGOH 1-10,11	N	NE	9-11'	127.5		lb/ft ³	Field bulk density
90AUGOH 3-12	N	NE	11-12'	137.3		lb/ft ³	Field bulk density
90AUGOH 1-12,13	N	NE	11-13'	133.4		lb/ft ³	Field bulk density
90AUGOH 1-14	N	NE	13-14'	144		lb/ft ³	Field bulk density
90AUGOH 3-14	N	NE	13-14'	141.6		lb/ft ³	Field bulk density
90AUGOH 1-16	N	NE	15-16'	141.6		lb/ft ³	Field bulk density
90AUGOH 3-16	N	NE	15-16'	136.4		lb/ft ³	Field bulk density
OHASH-1	N		Silo	36		degrees	Internal angle of friction
OHNT 8-2	N	NW	1-2'	72.6		degrees	Internal angle of friction
OHNT 1-4	N	SW	3-4'	53.4		degrees	Internal angle of friction
OHNT 1-6	N	SW	5-6'	70.3		degrees	Internal angle of friction
OHMW 1-3	N	downgrd	3-4'	33.7		%, dry	Liquid limit
OHNT 4-8	N	NW	7-8'	45.2		%, dry	Liquid limit
OHMW 1-7	N	downgrd	7-8'	34.3		%, dry	Liquid limit
OHNT 2-9	N	SE	8-9'		NP	%, dry	Liquid limit
OHASH-1	N		Silo	70.9		%	Maximum dry density
OHASH-1	N		Silo			wt %, dry	Moisture content
90MAYOH 1-1	N	SE	0-1'	57.9		wt %, dry	Moisture content

FP = fractured or permeable   NP = not plastic

Table I-1
(Continued)

Sample ID	Cell	Quadrant	Depth, ft	Results	Flag	Units	Measurement
90AUGOH 1-2	N	NE	1-2'	49.7		wt %, dry	Moisture content
90AUGOH 3-2	N	NE	1-2'	63.4		wt %, dry	Moisture content
91AUGOH6-1,2	N	NE	0-2'	20.1		wt %, dry	Moisture content
92AUGOH7-1	N	NE	0-2'	21.2		wt %, dry	Moisture content
90FEBOH 2-2	N	NW	1-2'	45.1		wt %, dry	Moisture content
92AUGOH8-2	N	NW	0-2'	22		wt %, dry	Moisture content
90MAYOH 1-2	N	SE	1-2'	55.2		wt %, dry	Moisture content
91AUGOH8-2	N	SE	1-2'	25.7		wt %, dry	Moisture content
OHNT 1-1,2	N	SW	0-2'	48.6		wt %, dry	Moisture content
OHNT 8-3	N	NW	2-3'	18.3		wt %, dry	Moisture content
90MAYOH 1-3	N	SE	2-3'	65		wt %, dry	Moisture content
91AUGOH8-3	N	SE	2-3'	51.1		wt %, dry	Moisture content
OHNT 1-3	N	SW	2-3'	47		wt %, dry	Moisture content
90AUGOH 1-4	N	NE	3-4'	49.2		wt %, dry	Moisture content
90AUGOH 3-4	N	NE	3-4'	64.2		wt %, dry	Moisture content
91AUGOH6-3,4	N	NE	2-4'	68.5		wt %, dry	Moisture content
92AUGOH7-4	N	NE	2-4'	118.4		wt %, dry	Moisture content
90FEBOH 2-3,4	N	NW	2-4'	63		wt %, dry	Moisture content
92AUGOH8-4	N	NW	2-4'	88.2		wt %, dry	Moisture content
90MAYOH 1-4	N	SE	3-4'	65.8		wt %, dry	Moisture content
91AUGOH8-6,7	N	SE	5-7'	83.4		wt %, dry	Moisture content
OHMW 1-3	N	downgrd	3-4'	8.5		wt %, dry	Moisture content
OHNT 8-5	N	NW	4-5'	40.8		wt %, dry	Moisture content
90MAYOH 1-5	N	SE	4-5'	69.4		wt %, dry	Moisture content
91AUGOH8-5	N	SE	4-5'	62		wt %, dry	Moisture content
OHNT 1-5	N	SW	4-5'	42.8		wt %, dry	Moisture content
90AUGOH 1-6	N	NE	5-6'	44.3		wt %, dry	Moisture content
90AUGOH 3-5,6	N	NE	4-6'	73.5		wt %, dry	Moisture content
91AUGOH6-5,6	N	NE	4-6'	75.8		wt %, dry	Moisture content
92AUGOH7-4.5	N	NE	4-6'	117.3		wt %, dry	Moisture content
90FEBOH 2-6	N	NW	5-6'	61.8		wt %, dry	Moisture content
92AUGOH8-5.5	N	NW	4-6'	68		wt %, dry	Moisture content
90MAYOH 1-6	N	SE	5-6'	61.1		wt %, dry	Moisture content
OHNT 8-7	N	NW	6-7'	40.2		wt %, dry	Moisture content
90MAYOH 1-7	N	SE	6-7'	65.2		wt %, dry	Moisture content
OHNT 1-7	N	SW	6-7'	4.9		wt %, dry	Moisture content
90AUGOH 1-8	N	NE	7-8'	36.6		wt %, dry	Moisture content

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Table I-1
(Continued)

Sample ID	Cell	Quadrant	Depth, ft	Results	Flag	Units	Measurement
90AUGOH 3-8	N	NE	7-8'	69.1		wt %, dry	Moisture content
91AUGOH6-7,8	N	NE	6-8'	79.6		wt %, dry	Moisture content
92AUGOH7-7.5	N	NE	6-8'	92.8		wt %, dry	Moisture content
90FEBOH 2-8	N	NW	7-8'	31.5		wt %, dry	Moisture content
92AUGOH8-7	N	NW	6-8'	79.8		wt %, dry	Moisture content
OHNT 4-8	N	NW	7-8'	13.2		wt %, dry	Moisture content
90MAYOH 1-8	N	SE	7-8'	82.5		wt %, dry	Moisture content
OHNT 1-8	N	SW	7-8'	7.3		wt %, dry	Moisture content
OHMW 1-7	N	downgrd	7-8'	4.9		wt %, dry	Moisture content
90MAYOH 1-9	N	SE	8-9'	4.8		wt %, dry	Moisture content
91AUGOH8-9	N	SE	8-9'	76.5		wt %, dry	Moisture content
OHNT 2-9	N	SE	8-9'	6.7		wt %, dry	Moisture content
OHNT 1-9	N	SW	8-9'	1.5		wt %, dry	Moisture content
90AUGOH 3-10	N	NE	9-10'	88.2		wt %, dry	Moisture content
92AUGOH7-9	N	NE	8-10'	60.3		wt %, dry	Moisture content
90FEBOH 2-10	N	NW	9-10'	1.9		wt %, dry	Moisture content
92AUGOH8-10	N	NW	8-10'	113.1		wt %, dry	Moisture content
90MAYOH 1-10	N	SE	9-10'	11.7		wt %, dry	Moisture content
91AUGOH8-10	N	SE	9-10'	13.6		wt %, dry	Moisture content
90AUGOH 3-10,11	N	NE	9-11'	14		wt %, dry	Moisture content
90AUGOH1-10,11	N	NE	9-11'	14.6		wt %, dry	Moisture content
91AUGOH6-11	N	NE	10-11'	83.5		wt %, dry	Moisture content
90AUGOH 3-12	N	NE	11-12'	14.4		wt %, dry	Moisture content
92AUGOH7-11.5	N	NE	10-12'	48.6		wt %, dry	Moisture content
92AUGOH8-11	N	NW	10-12'	99.1		wt %, dry	Moisture content
91AUGOH8-12	N	SE	11-12'	17.5		wt %, dry	Moisture content
90AUGOH1-12,13	N	NE	11-13'	7.1		wt %, dry	Moisture content
91AUGOH6-13	N	NE	12-13'	8.1		wt %, dry	Moisture content
90AUGOH 1-14	N	NE	13-14'	8.9		wt %, dry	Moisture content
90AUGOH 3-14	N	NE	13-14'	9.1		wt %, dry	Moisture content
91AUGOH6-14	N	NE	13-14'	10.2		wt %, dry	Moisture content
92AUGOH7-13.5	N	NE	12-14'	8.3		wt %, dry	Moisture content
92AUGOH8-13.5	N	NW	12-14'	12.4		wt %, dry	Moisture content
91AUGOH8-14	N	SE	13-14'	11.3		wt %, dry	Moisture content
90AUGOH 1-16	N	NE	15-16'	8.6		wt %, dry	Moisture content
90AUGOH 3-16	N	NE	15-16'	9.2		wt %, dry	Moisture content
91AUGOH6-16	N	NE	15-16'	10.3		wt %, dry	Moisture content

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Table I-1
(Continued)

Sample ID	Cell	Quadrant	Depth, ft	Results	Flag	Units	Measurement
92AUGOH7-15.5	N	NE	14-16'	10.1		wt %, dry	Moisture content
92AUGOH8-15	N	NW	14-16'	13		wt %, dry	Moisture content
91AUGOH8-16,17	N	SE	15-17'	11.1		wt %, dry	Moisture content
91AUGOH6-18	N	NE	17-18'	10.7		wt %, dry	Moisture content
92AUGOH7-18	N	NE	16-18'	11.5		wt %, dry	Moisture content
92AUGOH8-17	N	NW	16-18'	11.3		wt %, dry	Moisture content
92AUGOH7-19	N	NE	18-19'	11.1		wt %, dry	Moisture content
92AUGOH8-19	N	NW	18-20'	9.9		wt %, dry	Moisture content
92AUGOH8-20.5	N	NW	20-21'	9.9		wt %, dry	Moisture content
OHASH-1	N		Silo	38.8		%	Optimum moisture
OHASH-1	N		Silo	10.8		uM	Particle size distr., D50
OHASH-2	N		Silo	16.1		uM	Particle size distr., D50
OHNT 8-1	N	NW	0-1'	36.4		uM	Particle size distr., D50
90MAYOH 1-1	N	SE	0-1'	33		uM	Particle size distr., D50
OHLY 8-1	N	SW	0-1'	30		uM	Particle size distr., D50
90AUGOH 1-2	N	NE	1-2'	31.2		uM	Particle size distr., D50
90AUGOH 3-2	N	NE	1-2'	38.4		uM	Particle size distr., D50
90FEBOH 2-2	N	NW	1-2'	26.3		uM	Particle size distr., D50
OHNT 1-1,2	N	SW	0-2'	37.1		uM	Particle size distr., D50
OHNT 8-3	N	NW	2-3'	32.3		uM	Particle size distr., D50
90MAYOH 1-3	N	SE	2-3'	34.2		uM	Particle size distr., D50
OHNT 1-3	N	SW	2-3'	34.1		uM	Particle size distr., D50
90AUGOH 1-4	N	NE	3-4'	35.7		uM	Particle size distr., D50
90AUGOH 3-4	N	NE	3-4'	34		uM	Particle size distr., D50
90FEBOH 2-3,4	N	NW	2-4'	27.9		uM	Particle size distr., D50
OHLY 8-4	N	SW	3-4'	30.5		uM	Particle size distr., D50
OHMW 1-3	N	downgrd	3-4'	19.4		uM	Particle size distr., D50
OHNT 8-5	N	NW	4-5'	38		uM	Particle size distr., D50
90MAYOH 1-5	N	SE	4-5'	31.4		uM	Particle size distr., D50
OHNT 1-5	N	SW	4-5'	28.6		uM	Particle size distr., D50
90AUGOH 1-6	N	NE	5-6'	45		uM	Particle size distr., D50
90AUGOH 3-5,6	N	NE	4-6'	38.3		uM	Particle size distr., D50
90FEBOH 2-6	N	NW	5-6'	34.3		uM	Particle size distr., D50
OHNT 8-7	N	NW	6-7'	38.7		uM	Particle size distr., D50
90MAYOH 1-7	N	SE	6-7'	30.5		uM	Particle size distr., D50
OHLY 8-7	N	SW	6-7'	33.1		uM	Particle size distr., D50
OHNT 1-7	N	SW	6-7'	27.7		uM	Particle size distr., D50

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Table I-1
(Continued)

Sample ID	Cell	Quadrant	Depth, ft	Results	Flag	Units	Measurement
90AUGOH 1-8	N	NE	7-8'	47.5		uM	Particle size distr., D50
90AUGOH 3-8	N	NE	7-8'	35		uM	Particle size distr., D50
90FEBOH 2-8	N	NW	7-8'	29.8		uM	Particle size distr., D50
OHNT 1-8	N	SW	7-8'	12.1		uM	Particle size distr., D50
OHMW 1-7	N	downgrd	7-8'	19.2		uM	Particle size distr., D50
90MAYOH 1-9	N	SE	8-9'	23.3		uM	Particle size distr., D50
OHL 8-9	N	SW	8-9'	24.8		uM	Particle size distr., D50
OHNT 1-9	N	SW	8-9'	34.4		uM	Particle size distr., D50
90AUGOH 3-10	N	NE	9-10'	24.2		uM	Particle size distr., D50
90FEBOH 2-10	N	NW	9-10'	18.4		uM	Particle size distr., D50
90AUGOH 3-10,11	N	NE	9-11'	20.6		uM	Particle size distr., D50
90AUGOH 1-10,11	N	NE	9-11'	22.2		uM	Particle size distr., D50
90MAYOH 1-11	N	SE	10-11'	15.6		uM	Particle size distr., D50
90AUGOH 1-12,13	N	NE	11-13'	16.3		uM	Particle size distr., D50
90AUGOH 1-14	N	NE	13-14'	19.4		uM	Particle size distr., D50
90AUGOH 3-14	N	NE	13-14'	19.1		uM	Particle size distr., D50
90AUGOH 1-16	N	NE	15-16'	17.1		uM	Particle size distr., D50
90AUGOH 3-16	N	NE	15-16'	20.2		uM	Particle size distr., D50
OHASH-1	N		Silo	2.7			Particle spec. gravity
90MAYOH 1-1	N	SE	0-1'	2.4			Particle spec. gravity
90FEBOH 2-2	N	NW	1-2'	2.8			Particle spec. gravity
90MAYOH 1-2	N	SE	1-2'	2.5			Particle spec. gravity
OHNT 1-1,2	N	SW	0-2'	2.1			Particle spec. gravity
90MAYOH 1-3	N	SE	2-3'	2.5			Particle spec. gravity
OHNT 1-3	N	SW	2-3'	2.3			Particle spec. gravity
90FEBOH 2-3,4	N	NW	2-4'	2.8			Particle spec. gravity
90MAYOH 1-4	N	SE	3-4'	2.7			Particle spec. gravity
OHMW 1-3	N	downgrd	3-4'	2.6			Particle spec. gravity
OHNT 8-5	N	NW	4-5'	2.2			Particle spec. gravity
90MAYOH 1-5	N	SE	4-5'	2.6			Particle spec. gravity
OHNT 1-5	N	SW	4-5'	2.4			Particle spec. gravity
90FEBOH 2-6	N	NW	5-6'	2.9			Particle spec. gravity
90MAYOH 1-6	N	SE	5-6'	2.5			Particle spec. gravity
OHNT 8-7	N	NW	6-7'	2.4			Particle spec. gravity
90MAYOH 1-7	N	SE	6-7'	2.6			Particle spec. gravity
90FEBOH 2-8	N	NW	7-8'	2.6			Particle spec. gravity
OHNT 4-8	N	NW	7-8'	2.6			Particle spec. gravity

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Table I-1
(Continued)

Sample ID	Cell	Quadrant	Depth, ft	Results	Flag	Units	Measurement
90MAYOH 1-8	N	SE	7-8'	2.4			Particle spec. gravity
OHMW 1-7	N	downgrd	7-8'	2.3			Particle spec. gravity
90MAYOH 1-9	N	SE	8-9'	2.7			Particle spec. gravity
OHNT 2-9	N	SE	8-9'	2.5			Particle spec. gravity
OHNT 1-9	N	SW	8-9'	2.7			Particle spec. gravity
90FEBOH 2-10	N	NW	9-10'	2.8			Particle spec. gravity
90MAYOH 1-10	N	SE	9-10'	2.8			Particle spec. gravity
OHASH-1	N		Silo	5.6e-6		cm/s	Permeability
OHNT 8-1	N	NW	0-1'	1.3e-6		cm/s	Permeability
90MAYOH 1-1	N	SE	0-1'	3.1e-6		cm/s	Permeability
90AUGOH 1-2	N	NE	1-2'	2.7e-6		cm/s	Permeability
90AUGOH 3-2	N	NE	1-2'		FP	cm/s	Permeability
91AUGOH6-1,2	N	NE	0-2'	4.0e-7		cm/s	Permeability
92AUGOH7-1	N	NE	0-2'		FP	cm/s	Permeability
90FEBOH 2-2	N	NW	1-2'	5.2e-7		cm/s	Permeability
92AUGOH8-1.5	N	NW	0-2'		FP	cm/s	Permeability
92AUGOH8-2	N	NW	0-2'		FP	cm/s	Permeability
91AUGOH8-2	N	SE	1-2'	4.4e-6		cm/s	Permeability
OHNT 1-1,2	N	SW	0-2'	4.2e-8		cm/s	Permeability
OHNT 8-3	N	NW	2-3'		FP	cm/s	Permeability
91AUGOH8-3	N	SE	2-3'		FP	cm/s	Permeability
OHNT 1-3	N	SW	2-3'	6.8e-7		cm/s	Permeability
90AUGOH 1-4	N	NE	3-4'	8.1e-7		cm/s	Permeability
90AUGOH 3-4	N	NE	3-4'		FP	cm/s	Permeability
91AUGOH6-3,4	N	NE	2-4'	8.4e-8		cm/s	Permeability
92AUGOH7-3.5	N	NE	2-4'	9.8e-6		cm/s	Permeability
90FEBOH 2-3,4	N	NW	2-4'		FB	cm/s	Permeability
92AUGOH8-3.5	N	NW	2-4'	2.6e-4		cm/s	Permeability
90MAYOH 1-4	N	SE	3-4'	9.5e-6		cm/s	Permeability
91AUGOH8-6,7	N	SE	5-7'	0		cm/s	Permeability
OHNT 8-5	N	NW	4-5'	2.4e-6		cm/s	Permeability
90MAYOH 1-5	N	SE	4-5'	4.6e-6		cm/s	Permeability
91AUGOH8-5	N	SE	4-5'	2.8e-7		cm/s	Permeability
OHNT 1-5	N	SW	4-5'	6.4e-6		cm/s	Permeability
90AUGOH 1-6	N	NE	5-6'	7.4e-6		cm/s	Permeability
90AUGOH 3-5,6	N	NE	4-6'	2.7e-7		cm/s	Permeability
91AUGOH6-5,6	N	NE	4-6'	8.2e-4		cm/s	Permeability

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Table I-1
(Continued)

Sample ID	Cell	Quadrant	Depth, ft	Results	Flag	Units	Measurement
92AUGOH7-4.5	N	NE	4-6'	1.4e-5	FP	cm/s	Permeability
90FEBOH 2-6	N	NW	5-6'	5.9e-5		cm/s	Permeability
92AUGOH8-6	N	NW	4-6'	4.1e-6		cm/s	Permeability
OHNT 8-7	N	NW	6-7'	1.0e-7		cm/s	Permeability
90MAYOH 1-7	N	SE	6-7'	4.6e-5		cm/s	Permeability
OHNT 1-7	N	SW	6-7'			cm/s	Permeability
90AUGOH 1-8	N	NE	7-8'	2.3e-7		cm/s	Permeability
90AUGOH 3-8	N	NE	7-8'	2.0e-6		cm/s	Permeability
91AUGOH6-7,8	N	NE	6-8'	6.9e-4		cm/s	Permeability
92AUGOH7-7	N	NE	6-8'	8.0e-6		cm/s	Permeability
90FEBOH 2-8	N	NW	7-8'	2.5e-5	FP	cm/s	Permeability
92AUGOH8-7	N	NW	6-8'			cm/s	Permeability
92AUGOH8-7.5	N	NW	6-8'		FP	cm/s	Permeability
OHNT 1-8	N	SW	7-8'	3.0e-6	FP	cm/s	Permeability
90MAYOH 1-9	N	SE	8-9'	1.0e-5		cm/s	Permeability
91AUGOH8-9	N	SE	8-9'	9.4e-4		cm/s	Permeability
90AUGOH 3-10	N	NE	9-10'			cm/s	Permeability
92AUGOH7-9	N	NE	8-10'	1.4e-6		cm/s	Permeability
92AUGOH8-9	N	NW	8-10'	1.9e-5		cm/s	Permeability
91AUGOH8-10	N	SE	9-10'	2.0e-7		cm/s	Permeability
90AUGOH 3-10,11	N	NE	9-11'			cm/s	Permeability
90AUGOH1-10,11	N	NE	9-11'			cm/s	Permeability
91AUGOH6-11	N	NE	10-11'	2.9e-6		cm/s	Permeability
90AUGOH 3-12	N	NE	11-12'	1.3e-8	FP	cm/s	Permeability
92AUGOH7-11	N	NE	10-12'	1.9e-6		cm/s	Permeability
92AUGOH8-11.5	N	NW	10-12'	6.0e-6		cm/s	Permeability
91AUGOH8-12	N	SE	11-12'	3.9e-7		cm/s	Permeability
90AUGOH1-12,13	N	NE	11-13'	9.4e-8		cm/s	Permeability
91AUGOH6-13	N	NE	12-13'			cm/s	Permeability
90AUGOH 1-14	N	NE	13-14'	2.7e-8		cm/s	Permeability
90AUGOH 3-14	N	NE	13-14'	2.6e-6		cm/s	Permeability
91AUGOH6-14	N	NE	13-14'	1.5e-6		cm/s	Permeability
92AUGOH7-13.5	N	NE	12-14'	2.0e-5		cm/s	Permeability
92AUGOH8-14	N	NW	12-14'	7.9e-8	FP	cm/s	Permeability
91AUGOH8-14	N	SE	13-14'	3.0e-8		cm/s	Permeability
90AUGOH 1-16	N	NE	15-16'	3.8e-8		cm/s	Permeability
90AUGOH 3-16	N	NE	15-16'		FP	cm/s	Permeability

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Table I-1
(Continued)

Sample ID	Cell	Quadrant	Depth, ft	Results	Flag	Units	Measurement
91AUGOH6-16	N	NE	15-16'		FP	cm/s	Permeability
92AUGOH7-15	N	NE	14-16'	7.7e-8		cm/s	Permeability
92AUGOH8-15.5	N	NW	14-16'	5.4e-8		cm/s	Permeability
91AUGOH8-16,17	N	SE	15-17'	4.7e-8		cm/s	Permeability
91AUGOH6-18	N	NE	17-18'		FP	cm/s	Permeability
92AUGOH7-17.5	N	NE	16-18'	5.7e-9		cm/s	Permeability
92AUGOH8-17.5	N	NW	16-18'	1.1e-7		cm/s	Permeability
92AUGOH7-19	N	NE	18-19'	2.2e-7		cm/s	Permeability
92AUGOH8-19.5	N	NW	18-20'	5.1e-7		cm/s	Permeability
92AUGOH8-21	N	NW	20-21'	3.6e-8		cm/s	Permeability
OHMW 1-3	N	downgrd	3-4'	20.3		%, dry	Plastic limit
OHNT 4-8	N	NW	7-8'	33.2		%, dry	Plastic limit
OHMW 1-7	N	downgrd	7-8'	21		%, dry	Plastic limit
OHNT 2-9	N	SE	8-9'		NP	%, dry	Plastic limit
OHMW 1-3	N	downgrd	3-4'	13.4			Plasticity index
OHNT 4-8	N	NW	7-8'	12			Plasticity index
OHMW 1-7	N	downgrd	7-8'	13.3			Plasticity index
OHNT 2-9	N	SE	8-9'		NP		Plasticity index
OHASH-1	N		Silo	7.5		m2/g	Surface area
OHNT 8-1	N	NW	0-1'	50		m2/g	Surface area
90MAYOH 1-1	N	SE	0-1'	33.4		m2/g	Surface area
90AUGOH 1-2	N	NE	1-2'	36.2		m2/g	Surface area
90AUGOH 3-2	N	NE	1-2'	31.6		m2/g	Surface area
90FEBOH 2-2	N	NW	1-2'	36.1		m2/g	Surface area
OHNT 1-1,2	N	SW	0-2'	4.9		m2/g	Surface area
OHNT 8-3	N	NW	2-3'	31		m2/g	Surface area
90MAYOH 1-3	N	SE	2-3'	41.5		m2/g	Surface area
OHNT 1-3	N	SW	2-3'	32.2		m2/g	Surface area
90AUGOH 1-4	N	NE	3-4'	57.5		m2/g	Surface area
90AUGOH 3-4	N	NE	3-4'	39.3		m2/g	Surface area
90FEBOH 2-3,4	N	NW	2-4'	15.9		m2/g	Surface area
OHMW 1-3	N	downgrd	3-4'	19.5		m2/g	Surface area
OHNT 8-5	N	NW	4-5'	36.5		m2/g	Surface area
90MAYOH 1-5	N	SE	4-5'	21.8		m2/g	Surface area
OHNT 1-5	N	SW	4-5'	30.6		m2/g	Surface area
90AUGOH 1-6	N	NE	5-6'	45.6		m2/g	Surface area
90AUGOH 3-5,6	N	NE	4-6'	33.7		m2/g	Surface area

FP = fractured or permeable   NP = not plastic

Table I-1
(Continued)

Sample ID	Cell	Quadrant	Depth, ft	Results	Flag	Units	Measurement
90FEBOH 2-6	N	NW	5-6'	23.3		m2/g	Surface area
OHNT 8-7	N	NW	6-7'	39		m2/g	Surface area
90MAYOH 1-7	N	SE	6-7'	16.9		m2/g	Surface area
OHNT 1-7	N	SW	6-7'	37		m2/g	Surface area
90AUGOH 1-8	N	NE	7-8'	48.1		m2/g	Surface area
90AUGOH 3-8	N	NE	7-8'	31.2		m2/g	Surface area
90FEBOH 2-8	N	NW	7-8'	25.7		m2/g	Surface area
OHNT 4-8	N	NW	7-8'	20.1		m2/g	Surface area
OHNT 1-8	N	SW	7-8'	11.9		m2/g	Surface area
OHMW 1-7	N	downgrd	7-8'	10.3		m2/g	Surface area
90MAYOH 1-9	N	SE	8-9'	7.3		m2/g	Surface area
OHNT 1-9	N	SW	8-9'	7		m2/g	Surface area
90AUGOH 3-10	N	NE	9-10'	39.3		m2/g	Surface area
90FEBOH 2-10	N	NW	9-10'	21.3		m2/g	Surface area
90AUGOH 3-10,11	N	NE	9-11'	10.1		m2/g	Surface area
90AUGOH1-10,11	N	NE	9-11'	19.2		m2/g	Surface area
90MAYOH 1-11	N	SE	10-11'	17		m2/g	Surface area
90AUGOH1-12,13	N	NE	11-13'	14.7		m2/g	Surface area
90AUGOH 1-14	N	NE	13-14'	10.5		m2/g	Surface area
90AUGOH 3-14	N	NE	13-14'	8.9		m2/g	Surface area
90AUGOH 1-16	N	NE	15-16'	9.9		m2/g	Surface area
90AUGOH 3-16	N	NE	15-16'	7.5		m2/g	Surface area
OHASH-1	N		Silo	120		psi	Unconfined compressive strength
OHNT 8-1	N	NW	0-1'	1237		psi	Unconfined compressive strength
90AUGOH 1-2	N	NE	1-2'	256		psi	Unconfined compressive strength
90AUGOH 3-2	N	NE	1-2'	686.1		psi	Unconfined compressive strength
90FEBOH 2-2	N	NW	1-2'	402.3		psi	Unconfined compressive strength
90MAYOH 1-2	N	SE	1-2'	462		psi	Unconfined compressive strength
OHNT 1-1,2	N	SW	0-2'	539		psi	Unconfined compressive strength
OHNT 8-3	N	NW	2-3'	1016		psi	Unconfined compressive strength
91AUGOH8-3	N	SE	2-3'	945		psi	Unconfined compressive strength
OHNT 1-3	N	SW	2-3'	1384		psi	Unconfined compressive strength
90AUGOH 1-4	N	NE	3-4'	1531.7		psi	Unconfined compressive strength
90AUGOH 3-4	N	NE	3-4'		FP	psi	Unconfined compressive strength
91AUGOH6-3,4	N	NE	2-4'	765		psi	Unconfined compressive strength
92AUGOH7-4	N	NE	2-4'	38		psi	Unconfined compressive strength
90FEBOH 2-3,4	N	NW	2-4'	271.3		psi	Unconfined compressive strength

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Table I-1
(Continued)

Sample ID	Cell	Quadrant	Depth, ft	Results	Flag	Units	Measurement
92AUGOH8-4	N	NW	2-4'	92		psi	Unconfined compressive strength
90MAYOH 1-4	N	SE	3-4'	207.2		psi	Unconfined compressive strength
91AUGOH8-6,7	N	SE	5-7'	1096		psi	Unconfined compressive strength
OHNT 8-5	N	NW	4-5'	1220		psi	Unconfined compressive strength
90MAYOH 1-5	N	SE	4-5'	126		psi	Unconfined compressive strength
91AUGOH8-5	N	SE	4-5'	1250		psi	Unconfined compressive strength
OHNT 1-5	N	SW	4-5'	531		psi	Unconfined compressive strength
90AUGOH 1-6	N	NE	5-6'	606.8		psi	Unconfined compressive strength
90AUGOH 3-5,6	N	NE	4-6'	421.8		psi	Unconfined compressive strength
91AUGOH6-5,6	N	NE	4-6'	984.1		psi	Unconfined compressive strength
92AUGOH7-5	N	NE	4-6'	25		psi	Unconfined compressive strength
90FEBOH 2-6	N	NW	5-6'	436.2		psi	Unconfined compressive strength
92AUGOH8-6	N	NW	4-6'	490		psi	Unconfined compressive strength
OHNT 8-7	N	NW	6-7'	769		psi	Unconfined compressive strength
90MAYOH 1-7	N	SE	6-7'	263.1		psi	Unconfined compressive strength
OHNT 1-7	N	SW	6-7'	500		psi	Unconfined compressive strength
90AUGOH 1-8	N	NE	7-8'	1748.6		psi	Unconfined compressive strength
90AUGOH 3-8	N	NE	7-8'	950.2		psi	Unconfined compressive strength
91AUGOH6-7,8	N	NE	6-8'	725.2		psi	Unconfined compressive strength
92AUGOH7-7.5	N	NE	6-8'		FP	psi	Unconfined compressive strength
90FEBOH 2-8	N	NW	7-8'	321		psi	Unconfined compressive strength
92AUGOH8-7	N	NW	6-8'		FP	psi	Unconfined compressive strength
92AUGOH8-7.5	N	NW	6-8'		FP	psi	Unconfined compressive strength
90MAYOH 1-8	N	SE	7-8'	461.6		psi	Unconfined compressive strength
OHNT 1-8	N	SW	7-8'	281		psi	Unconfined compressive strength
91AUGOH8-9	N	SE	8-9'	151.8		psi	Unconfined compressive strength
92AUGOH7-9.5	N	NE	8-10'	1356		psi	Unconfined compressive strength
92AUGOH8-10	N	NW	8-10'	41		psi	Unconfined compressive strength
91AUGOH6-11	N	NE	10-11'	229.9		psi	Unconfined compressive strength
92AUGOH7-11.5	N	NE	10-12'	767		psi	Unconfined compressive strength
92AUGOH8-11	N	NW	10-12'	22		psi	Unconfined compressive strength
OHASH-3	S		Silo	22			Confining stress
OHASH-3	S		Silo	128			Dev. stress
90MAYOH 4-1	S	SE	0-1'	45.5		lb/ft3	Dry density
90AUGOH 6-1	S	SW	0-1'	48.9		lb/ft3	Dry density
90FEBOH 3-2	S	NE	1-2'	80		lb/ft3	Dry density
90MAYOH 4-2	S	SE	1-2'	66.2		lb/ft3	Dry density

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Table I-1
(Continued)

Sample ID	Cell	Quadrant	Depth, ft	Results	Flag	Units	Measurement
90AUGOH 5-2	S	SW	1-2'	45.7	FP	lb/ft3	Dry density
90MAYOH 4-3	S	SE	2-3'	80.1		lb/ft3	Dry density
90AUGOH 6-3	S	SW	2-3'		FP	lb/ft3	Dry density
90FEBOH 3-3,4	S	NE	2-4'	54		lb/ft3	Dry density
90MAYOH 4-4	S	SE	3-4'	64.6	FP	lb/ft3	Dry density
90AUGOH 5-4	S	SW	3-4'			lb/ft3	Dry density
90MAYOH 4-5	S	SE	4-5'	62.3	FP	lb/ft3	Dry density
90AUGOH 6-5	S	SW	4-5'	56.5		lb/ft3	Dry density
90FEBOH 3-5,6	S	NE	4-6'	55.4	FP	lb/ft3	Dry density
90MAYOH 4-6	S	SE	5-6'	72.1		lb/ft3	Dry density
90AUGOH 5-6	S	SW	5-6'		FP	lb/ft3	Dry density
90MAYOH 4-7	S	SE	6-7'	85.4		lb/ft3	Dry density
90AUGOH 6-7	S	SW	6-7'	119.4	FP	lb/ft3	Dry density
90MAYOH 4-8	S	SE	7-8'	110.1		lb/ft3	Dry density
90AUGOH 5-8	S	SW	7-8'		FP	lb/ft3	Dry density
90MAYOH 4-9	S	SE	8-9'	122.8		lb/ft3	Dry density
90AUGOH 6-9	S	SW	8-9'	122.1	FP	lb/ft3	Dry density
90AUGOH 5-10,11	S	SW	9-11'	120.3		lb/ft3	Dry density
90AUGOH 6-11	S	SW	10-11'		FP	lb/ft3	Dry density
90AUGOH 5-12	S	SW	11-12'	124.9		lb/ft3	Dry density
90AUGOH 6-13	S	SW	12-13'		FP	lb/ft3	Dry density
90AUGOH 5-14	S	SW	13-14'	122.1		lb/ft3	Dry density
90AUGOH 5-16	S	SW	15-16'	136	FP	lb/ft3	Dry density
90MAYOH 4-1	S	SE	0-1'	86.8		lb/ft3	Field bulk density
90AUGOH 6-1	S	SW	0-1'	82.1	FP	lb/ft3	Field bulk density
90FEBOH 3-2	S	NE	1-2'	99.6		lb/ft3	Field bulk density
90MAYOH 4-2	S	SE	1-2'	91.8	FP	lb/ft3	Field bulk density
90AUGOH 5-2	S	SW	1-2'	72.1		lb/ft3	Field bulk density
90MAYOH 4-3	S	SE	2-3'	100.8	FP	lb/ft3	Field bulk density
90AUGOH 6-3	S	SW	2-3'			lb/ft3	Field bulk density
90FEBOH 3-3,4	S	NE	2-4'	75.4	FP	lb/ft3	Field bulk density
90MAYOH 4-4	S	SE	3-4'	87.2		lb/ft3	Field bulk density
90AUGOH 5-4	S	SW	3-4'		FP	lb/ft3	Field bulk density
90MAYOH 4-5	S	SE	4-5'	88.7		lb/ft3	Field bulk density
90AUGOH 6-5	S	SW	4-5'	86.8	FP	lb/ft3	Field bulk density
90FEBOH 3-5,6	S	NE	4-6'	75		lb/ft3	Field bulk density
90MAYOH 4-6	S	SE	5-6'	96.8		lb/ft3	Field bulk density

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Table I-1
(Continued)

Sample ID	Cell	Quadrant	Depth, ft	Results	Flag	Units	Measurement
90AUGOH 5-6	S	SW	5-6'		FP	lb/ft ³	Field bulk density
90MAYOH 4-7	S	SE	6-7'	125.9		lb/ft ³	Field bulk density
90AUGOH 6-7	S	SW	6-7'	132.7		lb/ft ³	Field bulk density
90FEBOH 3-8	S	NE	7-8'	123.4		lb/ft ³	Field bulk density
OHSS 3	S	NE	8'		FP	lb/ft ³	Field bulk density
OHSS 4	S	NW	8'		FP	lb/ft ³	Field bulk density
90MAYOH 4-8	S	SE	7-8'	130.4		lb/ft ³	Field bulk density
OHSS 2	S	SE	8'		FP	lb/ft ³	Field bulk density
90AUGOH 5-8	S	SW	7-8'		FP	lb/ft ³	Field bulk density
OHSS 1	S	SW	8'		FP	lb/ft ³	Field bulk density
90MAYOH 4-9	S	SE	8-9'	128.5		lb/ft ³	Field bulk density
90AUGOH 6-9	S	SW	8-9'	138.3		lb/ft ³	Field bulk density
90AUGOH 5-10,11	S	SW	9-11'	130.7		lb/ft ³	Field bulk density
90AUGOH 6-11	S	SW	10-11'		FP	lb/ft ³	Field bulk density
90AUGOH 5-12	S	SW	11-12'	136.6		lb/ft ³	Field bulk density
90AUGOH 6-13	S	SW	12-13'		FP	lb/ft ³	Field bulk density
90AUGOH 5-14	S	SW	13-14'	127.9		lb/ft ³	Field bulk density
90AUGOH 5-16	S	SW	15-16'	143.6		lb/ft ³	Field bulk density
OHASH-3	S		Silo	38		degrees	Internal angle of friction
OHMW 4-2,3	S	downgrd	1-3'	41		%, dry	Liquid limit
OHMW 4-6,7	S	downgrd	5-7'	53		%, dry	Liquid limit
OHMW 4-4,5	S	downgrd	3-5'	33		%, dry	Liquid limit
OHSS 4	S	NW	8'	27.8		%, dry	Liquid limit
OHSS 2	S	SE	8'	28.7		%, dry	Liquid limit
OHSS 1	S	SW	8'		NP	%, dry	Liquid limit
90AUGOH 6-9	S	SW	8-9'	28		%, dry	Liquid limit
OHMW 4-9	S	downgrd	8-9'	41.4		%, dry	Liquid limit
90AUGOH 5-10,11	S	SW	9-11'	29		%, dry	Liquid limit
90AUGOH 6-11	S	SW	10-11'	26		%, dry	Liquid limit
90AUGOH 5-12	S	SW	11-12'	32		%, dry	Liquid limit
90AUGOH 6-13	S	SW	12-13'	25		%, dry	Liquid limit
90AUGOH 5-14	S	SW	13-14'	23		%, dry	Liquid limit
90AUGOH 5-16	S	SW	15-16'	24		%, dry	Liquid limit
OHASH-3	S		Silo	75.6		%	Maximum dry density
OHASH-3	S		Silo	.1		wt %, dry	Moisture content
90MAYOH 4-1	S	SE	0-1'	90.8		wt %, dry	Moisture content
91AUGOH2-1	S	SE	0-1'	16.8		wt %, dry	Moisture content

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Table I-1
(Continued)

Sample ID	Cell	Quadrant	Depth, ft	Results	Flag	Units	Measurement
90AUGOH 6-1	S	SW	0-1'	67.8		wt %, dry	Moisture content
90FEBOH 3-2	S	NE	1-2'	24.5		wt %, dry	Moisture content
92AUGOH1-1	S	NE	0-2'	14.7		wt %, dry	Moisture content
91AUGOH4-2	S	NW	1-2'	60		wt %, dry	Moisture content
92AUGOH4-1.5	S	NW	0-2'	20.6		wt %, dry	Moisture content
90MAYOH 4-2	S	SE	1-2'	38.6		wt %, dry	Moisture content
91AUGOH2-2	S	SE	1-2'	109.1		wt %, dry	Moisture content
90AUGOH 5-2	S	SW	1-2'	57.9		wt %, dry	Moisture content
91AUGOH4-3	S	NW	2-3'	78		wt %, dry	Moisture content
90MAYOH 4-3	S	SE	2-3'	25.9		wt %, dry	Moisture content
90AUGOH 6-3	S	SW	2-3'	49.3		wt %, dry	Moisture content
90FEBOH 3-3,4	S	NE	2-4'	39.7		wt %, dry	Moisture content
92AUGOH1-3.5	S	NE	2-4'	92.6		wt %, dry	Moisture content
91AUGOH4-4	S	NW	3-4'	56.3		wt %, dry	Moisture content
92AUGOH4-4	S	NW	2-4'	55.8		wt %, dry	Moisture content
90MAYOH 4-4	S	SE	3-4'	34.9		wt %, dry	Moisture content
91AUGOH2-4	S	SE	3-4'	7		wt %, dry	Moisture content
90AUGOH 5-4	S	SW	3-4'	39.2		wt %, dry	Moisture content
90MAYOH 4-5	S	SE	4-5'	42.5		wt %, dry	Moisture content
90AUGOH 6-5	S	SW	4-5'	53.6		wt %, dry	Moisture content
90FEBOH 3-5,6	S	NE	4-6'	35.3		wt %, dry	Moisture content
92AUGOH1-6	S	NE	4-6'	84.3		wt %, dry	Moisture content
91AUGOH4-6	S	NW	5-6'	50.5		wt %, dry	Moisture content
92AUGOH4-6	S	NW	4-6'	90.5		wt %, dry	Moisture content
90MAYOH 4-6	S	SE	5-6'	34.2		wt %, dry	Moisture content
91AUGOH2-6	S	SE	5-6'	52		wt %, dry	Moisture content
90AUGOH 5-6	S	SW	5-6'	51.6		wt %, dry	Moisture content
90MAYOH 4-7	S	SE	6-7'	47.5		wt %, dry	Moisture content
90AUGOH 6-7	S	SW	6-7'	11.1		wt %, dry	Moisture content
92AUGOH1-8	S	NE	6-8'	117		wt %, dry	Moisture content
OHSS 3	S	NE	8'	13.7		wt %, dry	Moisture content
91AUGOH4-8	S	NW	7-8'	72.1		wt %, dry	Moisture content
92AUGOH4-8	S	NW	6-8'	102.2		wt %, dry	Moisture content
OHSS 4	S	NW	8'	19		wt %, dry	Moisture content
90MAYOH 4-8	S	SE	7-8'	18.5		wt %, dry	Moisture content
91AUGOH2-8	S	SE	7-8'	72.4		wt %, dry	Moisture content
OHSS 2	S	SE	8'	15.7		wt %, dry	Moisture content

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Table I-1
(Continued)

Sample ID	Cell	Quadrant	Depth, ft	Results	Flag	Units	Measurement
90AUGOH 5-8	S	SW	7-8'	49.4		wt %, dry	Moisture content
OHSS 1	S	SW	8'	20		wt %, dry	Moisture content
91AUGOH4-9	S	NW	8-9'	14.5		wt %, dry	Moisture content
90MAYOH 4-9	S	SE	8-9'	4.7		wt %, dry	Moisture content
90AUGOH 6-9	S	SW	8-9'	13.3		wt %, dry	Moisture content
OHMW 4-9	S	downgrd	8-9'	9.8		wt %, dry	Moisture content
92AUGOH1-9.5	S	NE	8-10'	113.7		wt %, dry	Moisture content
92AUGOH4-10	S	NW	8-10'	15.1		wt %, dry	Moisture content
91AUGOH4-11	S	NW	10-11'	11.9		wt %, dry	Moisture content
91AUGOH2-11	S	SE	10-11'	17.5		wt %, dry	Moisture content
90AUGOH 5-10,11	S	SW	9-11'	8.6		wt %, dry	Moisture content
90AUGOH 6-11	S	SW	10-11'	4.4		wt %, dry	Moisture content
92AUGOH1-12	S	NE	10-12'	10.4		wt %, dry	Moisture content
92AUGOH4-12	S	NW	10-12'	14.9		wt %, dry	Moisture content
90AUGOH 5-12	S	SW	11-12'	9.4		wt %, dry	Moisture content
91AUGOH4-13	S	NW	12-13'	10.8		wt %, dry	Moisture content
91AUGOH2-12,13	S	SE	11-13'	18.4		wt %, dry	Moisture content
90AUGOH 6-13	S	SW	12-13'	2.9		wt %, dry	Moisture content
92AUGOH1-13	S	NE	12-14'	10.9		wt %, dry	Moisture content
92AUGOH4-14	S	NW	12-14'	11.1		wt %, dry	Moisture content
90AUGOH 5-14	S	SW	13-14'	4.7		wt %, dry	Moisture content
91AUGOH4-15	S	NW	14-15'	11.2		wt %, dry	Moisture content
91AUGOH2-15	S	SE	14-15'	13.9		wt %, dry	Moisture content
92AUGOH1-14.5	S	NE	14-16'	11.7		wt %, dry	Moisture content
92AUGOH4-16	S	NW	14-16'	7.2		wt %, dry	Moisture content
90AUGOH 5-16	S	SW	15-16'	5.6		wt %, dry	Moisture content
91AUGOH2-17	S	SE	16-17'	14.4		wt %, dry	Moisture content
92AUGOH1-17.5	S	NE	16-18'	8.2		wt %, dry	Moisture content
92AUGOH4-18	S	NW	16-18'	5.9		wt %, dry	Moisture content
92AUGOH1-18.5	S	NE	18-19'	8.4		wt %, dry	Moisture content
OHASH-3	S		Silo	35.6		%	Optimum moisture
OHASH-3	S		Silo	9.6		uM	Particle size distr., D50
OHASH-4	S		Silo	28		uM	Particle size distr., D50
OHLY 16-1	S	NW	0-1'	35		uM	Particle size distr., D50
90AUGOH 6-1	S	SW	0-1'	58.9		uM	Particle size distr., D50
90FEBOH 3-2	S	NE	1-2'	41.9		uM	Particle size distr., D50
90MAYOH 4-2	S	SE	1-2'	46.2		uM	Particle size distr., D50

FP = fractured or permeable   NP = not plastic

Table I-1

(Continued)

Sample ID	Cell	Quadrant	Depth, ft	Results	Flag	Units	Measurement
90AUGOH 5-8	S	SW	7-8'	49.4		wt %, dry	Moisture content
OHSS 1	S	SW	8'	20		wt %, dry	Moisture content
91AUGOH4-9	S	NW	8-9'	14.5		wt %, dry	Moisture content
90MAYOH 4-9	S	SE	8-9'	4.7		wt %, dry	Moisture content
90AUGOH 6-9	S	SW	8-9'	13.3		wt %, dry	Moisture content
OHMW 4-9	S	downgrd	8-9'	9.8		wt %, dry	Moisture content
92AUGOH1-9.5	S	NE	8-10'	113.7		wt %, dry	Moisture content
92AUGOH4-10	S	NW	8-10'	15.1		wt %, dry	Moisture content
91AUGOH4-11	S	NW	10-11'	11.9		wt %, dry	Moisture content
91AUGOH2-11	S	SE	10-11'	17.5		wt %, dry	Moisture content
90AUGOH 5-10,11	S	SW	9-11'	8.6		wt %, dry	Moisture content
90AUGOH 6-11	S	SW	10-11'	4.4		wt %, dry	Moisture content
92AUGOH1-12	S	NE	10-12'	10.4		wt %, dry	Moisture content
92AUGOH4-12	S	NW	10-12'	14.9		wt %, dry	Moisture content
90AUGOH 5-12	S	SW	11-12'	9.4		wt %, dry	Moisture content
91AUGOH4-13	S	NW	12-13'	10.8		wt %, dry	Moisture content
91AUGOH2-12,13	S	SE	11-13'	18.4		wt %, dry	Moisture content
90AUGOH 6-13	S	SW	12-13'	2.9		wt %, dry	Moisture content
92AUGOH1-13	S	NE	12-14'	10.9		wt %, dry	Moisture content
92AUGOH4-14	S	NW	12-14'	11.1		wt %, dry	Moisture content
90AUGOH 5-14	S	SW	13-14'	4.7		wt %, dry	Moisture content
91AUGOH4-15	S	NW	14-15'	11.2		wt %, dry	Moisture content
91AUGOH2-15	S	SE	14-15'	13.9		wt %, dry	Moisture content
92AUGOH1-14.5	S	NE	14-16'	11.7		wt %, dry	Moisture content
92AUGOH4-16	S	NW	14-16'	7.2		wt %, dry	Moisture content
90AUGOH 5-16	S	SW	15-16'	5.6		wt %, dry	Moisture content
91AUGOH2-17	S	SE	16-17'	14.4		wt %, dry	Moisture content
92AUGOH1-17.5	S	NE	16-18'	8.2		wt %, dry	Moisture content
92AUGOH4-18	S	NW	16-18'	5.9		wt %, dry	Moisture content
92AUGOH1-18.5	S	NE	18-19'	8.4		wt %, dry	Moisture content
OHASH-3	S		Silo	35.6		%	Optimum moisture
OHASH-3	S		Silo	9.6		uM	Particle size distr., D50
OHASH-4	S		Silo	28		uM	Particle size distr., D50
OHLY 16-1	S	NW	0-1'	35		uM	Particle size distr., D50
90AUGOH 6-1	S	SW	0-1'	58.9		uM	Particle size distr., D50
90FEBOH 3-2	S	NE	1-2'	41.9		uM	Particle size distr., D50
90MAYOH 4-2	S	SE	1-2'	46.2		uM	Particle size distr., D50

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Table I-1
(Continued)

Sample ID	Cell	Quadrant	Depth, ft	Results	Flag	Units	Measurement
90AUGOH 5-2	S	SW	1-2'	48.8		uM	Particle size distr., D50
90AUGOH 6-3	S	SW	2-3'	45.2		uM	Particle size distr., D50
OHMW 4-2,3	S	downgrd	1-3'	33.8		uM	Particle size distr., D50
90FEBOH 3-3,4	S	NE	2-4'	33.7		uM	Particle size distr., D50
OHLY 16-4	S	NW	3-4'	30.9		uM	Particle size distr., D50
90MAYOH 4-4	S	SE	3-4'	51.2		uM	Particle size distr., D50
90AUGOH 5-4	S	SW	3-4'	66		uM	Particle size distr., D50
OHMW 4-6,7	S	downgrd	5-7'	19.9		uM	Particle size distr., D50
90AUGOH 6-5	S	SW	4-5'	38.9		uM	Particle size distr., D50
OHMW 4-4,5	S	downgrd	3-5'	26.9		uM	Particle size distr., D50
90FEBOH 3-5,6	S	NE	4-6'	35.1		uM	Particle size distr., D50
OHLY 16-6	S	NW	5-6'	41.9		uM	Particle size distr., D50
90MAYOH 4-6	S	SE	5-6'	45.3		uM	Particle size distr., D50
90AUGOH 5-6	S	SW	5-6'	49.2		uM	Particle size distr., D50
90AUGOH 6-7	S	SW	6-7'	19.6		uM	Particle size distr., D50
90FEBOH 3-8	S	NE	7-8'	15.4		uM	Particle size distr., D50
OHSS 4	S	NW	8'	14.9		uM	Particle size distr., D50
90MAYOH 4-8	S	SE	7-8'	17.1		uM	Particle size distr., D50
OHSS 2	S	SE	8'	17.6		uM	Particle size distr., D50
90AUGOH 5-8	S	SW	7-8'	52.7		uM	Particle size distr., D50
90AUGOH 6-9	S	SW	8-9'	17.9		uM	Particle size distr., D50
OHMW 4-9	S	downgrd	8-9'	15.1		uM	Particle size distr., D50
90AUGOH 5-10,11	S	SW	9-11'	20.7		uM	Particle size distr., D50
90AUGOH 6-11	S	SW	10-11'	23.4		uM	Particle size distr., D50
90AUGOH 5-12	S	SW	11-12'	22.6		uM	Particle size distr., D50
90AUGOH 6-13	S	SW	12-13'	23		uM	Particle size distr., D50
90AUGOH 5-14	S	SW	13-14'	26.3		uM	Particle size distr., D50
90AUGOH 5-16	S	SW	15-16'	24		uM	Particle size distr., D50
90MAYOH 4-1	S	SE	0-1'	2.3			Particle spec. gravity
90FEBOH 3-2	S	NE	1-2'	2.7			Particle spec. gravity
90MAYOH 4-2	S	SE	1-2'	2.1			Particle spec. gravity
90MAYOH 4-3	S	SE	2-3'	2.6			Particle spec. gravity
90AUGOH 6-3	S	SW	2-3'	2.3			Particle spec. gravity
OHMW 4-2,3	S	downgrd	1-3'	2.7			Particle spec. gravity
90FEBOH 3-3,4	S	NE	2-4'	3			Particle spec. gravity
90MAYOH 4-4	S	SE	3-4'	2.9			Particle spec. gravity
OHMW 4-6,7	S	downgrd	5-7'	2.7			Particle spec. gravity

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Table I-1
(Continued)

Sample ID	Cell	Quadrant	Depth, ft	Results	Flag	Units	Measurement
90MAYOH 4-5	S	SE	4-5'	2.6			Particle spec. gravity
90AUGOH 6-5	S	SW	4-5'	2.5			Particle spec. gravity
OHMW 4-4,5	S	downgrd	3-5'	2.7			Particle spec. gravity
90FEBOH 3-5,6	S	NE	4-6'	2.9			Particle spec. gravity
90MAYOH 4-6	S	SE	5-6'	2.8			Particle spec. gravity
90MAYOH 4-7	S	SE	6-7'	2.7			Particle spec. gravity
OHSS 4	S	NW	8'	2.6			Particle spec. gravity
90MAYOH 4-8	S	SE	7-8'	2.8			Particle spec. gravity
OHSS 2	S	SE	8'	2.6			Particle spec. gravity
90MAYOH 4-9	S	SE	8-9'	2.7			Particle spec. gravity
OHMW 4-9	S	downgrd	8-9'	2.7			Particle spec. gravity
OHASH-3	S		Silo	1.6e-6		cm/s	Permeability
91AUGOH2-1	S	SE	0-1'	1.1e-7		cm/s	Permeability
90AUGOH 6-1	S	SW	0-1'	2.6e-6		cm/s	Permeability
90FEBOH 3-2	S	NE	1-2'	2.4e-7		cm/s	Permeability
92AUGOH1-1.5	S	NE	0-2'	3.1e-8		cm/s	Permeability
91AUGOH4-2	S	NW	1-2'	2.0e-5		cm/s	Permeability
92AUGOH4-2	S	NW	0-2'	2.0e-7		cm/s	Permeability
90MAYOH 4-2	S	SE	1-2'	1.4e-6		cm/s	Permeability
91AUGOH2-2	S	SE	1-2'		FP	cm/s	Permeability
90AUGOH 5-2	S	SW	1-2'	4.2e-6		cm/s	Permeability
91AUGOH4-3	S	NW	2-3'		FP	cm/s	Permeability
90MAYOH 4-3	S	SE	2-3'	4.2e-6		cm/s	Permeability
90AUGOH 6-3	S	SW	2-3'		FP	cm/s	Permeability
90FEBOH 3-3,4	S	NE	2-4'	9.5e-8		cm/s	Permeability
92AUGOH1-3	S	NE	2-4'	4.5e-4		cm/s	Permeability
91AUGOH4-4	S	NW	3-4'		FP	cm/s	Permeability
92AUGOH4-4	S	NW	2-4'		FP	cm/s	Permeability
90MAYOH 4-4	S	SE	3-4'	4.9e-7		cm/s	Permeability
91AUGOH2-4	S	SE	3-4'		FP	cm/s	Permeability
90AUGOH 5-4	S	SW	3-4'		FP	cm/s	Permeability
90MAYOH 4-5	S	SE	4-5'	9.1e-7		cm/s	Permeability
90AUGOH 6-5	S	SW	4-5'	1.6e-6		cm/s	Permeability
90FEBOH 3-5,6	S	NE	4-6'	1.4e-7		cm/s	Permeability
92AUGOH1-5.5	S	NE	4-6'	5.1e-7		cm/s	Permeability
91AUGOH4-6	S	NW	5-6'	1.9e-5		cm/s	Permeability
92AUGOH4-5.5	S	NW	4-6'	8.3e-7		cm/s	Permeability

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Table I-1
(Continued)

Sample ID	Cell	Quadrant	Depth, ft	Results	Flag	Units	Measurement
90MAYOH 4-6	S	SE	5-6'	6.1e-7		cm/s	Permeability
91AUGOH2-6	S	SE	5-6'	2.9e-6		cm/s	Permeability
90AUGOH 5-6	S	SW	5-6'		FP	cm/s	Permeability
90AUGOH 6-7	S	SW	6-7'		FP	cm/s	Permeability
90FEBOH 3-8	S	NE	7-8'	4.2e-8		cm/s	Permeability
92AUGOH1-7.5	S	NE	6-8'	2.5e-6		cm/s	Permeability
91AUGOH4-8	S	NW	7-8'		FP	cm/s	Permeability
92AUGOH4-7.5	S	NW	6-8'	1.3e-6		cm/s	Permeability
91AUGOH2-8	S	SE	7-8'		FP	cm/s	Permeability
90AUGOH 5-8	S	SW	7-8'		FP	cm/s	Permeability
91AUGOH4-9	S	NW	8-9'	4.9e-8		cm/s	Permeability
90AUGOH 6-9	S	SW	8-9'		FP	cm/s	Permeability
92AUGOH1-9	S	NE	8-10'	4.6e-6		cm/s	Permeability
92AUGOH4-9.5	S	NW	8-10'	7.2e-8		cm/s	Permeability
91AUGOH4-11	S	NW	10-11'	1.2e-7		cm/s	Permeability
91AUGOH2-11	S	SE	10-11'	1.7e-8		cm/s	Permeability
90AUGOH 5-10,11	S	SW	9-11'	1.2e-8		cm/s	Permeability
90AUGOH 6-11	S	SW	10-11'		FP	cm/s	Permeability
92AUGOH1-12	S	NE	10-12'	2.5e-7		cm/s	Permeability
92AUGOH4-11.5	S	NW	10-12'	4.8e-7		cm/s	Permeability
90AUGOH 5-12	S	SW	11-12'	1.7e-8		cm/s	Permeability
91AUGOH4-13	S	NW	12-13'		FP	cm/s	Permeability
91AUGOH2-12,13	S	SE	11-13'	1.3e-8		cm/s	Permeability
90AUGOH 6-13	S	SW	12-13'		FP	cm/s	Permeability
92AUGOH1-13.5	S	NE	12-14'	2.4e-8		cm/s	Permeability
92AUGOH4-13.5	S	NW	12-14'	3.2e-7		cm/s	Permeability
90AUGOH 5-14	S	SW	13-14'		FP	cm/s	Permeability
91AUGOH4-15	S	NW	14-15'		FP	cm/s	Permeability
91AUGOH2-15	S	SE	14-15'		FP	cm/s	Permeability
92AUGOH1-15	S	NE	14-16'	7.2e-7		cm/s	Permeability
92AUGOH4-16	S	NW	14-16'	4.4e-5		cm/s	Permeability
90AUGOH 5-16	S	SW	15-16'	6.5e-8		cm/s	Permeability
91AUGOH2-17	S	SE	16-17'		FP	cm/s	Permeability
92AUGOH1-17	S	NE	16-18'	3.8e-7		cm/s	Permeability
92AUGOH4-17.5	S	NW	16-18'	4.9e-7		cm/s	Permeability
92AUGOH1-18.5	S	NE	18-19'	1.2e-5		cm/s	Permeability
OHMW 4-2,3	S	downgrd	1-3'	24		%, dry	Plastic limit

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Table I-1
(Continued)

Sample ID	Cell	Quadrant	Depth, ft	Results	Flag	Units	Measurement
OHMW 4-6,7	S	downgrd	5-7'	26	NP	%, dry	Plastic limit
OHMW 4-4,5	S	downgrd	3-5'	17		%, dry	Plastic limit
OHSS 4	S	NW	8'	20.1		%, dry	Plastic limit
OHSS 2	S	SE	8'	18.9		%, dry	Plastic limit
OHSS 1	S	SW	8'			%, dry	Plastic limit
90AUGOH 6-9	S	SW	8-9'	22		%, dry	Plastic limit
OHMW 4-9	S	downgrd	8-9'	22.3		%, dry	Plastic limit
90AUGOH 5-10,11	S	SW	9-11'	22		%, dry	Plastic limit
90AUGOH 6-11	S	SW	10-11'	22		%, dry	Plastic limit
90AUGOH 5-12	S	SW	11-12'	22		%, dry	Plastic limit
90AUGOH 6-13	S	SW	12-13'	21		%, dry	Plastic limit
90AUGOH 5-14	S	SW	13-14'	18		%, dry	Plastic limit
90AUGOH 5-16	S	SW	15-16'	18		%, dry	Plastic limit
OHMW 4-2,3	S	downgrd	1-3'	17			Plasticity index
OHMW 4-6,7	S	downgrd	5-7'	27			Plasticity index
OHMW 4-4,5	S	downgrd	3-5'	15			Plasticity index
OHSS 4	S	NW	8'	7.7	NP		Plasticity index
OHSS 2	S	SE	8'	9.8			Plasticity index
OHSS 1	S	SW	8'				Plasticity index
90AUGOH 6-9	S	SW	8-9'	6			Plasticity index
OHMW 4-9	S	downgrd	8-9'	19.1			Plasticity index
90AUGOH 5-10,11	S	SW	9-11'	7			Plasticity index
90AUGOH 6-11	S	SW	10-11'	4			Plasticity index
90AUGOH 5-12	S	SW	11-12'	10			Plasticity index
90AUGOH 6-13	S	SW	12-13'	4			Plasticity index
90AUGOH 5-14	S	SW	13-14'	5			Plasticity index
90AUGOH 5-16	S	SW	15-16'	6			Plasticity index
OHASH-3	S		Silo	10.7		m2/g	Surface area
90AUGOH 6-1	S	SW	0-1'	25.2		m2/g	Surface area
90FEBOH 3-2	S	NE	1-2'	39.8		m2/g	Surface area
90MAYOH 4-2	S	SE	1-2'	57.9		m2/g	Surface area
90AUGOH 5-2	S	SW	1-2'	34.6		m2/g	Surface area
90AUGOH 6-3	S	SW	2-3'	38.2		m2/g	Surface area
OHMW 4-2,3	S	downgrd	1-3'	14.1		m2/g	Surface area
90FEBOH 3-3,4	S	NE	2-4'	37.5		m2/g	Surface area
90MAYOH 4-4	S	SE	3-4'	28		m2/g	Surface area
90AUGOH 5-4	S	SW	3-4'	28.3		m2/g	Surface area

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Table I-1
(Continued)

Sample ID	Cell	Quadrant	Depth, ft	Results	Flag	Units	Measurement
OHMW 4-6,7	S	downgrd	5-7'	21		m2/g	Surface area
90AUGOH 6-5	S	SW	4-5'	23.4		m2/g	Surface area
OHMW 4-4,5	S	downgrd	3-5'	14		m2/g	Surface area
90FEBOH 3-5,6	S	NE	4-6'	28.9		m2/g	Surface area
90MAYOH 4-6	S	SE	5-6'	58.7		m2/g	Surface area
90AUGOH 5-6	S	SW	5-6'	30.1		m2/g	Surface area
90AUGOH 6-7	S	SW	6-7'	13		m2/g	Surface area
90FEBOH 3-8	S	NE	7-8'	11.4		m2/g	Surface area
OHSS 4	S	NW	8'	13.9		m2/g	Surface area
90MAYOH 4-8	S	SE	7-8'	21.9		m2/g	Surface area
OHSS 2	S	SE	8'	13.5		m2/g	Surface area
90AUGOH 5-8	S	SW	7-8'	43.7		m2/g	Surface area
90AUGOH 6-9	S	SW	8-9'	9.4		m2/g	Surface area
OHMW 4-9	S	downgrd	8-9'	18.1		m2/g	Surface area
90AUGOH 5-10,11	S	SW	9-11'	18.3		m2/g	Surface area
90AUGOH 6-11	S	SW	10-11'	6.5		m2/g	Surface area
90AUGOH 5-12	S	SW	11-12'	24.6		m2/g	Surface area
90AUGOH 6-13	S	SW	12-13'	4.9		m2/g	Surface area
90AUGOH 5-14	S	SW	13-14'	7.2		m2/g	Surface area
90AUGOH 5-16	S	SW	15-16'	12.1		m2/g	Surface area
90MAYOH 4-1	S	SE	0-1'	137.9		psi	Unconfined compressive strength
90AUGOH 6-1	S	SW	0-1'	320.7		psi	Unconfined compressive strength
90FEBOH 3-2	S	NE	1-2'	1937.1		psi	Unconfined compressive strength
90MAYOH 4-2	S	SE	1-2'	1382.7		psi	Unconfined compressive strength
91AUGOH2-2	S	SE	1-2'	50.7		psi	Unconfined compressive strength
90AUGOH 5-2	S	SW	1-2'	299.5		psi	Unconfined compressive strength
91AUGOH4-3	S	NW	2-3'	1740		psi	Unconfined compressive strength
90MAYOH 4-3	S	SE	2-3'	1956.9		psi	Unconfined compressive strength
90AUGOH 6-3	S	SW	2-3'		FP	psi	Unconfined compressive strength
90FEBOH 3-3,4	S	NE	2-4'	281.2		psi	Unconfined compressive strength
92AUGOH1-3.5	S	NE	2-4'	763		psi	Unconfined compressive strength
91AUGOH4-4	S	NW	3-4'	2761.8		psi	Unconfined compressive strength
92AUGOH4-4	S	NW	2-4'		FP	psi	Unconfined compressive strength
90MAYOH 4-4	S	SE	3-4'	731.5		psi	Unconfined compressive strength
91AUGOH2-4	S	SE	3-4'	310.9		psi	Unconfined compressive strength
90AUGOH 5-4	S	SW	3-4'		FP	psi	Unconfined compressive strength
90MAYOH 4-5	S	SE	4-5'	464.2		psi	Unconfined compressive strength

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Table I-1
(Continued)

Sample ID	Cell	Quadrant	Depth, ft	Results	Flag	Units	Measurement
90AUGOH 6-5	S	SW	4-5'	319.1	FP	psi	Unconfined compressive strength
90FEBOH 3-5,6	S	NE	4-6'	1879		psi	Unconfined compressive strength
92AUGOH1-6	S	NE	4-6'	68		psi	Unconfined compressive strength
91AUGOH4-6	S	NW	5-6'	448.6		psi	Unconfined compressive strength
92AUGOH4-6	S	NW	4-6'	168		psi	Unconfined compressive strength
90MAYOH 4-6	S	SE	5-6'	916.7		psi	Unconfined compressive strength
91AUGOH2-6	S	SE	5-6'	1003.4		psi	Unconfined compressive strength
90AUGOH 5-6	S	SW	5-6'			psi	Unconfined compressive strength
90AUGOH 6-7	S	SW	6-7'	313.9		psi	Unconfined compressive strength
92AUGOH1-8	S	NE	6-8'	56		psi	Unconfined compressive strength
91AUGOH4-8	S	NW	7-8'	97	FP	psi	Unconfined compressive strength
92AUGOH4-8	S	NW	6-8'	68		psi	Unconfined compressive strength
91AUGOH2-8	S	SE	7-8'		FP	psi	Unconfined compressive strength
90AUGOH 5-8	S	SW	7-8'		FP	psi	Unconfined compressive strength
92AUGOH1-9.5	S	NE	8-10'	40		psi	Unconfined compressive strength

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