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Agency

Office of Solid Waste
and Emergency Response
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Solid Waste

EPA

Characterization of MWC Ashes and Leachates from MSW Landfills, Monofills, and Co-Disposal Sites

Volume VII of VII
Addendum to Monofill Report

D-33-5-7-21

FINAL

ADDENDUM TO MONOFILL REPORT
VOLUME VII OF VII

Prepared for

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF SOLID WASTE
WASHINGTON, D.C.

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ACRONYMS AND DEFINITIONS

BNA	Base-neutral and Acid Extractables
BOD	Biological Oxygen Demand
CAS	Chemical Abstract Service
CB	Chlorobiphenyl
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COD	Chemical Oxygen Demand
Codisposal	Disposal together of municipal solid wastes and municipal solid waste combustion ashes
CP	Chlorinated Phenols
DWE	Deionized Water Extraction Test Method
EP	Extraction Procedure
EPA	U.S. Environmental Protection Agency
ESP	Electrostatic Precipitator
HSWA	Hazardous and Solid Waste Amendments
HWC	Hazardous Waste Combustion
LF	Landfill
MCL	Maximum Contaminant Level
Monofill	A landfill that contains only solid waste combustion ashes and residues
MSW	Municipal Solid Waste
MW	Monitoring Well
MWC	Municipal Waste Combustion
MWEP	Monofilled Waste Extraction Procedure, also known as SW-924
ND	Not Detected
NPDES	National Pollutant Discharge Elimination System
PAHs	Polynuclear Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls

ACRONYMS AND DEFINITIONS
PAGE TWO

PCDDs	Polychlorinated dibenzo-p-dioxins
PCDFs	Polychlorinated dibenzofurans
POTW	Publically Owned Treatment Works
RCRA	Resource Conservation and Recovery Act
RDF	Refuse Derived Fuel
RPD	Relative Percent Difference
SS	Suspended Solids
SW-924	Deionized Water Extraction Test Method
TCLP	Toxic Characteristics Leaching Procedure Test Method
TDS	Total Dissolved Solids
TEF	Toxic Equivalency Factors
TNK	Total Nitrogen Kjeldahl
TOC	Total Organic Carbon
TSCA	Toxic Substances Control Act

CONVENTIONAL PARAMETERS IN LEACHATES FROM MONOFILLS AND IN QUENCH WATERS

The four monofills sampled by Versar in September of 1986 were revisited and resampled by NUS during the week of June 2 through June 6, 1987.

Leachates and quench water samples were analyzed in-situ for pH and specific conductance. Samples were sent to the NUS Pittsburgh laboratory for COD and ammonia-nitrogen analyses. Results are presented in Table 1. The applicable information collected during this sampling week are given in the corresponding Trip Reports which follow.

Table 2 provides a summary of the four Municipal Waste Combustor design and operating characteristics, and Table 3 provides the Ash Monofill Characteristics. Data provided in these two tables originate from the Versar Report (Volume V of this report) and from data collected during the additional sampling trip.

TABLE 1

CONVENTIONAL PARAMETERS IN LEACHATES FROM MONOFILLS AND IN QUENCH WATERS

Parameter	Facility A		Facility B		Facility C		Facility D	
	Leachate	Quench Water	Leachate	Quench Water	Leachate	Quench Water	Leachate	Quench Water
pH*	-	11.91	7.44	12.09	8.58	5.68	8.12	11.73
Specific Conductance**	-	4,900	4,200	5,100	<10,000	9,100	9,300	<10,000
COD, mg/l	-	38	<5	810	1,200	470	840	820
NH_3-N, mg/l	-	0.7	1.2	3.9	3.0	4.1	36	4.5
Temperature, °C	-	36.3	27.5	32.5	33.3	40.8	29.3	31.5

* pH in pH Units
** Specific Conductance in µho/cm
\- Leachate collection system unavailable

TABLE 2

MUNICIPAL WASTE COMBUSTOR DESIGN AND OPERATING CHARACTERISTICS

Facility	Facility Type	No. of Combustors	Year of Construction	Capacity tons/day (design)	Design Combustion Temperature (°F)	Air Pollution Control	Waste Composition %Residential %Com./Indust.	Waste Processing or Pre-Handling
A	Resource/energy recovery continuous feed, water-wall, rotary kiln	2 #1/#2	1981/1982	100/100	1,200	Cyclone, ESP	50 50	Remove large objects; separate glass, iron, and aluminum for recycle
B	Energy recovery continuous feed, water-wall, traveling grate	3 #2/#3/#4	1974 1986	360/360/ 400	1,800	Cyclone, ESP	80 20	Remove large appliances and shred tires
C	Continuous feed, reciprocating grate, rotary kiln	2 #1/#2	1970	300/300	1,800	ESP	50 50	Remove large items
D	Energy recovery continuous feed, water-wall reciprocating grate	2 #1/#2	1972	360/360	1,800	ESP	50 50	Remove tires and large noncombustible materials; recycle ferrous metals as scrap; periodically shred and burn tires

ESP = Electrostatic precipitation

TABLE 3

ASH MONOFILL CHARACTERISTICS

Facility	Years of Operation	Combustor Residue Disposed	Other Types of Waste Disposed	Leachate Collection System	Cover	Runoff Control	No. of Usable Groundwater Monitoring Wells
A	1982-1987	60 TPD	Tires, construction debris, and noncombustibles	None	Daily soil cover; 3-foot clay final cover	Impermeable cap; graded contour; diversion ditch around landfill perimeter	1
B	1981-1987	130	Large items and construction debris	None	Soil 6-12 inches	Relatively thin cap; hay bales around one corner of landfill to inhibit runoff	2
C	1970-2050	155	Noncombustible items	None	NA	Adjacent mounds of waste tend to trap surface water; erosion of slope evident	3
D	Post-1980-1987	90	Tires and noncombustibles	Gravel (not functioning)	NA	Flat area adjacent to waste pile tends to collect surface water	0

TPD = Tons Per Day
NA = Not Applicable

TRIP REPORT

LEACHATE SAMPLING OF LANDFILL

FACILITY A

JUNE 3, 1987

TO: HAIA ROFFMAN

FROM: RICK ADKISSON

DATE: JUNE 23, 1987

Facility A Introduction

Facility A was visited on June 3, 1987. Only quench water was obtained. Insitu measurements were as follows:

Sample Number	Q1 (Quench water from Unit 1 quench tank inlet to the overflow
pH	11.91
Conductivity	4900 (micromhos/cm)
Water Temperature	36.3^{o}C

Key Facts Regarding This Facility Are:

- Facility accepts municipal, commercial, and industrial wastes (approximately 50% is industrial).
- Facility has 2 units with start-up dates of December 1981, and March 1982.
- Each unit capacity is 100 tons/day.
- Incineration temperature is 1800-2000^{o}F.
- Process achieves approximately a 90% reduction in volume, and a 50% reduction in weight.
- No bulk liquids, however, sometimes paper products may be soaked with various industrial fluids, and run through the plant.

TO: HAIA ROFFMAN
FROM: RICK ADKISSON
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- Quench water tank contains approximately 10% fly ash, and 90% bottom ash.
- Plant uses a modified Rotary Barrel design with electrostatic precipitators, and no scrubbers for fly ash control.
- When both units are operational, they produce 50,000 lbs. of steam/hour. Roughly 18,000-20,000 lbs. water/hour are required for system make-up.
- Ash is landfilled 13 miles from the plant. The landfill has no leachate collection system, no liner, and no run-off diversion system.
- The percentage of weight reduction achieved is dependent upon the quench water ash cooling tank process which significantly increases the ash weight (estimated at 10% moisture content immediately following the tank cooling), as well as the amount of industrial scrap metal run at any one time.
- Four (4) VOAs shipped to NUS Pittsburgh Laboratory under Federal Express Airbill No. 4399042362 on June 3, 1987.

RA/lmd

TRIP REPORT

LEACHATE SAMPLING OF LANDFILL

FACILITY B

JUNE 3, 1987

TO: HAIA ROFFMAN

FROM: RICK ADKISSON

DATE: JUNE 23, 1987

Facility B Introduction

Facility B was visited on June 3, 1987. Both a quench water and a leachate water sample were obtained. These samples were obtained from the same locations. Versar had obtained their samples in September of 1986. The insitu measurements were as follows:

Sample Number	Q2 (Quench water taken from sample location as Versar. Taken in the surface drainage channel below the Ash Fill Area. L2 (Leachate sample collected at the NE corner of the landfill).
pH	12.09 7.44
Conductivity	5100 (micromhos/cm) 4200 (micromhos/cm)
Water Temperature	32.5°C 27.5°C

Key Facts Regarding This Facility Are:

- Facility accepts mostly municipal waste (80%), commercial waste (18%), and some industrial waste (2%).
- Facility has two 360 ton capacity units, and one 400 ton capacity unit.

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FROM: RICK ADKISSON
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- The 400 ton unit was operational approximately 6 months ago, while both 360 ton units became operational in 1974.
- Incineration temperature is about 1800^{o}F.
- Process achieves approximately a 90% reduction in volume, and a 70% reduction in weight.
- No bulk liquids are accepted.
- Plant uses a mass burn, water wall stoker, grate design with electrostatic precipitators, and no scrubbers for fly ash control.
- Both bottom and fly ash are mixed prior to landfilling and during the cooling process.
- Cooling process involves the spraying of water through jets instead of using a quench water tank system.
- Yearly average of waste handled on a daily basis is 634.70 tons/day.
- Apparently landfill (5 miles from plant) has no leachate collection system, no liner, and no run-off diversion system.
- Quench water from plant is discharged into the sanitary sewer.
- Eight (8) VOAs shipped to NUS Pittsburgh Laboratory under Federal Express Airbill No. 4399042362.

RA/lmd

TRIP REPORT

LEACHATE SAMPLING OF LANDFILL

FACILITY C

JUNE 2, 1987

TO: HAIA ROFFMAN

FROM: TERRY ROJAHN

DATE: JUNE 23, 1987

Facility C Introduction

Facility C is 18 years old and has a fill area of 60 acres. Approximately 450-500 tons of solid waste is incinerated in a 24-hour period; or, 150,000 tons incinerated and subsequently disposed of by this facility in a period of one year. At the present rate of filling this facility should last to the year 2020. The incineration process consumes approximately 70% of the solid waste and the remaining 30% comes out as ash, metal and glass. Ninty percent of the waste accepted by this facility is of the household type and the remaining ten percent comes from industry. As the pile is filled it is covered with top soil and extended in a northwardly direction. The landfill has no liner; however, plans to construct a catch basin for the leachate water coming from a seep at the notheast corner of the presently disturbed fill area is in progress. Leachate water will be trapped in the catch basin and pumped via PVC piping to the sewage line west of the fill area.
Brinkman.

Facility C Sampling

Leachate Water: Sampled leachate seep at the northeast corner of the landfill. Sampling information was as follows:

Time	1410 Hours
pH	8.58
Temperature	33.3^{o}C
Specific Conductivity	> 10,000
Color	Black
Turbidity	High
Collection Method	Stainless Steel Beaker

TO: HAIA ROFFMAN
FROM: TERRY ROJAHN
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Quench Water: At the time of the sampling the incinerator units were fired up but the plant was not operating due to loss of power to the grates cased by a thunderstorm going through the area at approximately 1230 hours. Sampling information was as follows:

Time	1520 Hours
pH	5.68
Temperature	40.8°C
Specific conductivity	9,100
Color	Black
Turbidity	High
Collection Method	Stainless Steel beaker
Remarks	Sample collected at the weir overflow to the sump

The above samples were deliverable to the NUS Laboratory for analysis (See Attachment 1 - Chain-of-Custody Record).

Stream Information

The stream flowing west to east running beneath the landfill was not sampled; however, at three distinct locations (See Attachment 2):

- o West of landfill (Location 1)
- o East of landfill and before leachate seep point of entry (Location 2)
- o East of landfill and after leachate seep point of entry (Location 3)

The following information was obtained:

Location	1	2	3
pH	7.71	8.22	8.47
Tempature	23.8°C	27.6°C	26.7°
Specific Conductivity	360	2000	2400
Color	Tan	Lt. tan	Slightly darker than Loc. 2
Turbidity	MID	MID	MID

TR/sic

NUS CORPORATION

CHAIN OF CUSTODY RECORD

PROJECT NO.: Y930

SITE NAME: Facility C

SAMPLERS (SIGNATURE): [illegible]

STATION NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	[illegible]						REMARKS
Leachate	[illegible]	1410		✓	C - Leachate Water	3	3						preserved with Sulfuric acid
Quench water	[illegible]	1520		✓	C - Quench Water	4	4						

RELINQUISHED BY (SIGNATURE):	DATE/TIME:	RECEIVED BY (SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE/TIME:	RECEIVED BY (SIGNATURE):
[illegible signature]					

RELINQUISHED BY (SIGNATURE):	DATE/TIME:	RECEIVED BY (SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE/TIME:	RECEIVED BY (SIGNATURE):

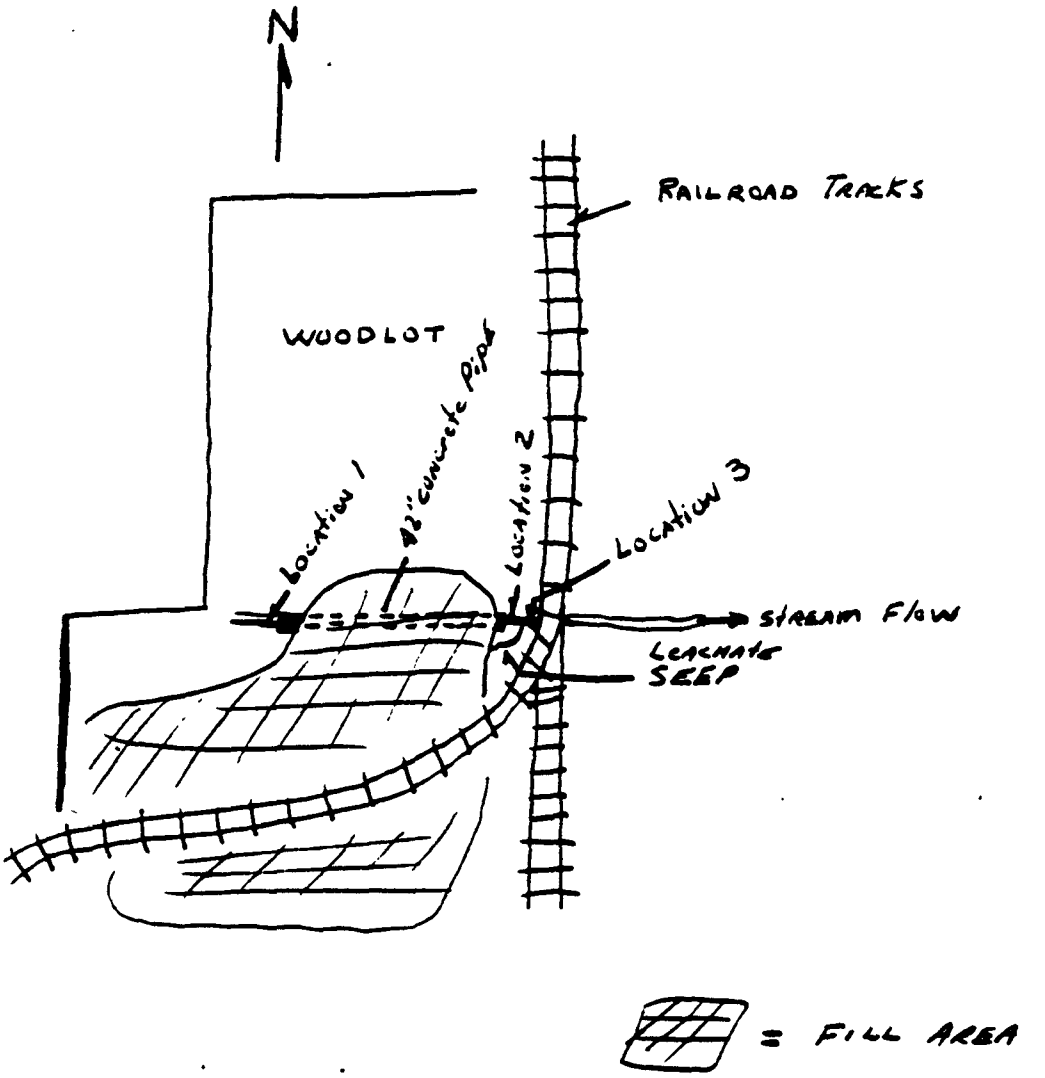
RELINQUISHED BY (SIGNATURE):	DATE/TIME:	RECEIVED FOR LABORATORY BY (SIGNATURE):	DATE/TIME:	REMARKS:

NUS 440 34 0484

ATTACHMENT 2

ATTACHMENT 3

MAP OF STREAM THROUGH LANDFILL



MAP NOT TO SCALE

TRIP REPORT

LEACHATE SAMPLING OF LANDFILL

FACILITY D

JUNE 1, 1987

TO: HAIA ROFFMAN

FROM: TERRY ROJAHN

DATE: JUNE 23, 1987

Facility D Information

Facility D has an intake of refuse at approximately 650 tons/day with a reduction in volume of 75-90% after incineration. Incineration takes place on-site. Large bulky items are segregated (ex. refrigerators, large paper rolls, etc.) before incineration to prevent conveyor blockage. Later contractors haul bulky items away for recycling at no charge imposed by the facility. For the most part municipal refuse (ex. bottles, fabric, tin cans, tires, furniture, metal items small enough to pass through the conveyor system etc.) is presently being burned and disposed of via Landfill B1 (age 5-6 years old) as the old landfill, Landfill A (age 15 years old), was filled to capacity. Residue Site B1 occupies a total area of 2.63 acres, and has a capacity of approximately 96,216 cu. yds. Site B1 is almost filled to capacity and plans for expansion are already in progress. The facility also has plans to mix sewage sludge sometime in the future.

Facility D Sampling

Leachate Water:

Leachate water was sampled from a large area of standing water at the base of the northeast corner of Landfill B. The area of standing water was littered with debris (ex. rags, tires, cans, plastic, etc.) and nude of vegetation. Sampling information was as follows:

Time	1035 Hours
pH	8.12
Temperature	29.3°C
Specific Conductivity	9,300
Color	Tan
Turbidity	MID
Sampling Method	Stainless Steel Beaker
Remarks	Refuse odor, insect larvae on water surface, and occasional bubbling action of water observed

Quench Water:

The quench water sample was obtained in the middle of the second shift from the Unit 1 discharger as Unit 2 (where Versar took their samples) was shut down. The following information was obtianed:

Time	1135 Hours
pH	11.73
Temperature	31.5^{o}C
Specific Conductivity	>10,000
Color	clear
Turbidity	Low
Sampling Method	Sample was obtained by collecting the drippings directly beneath the discharger, because of the amount of fine metal particles in the quench water and the unsafe footing at the end of the discharger

The above samples were delivered to the NUS Laboratory for analysis (see Attachment 1).

Other Site Information

The small pond at the base of the south side of the old landfill (Landfill A) was not sampled; however, the following information was obtained:

Time	1110
pH	7.99
Temperature	13.7
Specific Conductivity	2,400
Color	Green tint
Turbidity	Low-MID
Remarks	Pond contained aquatic vegetation

TR/sic

NUS CORPORATION

CHAIN OF CUSTODY RECORD

PROJECT NO.: Y950

SITE NAME: FACILITY D

SAMPLERS (SIGNATURE): Terry R. Lynch

STATION NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	40 ml VIALS Ammonia ECD Analysis	REMARKS
D-Leachate	6/1/87	1135		✓	D-Leachate	4	4	Preserved with Surfuric Acid
D-Quench Water	6/1/87	1135		✓	D-Quench Water	4	4	" " " 4

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Terry R. Lynch	6/1/87 1625				
RELINQUISHED BY (SIGNATURE):	DATE/TIME:	RECEIVED BY (SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE/TIME:	RECEIVED BY (SIGNATURE):
RELINQUISHED BY (SIGNATURE):	DATE/TIME:	RECEIVED FOR LABORATORY BY (SIGNATURE):	DATE/TIME:	REMARKS:	
		Mary Stefanosky	6/1 1630		

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