ECRS
Environmental
Construction &
Remediation
Services, Inc.

March 23, 1993

Ms. Theresa Evanson
Wisconsin Department of Natural Resources
Environmental Response and Repair Section
Bureau of Solid and Hazardous Waste Management
101 South Webster Street, GEF II, SE/3
Madison, Wisconsin 53707

Re: Operation and Maintenance Summary - January 1993
Landfill Gas and Leachate Extraction System
Refuse Hideaway Landfill - Middleton, Wisconsin
Project No. C6024.01

Dear Ms. Evanson:

This letter summarizes operation and maintenance (O&M) activities performed by Environmental Construction and Remediation Services, Inc. (ECRS), during the month of January 1993, at the Refuse Hideaway Landfill. Specific tasks are discussed in the following sections:

SCHEDULED LEACHATE LOADOUT

Leachate/Condensate was pumped and transported by Al's Modern Sewer Service to the Madison Metropolitan Sewage District Treatment facility. The hauling dates and quantities are as follows:

	Measured Volume (gals)
December 30, 1992	2,986
January 14, 1993	2,767
January 19, 1993	1,887

WEEKLY/MONTHLY MONITORING SCHEDULE

Weekly/Monthly monitoring of the landfill gas and leachate extraction system was performed on the following dates:

January 4, 1993	Weekly
January 15, 1993	Weekly
January 18, 1993 (week of)	No monitoring, flare shutdown January 11 to 23, 1993
January 30, 1993	Weekly/Monthly/

2201 Vondron Road, Madison, WI 53704-6795 (608) 221-3556 FAX (608) 221-3991

Summary tables for weekly and monthly monitoring schedules are attached. Specific site observations are discussed in the following section:

OBSERVATIONS AND DISCUSSION

Gas Wells GW-1 and GW-2 were closed on November 3, 1992, and the vacuum in the southern branch was increased to withdraw more gas from GW-5. The wells were opened on January 30, 1993 to determine if gas production has recovered in this portion of the landfill. We are continuing to monitor the southern branch wells to verify that increased pressure does not induce oxygen into the landfill, that the reduced levels of methane in GP-11 are maintained; and to monitor gas production from GW-1 and 2.

Landfill gas odors continue to be detectable near Gas Well GW-5. Snow cover prevents observation of the landfill cap. Several monitoring valves were frozen on the gas extraction wells during monthly monitoring. No readings were obtainable.

The volume of leachate hauled to the wastewater treatment facility is less than the standard 5,000 gallon loadout volume. The leachate hauler has been using a smaller truck due to mechanical problems with the larger capacity honey wagon.

The obstruction in GW-9 was removed and the leachate pump reset on January 4, 1993. The pump is operating since liquids flow is audible in the discharge pipe when the pump runs. We have adjusted the Coyote controls to initiate the pump cycle every 30 minutes instead of every 45 minutes. This action should result in more leachate pumpage and a decrease in leachate head.

The flare shutdown on January 11, 1993 due to a thermocouple malfunction. An attempt was made to operate the flare through bypassing the thermocouple, but both sensors were defective eliminating that option. A replacement was ordered from Linklater and replaced on January 23, 1993. The system was not in operation during that period.

Weekly monitoring was conducted January 15, 1993 during the period the flare was shutdown, to monitor conditions at the blower and at gas probes G-9, GP-11s and GP-11d. Gas odors were noticeable in the blower house. We are in the process of ordering/replacing the blower seals to rectify this ongoing concern. Landfill gas was not detected in the gas probes.

Weekly monitoring was not conducted the week of January 18, 1993 due to the flare being inoperable. Weekly monitoring was continued on January 30, 1993 after the flare was repaired on January 23, 1993.

If you have any questions or comments, please feel free to call.

Sincerely,

ENVIRONMENTAL CONSTRUCTION AND REMEDIATION SERVICES, INC.

Brian J. Hegge
Technical Manager

Enclosures: As Stated

TABLE 1

REFUSE HIDEAWAY LANDFILL
MONTHLY GAS EXTRACTION WELLS MONITORING INFORMATION

Date: January 30, 1993
Temperature: 15° F at 9:00a.m.
Barometric pressure: 30.18 inches Hg
Monitored by: B. Hegge
Gas Detector Model No.: GA 1.1
Gas Detector Serial No.: 381
Date last calibrated: Factory calibrated June 1992(5)

Well (1)	Well Pressure (inches W.C.)	Header Pressure (inches W.C.)	CH_4(2) (%)	O_2 (%)	CO_2 (%)	Valve Setting (fraction open)	Gas(3) Velocity (fpm)	Gas(4) Flow (cfm)	Gas Temp (°F)
GW-1	-1	-15	13.8	11.4	11.6	1/13	525	23.6	53.0
GW-2	-2	-13.5	0.0	20.4	0.1	2/13	475	21.4	53.3
GW-3	frozen	-10.5	46.9	0.5	37.7	4/9	2200	99.0	57.0
GW-4	frozen	-11.5	46.8	0.5	36.6	5/9	750	33.8	62.0
GW-5	-11.5	-11.5	56.3	0.4	41.7	7/9	800	36.0	74.6
GW-6	-13.5	-3.5	34.0	0.2	33.1	6/9	700	31.5	66.0
GW-7	-8.5	-12	53.1	0.2	38.3	5/9	1250	56.3	87.4
GW-8(1)	-13	frozen	56.5	0.1	41.5	3/9	625	28.1	91.2
GW-9(1)	-13	frozen	56.3	0.0	41.6	6/9	600	27.0	104.0
GW-10	-4	-9	36.8	0.0	32.4	5/9	850	38.3	90.3
GW-11(1)	frozen	-5	56.8	0.0	40.5	3/9	375	16.9	101.5
GW-12	frozen	-8	45.0	0.8	34.4	4/9	1900	85.5	98.3
GW-13	frozen	frozen				7/9	950	42.8	82.0

Notes:

(1)Wells with leachate extraction pump and controls.
(2)Percent CH_4 (methane).
(3) Flow and temperature readings were obtained 2/5/93 due to instrument malfunction on 1/30/93.
(4)Gas flow (cfm) is calculated by multiplying the gas velocity (fpm) by 0.045 ft^2 for 3-inch diameter PVC pipe.
(5)Calibration checked January 30, 1993:
99% CH_4 read 99 % CH_4
2.5% CH_4 read 2.6 % CH_4
15% CO_2 not analyzed

GW-1 + 2 - valve settings adjusted between Jan + Feb. Slightly crack valve so pressure doesn't build up. Velocity not correct for GW-1+2 for Jan reading. Wells closed when reading taken - O_2 levels indicate non-producing well (gas not being measured).

TABLE 2

REFUSE HIDEAWAY LANDFILL
MONTHLY GAS PROBE MONITORING INFORMATION

Date: January 30, 1993
Temperature: 20° F at 11:00 a.m.
Barometric pressure: 30.18 inches Hg
Monitored by: B. Hegge
Gas Detector Model No.: GA 1.1
Gas Detector Serial No.: 381
Date last calibrated: Factory calibrated June 1992 (4)

Probe	Pressure (inches W.C.)	CH_4 (%)	CH_4 (1) (% LEL)	O_2 (%)
G-1S	0.0	0.0	0.0	19.4
G-1D	0.0	0.0	0.0	19.4
G-6	0.0	0.0	0.0	19.4
G-8	0.0	0.0	0.0	19.8
G-9	0.0	0.0	0.0	18.6
G-10	+1.0	0.0	0.0	19.9
GP-11S	0.0	0.0	0.0	19.8
GP-11D	-0.5	0.0	0.0	19.8
GPW-1S	0.0	0.0	0.0	17.7
GPW-1M	+1.5	0.0	0.0	18.0
GPW-1D	+1.5	0.0	0.0	17.7
Speedway Building (2)	NA	No readings, buildings closed.		
Speedway Building (3)	NA			

Notes:

(1) Percent of lower explosive limit of CH_4 (100% LEL = 5% CH_4 by volume).
(2) Readings obtained from the northeast corner of the interior of the scale house.
(3) Readings obtained from interior of Mechanic's shop.
(4) See calibration data on Table 1.
NA Not applicable.

TABLE 3

REFUSE HIDEAWAY LANDFILL
MONTHLY BRANCH AND FLARE MONITORING INFORMATION
January 30, 1993

	Pressure (in. W.C.)	CH_4[(1)] (%)	O_2 (%)	Gas[(2)] Velocity (fpm)	Flow[(3)] (cfm)	Flow[(4)] (scfm)	Gas Temp	Valve Setting (fraction open)
Branch Monitoring Station								
North Branch	-10	46.0	0.6	2900	226.2	234.7	43.1	6/13
Central Branch	-13.5	47.7	1.1	2050	159.9	162.3	44.6	6/13
South Branch	-15	45.3	0.0	3500	273.0	278.6	40.2	6/13
Flare Inlet Pipe								
Port A	+15	46.7	0.0	2900	536.5	567.0	60.0	N/A
Port B	+6.5	46.7	0.2	3000	555.0	574.7	60.0	1/2
Port C	+4.5	47.0	0.3	2200	407.0	427.6	55.0	N/A

Notes:

(1) Percent CH_4 (methane).
(2) Flow and temperatures were obtained 2/5/93 due to instrument malfunction on 1/30/93.
(3) Gas velocity is converted to gas flow by multiplying fpm x 0.185 @ 6-inch HDPE and fpm x 0.078 @ 4-inch PVC.
(4) Flows have been converted to standard conditions of 70°F and 406.9 inches water.
NA Not applicable.

TABLE 4

REFUSE HIDEAWAY LANDFILL
MONTHLY LEACHATE HEAD MONITORING INFORMATION
January 30, 1993

Well	LEACHATE HEAD [2] (ft)			Current Pump Hours		Previous Pump Hours		Elapsed Pump Hours	
	Gas Well Depth	Depth to Leachate	Leachate Head	Total Hours	Time[3]	Total Hours	Time[3]	Total Hours	Pump Hours
GW-1	51.7	49.2	2.5						
GW-2	53.3	48.1	5.2						
GW-3	57	56.0	1.0						
GW-4	65	53.8	11.2						
GW-5	70	59.3	10.7						
GW-6	36	36.4	Dry						
GW-7	60	55.0	6.0						
GW-8[1]	69	52.0	17.0	5703.4	10:43	4959.8	10:00	744	743.6
GW-9[1]	66	47.5	18.5	8477.8	10:06	8476.4	11:45[4]	624	1.4
GW-10	70	65.0	5.0						
GW-11[1]	65	48.6	16.4	313.7	10:16	303.7	9:50	744	10.0
GW-12	81	65.4	15.6						
GW-13	69	61.2	7.8						

Notes:

(1) Wells with leachate extraction pumps and controls.
(2) Gas wells retro-fitted with threaded ports on risers October 1992. Leachate levels measured from retro-fitted port on gas well riser. Gas well depths obtained from Construction Observation Report, November, 1990 and Operation and Maintenance Manual, November 1991.
(3) Time of hour meter reading was recorded on December 30, 1992 and January 30, 1993, 1993.
(4) Leachate pump was turned off December 23, 1992, after electrical short was discovered. Restarted at 11:45 on 1/4/93.
NA Previous pump hour readings were not available.
Shaded areas do not have reportable information.

TABLE 5

REFUSE HIDEAWAY LANDFILL
MONTHLY SUMMARY OF SYSTEM ALARM LOG
January 1993

Alarm Dates	Alarm Cause	Solution (hours flare not operational)
1/4/93	Unknown, no alarm received from Verbatim system. Low battery indicated, but power still on to system. When power was switched off, Verbatim indicated alarm condition.	Restarted (17hrs)
1/11/93	Thermocoupler malfunction.	Troubleshoot flare and thermocoupler. Order replacement from Linklater and replace thermocoupler on 1/23/93. (312 hours)

TABLE 6

REFUSE HIDEAWAY LANDFILL
SUMMARY OF WEEKLY MONITORING INFORMATION
January 1993

	January 4, 1993				January 15, 1993[2]				January 30, 1993			
Description	Valve Setting	Pressure (in. W.C.)	CH_4[1] (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4[1] (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4[1] (%)	O_2 (%)
Branch Monitoring Station												
North Branch	6/13	-6	57.2	0.4	6/13	+5	57.3	0.6	6/13	-10	46.0	0.6
Central Branch	6/13	-9	56.5	0.7	6/13	+5.5	57.3	0.3	6/13	-13.5	47.7	1.1
South Branch	6/13	-13.5	55.7	0.6	6/13	+5.5	58.0	0.0	6/13	-15	45.3	0.0
Blower Inlet Pipe												
Inlet Port A		-19	56.6	0.5		+5	58.3	0.8		-22	46.0	0.8
Inlet Port B		-20	56.8	0.4		+5	58.3	0.0		-23	46.1	0.9
Outlet Port A		+19	57.1	0.2		+5	58.2	0.2		+16	46.7	0.6
Flare Inlet Pipe												
Sample Port A		+16	57.4	0.3		0	valves frozen			+15	46.7	0.0
Sample Port B		+6.5	57.2	0.3		0				+6.5	46.7	0.2
Sample Port C		+4	57.0	0.3		0				+4.5	47.0	0.3
Flare Temperature (°F)	1550				(2)				1530			

Notes:

(1) Percent CH_4 (methane).
(2) Flare not operating due to thermocoupler malfunction.
Shaded areas do not have reportable information.

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Services, Inc.

March 23, 1993

Ms. Theresa Evanson
Wisconsin Department of Natural Resources
Environmental Response and Repair Section
Bureau of Solid and Hazardous Waste Management
101 South Webster Street, GEF II, SE/3
Madison, Wisconsin 53707

Re: Operation and Maintenance Summary - February 1993
Landfill Gas and Leachate Extraction System
Refuse Hideaway Landfill - Middleton, Wisconsin
ECRS Project No. C6024.01

Dear Ms. Evanson:

This letter summarizes operation and maintenance (O&M) activities performed by Environmental Construction and Remediation Services, Inc. (ECRS), during the month of February 1993, at the Refuse Hideaway Landfill. Specific tasks are discussed in the following sections:

SCHEDULED LEACHATE LOADOUT

Leachate/Condensate was pumped and transported by Al's Modern Sewer Service to the Madison Metropolitan Sewage District Treatment facility. The hauling dates and quantities are as follows:

	Measured Volume (gals)
February 1, 1993	2,815
February 12, 1993	4,580
February 19, 1993	4,532

WEEKLY/MONTHLY MONITORING SCHEDULE

Weekly/Monthly monitoring of the landfill gas and leachate extraction system was performed on the following dates:

February 5, 1993	Weekly
February 14, 1993	Weekly
February 18, 1993	Weekly
March 1, 1993	Weekly/Monthly

2201 Vondron Road, Madison, WI 53704-6795 (608) 221-3556 FAX (608) 221-3991

Summary tables for weekly and monthly monitoring schedules are attached. Specific site observations are discussed in the following section:

OBSERVATIONS AND DISCUSSION

Gas Wells GW-1 and GW-2 were opened on January 30, 1993 to determine if gas production had recovered in this portion of the landfill. We are currently drawing gas from these wells, but have not yet determined whether the production is sufficient to keep the wells open. We will continue to monitor the southern branch wells to verify that increased pressure does not induce oxygen into the landfill and that reduced levels of methane at GP-11 are maintained.

Leachate head has decreased in GW-9 and GW-11 with the adjustment of the Coyote controls to initiate the pump cycle every 30 minutes instead of every 45 minutes. The leachate pump in GW-8 is not operating properly and we have scheduled an electrician to assist in troubleshooting the electrical system.

After the leachate pump in GW-8 is repaired and all three leachate pumps are operating, we will determine whether elevated leachate levels in other gas wells are reduced. If leachate levels are impacted, installation of additional leachate pumps may be warranted. The table below contains a list of wells with leachate head and the length of screen that is blinded by leachate.

Well	Gas Well Depth (feet)	Leachate Head (feet)	Screen Length (feet)	Available Screen (feet)	Available Screen (%)
GW-4	65	10.5	43.5	33.5	77
GW-5	70	10.3	48.5	38.2	79
GW-12	81	23.8	59.5	35.7	60
GW-13	69	7.7	47.5	39.8	84

Gas concentrations have decreased at wells GW-3, GW-6, GW-10 and GW-12 and subsequently the gas concentrations monitored at the flare on March 1, 1993 have decreased. We have adjusted several wells to maximize gas flow and gas composition.

We will be forwarding correspondence requesting a change in the monitoring locations and frequency at the flare. Currently, nine (9) sample ports are monitored for gas concentrations, pressure and flow. Sampling in several of these ports could be eliminated as they provide duplicate samples.

We will also begin monitoring flow, at the flare, bi-monthly in accordance with the schedule required by NR445. The O&M schedule contained in the maintenance manuals only requires flow monitoring at the flare on a monthly basis.

If you have any questions or comments, please feel free to call.

Sincerely,

ENVIRONMENTAL CONSTRUCTION AND REMEDIATION SERVICES, INC.

Brian J. Hegge
Technical Manager

Enclosures: As Stated

TABLE 1

REFUSE HIDEAWAY LANDFILL
MONTHLY GAS EXTRACTION WELLS MONITORING INFORMATION

Date: March 1, 1993
Temperature: 35° F at 12:00 p.m.
Barometric pressure: 29.96 inches Hg
Monitored by: K. Solberg
Gas Detector Model No./Serial No.: GA 1.1/381
Velometer Model No./Serial No.: 6000AP/N-2-R
Date last calibrated: Factory calibrated June 1992(4)

Well (1)	Well Pressure (inches W.C.)	Header Pressure (inches W.C.)	CH_4(2) (%)	O_2 (%)	CO_2 (%)	Valve Setting (fraction open)	Gas(3) Velocity (fpm)	Gas(4) Flow (cfm)	Gas Temp (°F)
GW-1	-2	-13	7.3	0.4	21.7	5/13	<10	<0.45	46.0
GW-2	-4	-11	16.8	0.3	25.5	5/13	<10	<0.45	52.0
GW-3	-7	-11.5	41.3	0.3	35.1	4/9	2300	103.5	60.0
GW-4	-11.5	-12	45.4	0.6	35.6	5/9	1600	72.0	63.0
GW-5	-11.5	-12	56.3	0.5	43.1	7/9	800	36.0	80.0
GW-6	-4	-14	19.7	0.4	26.7	3/9	950	42.8	63.0
GW-7	-13	-14	52.8	0.3	39.8	5/9	1000	45.0	87.0
GW-8(1)	-13.5	-14	56.7	0.5	42.1	5/9	950	42.8	91.0
GW-9(1)	-13.5	-13.5	56.6	0.3	42.7	5/9	650	29.3	101.5
GW-10	-4	-9.5	37.2	0.3	32.5	2/9	1050	47.3	88.0
GW-11(1)	-9	-9	57.2	0.5	41.6	6/9	600	27.0	94.0
GW-12	-7	-9	42.5	0.3	33.5	5/9	1450	65.3	96.0
GW-13	-8.5	-9	51.4	0.4	39.9	7/9	700	31.5	76.0

Notes:

(1) Wells with leachate extraction pump and controls.
(2) Percent CH_4 (methane).
(3) Gas flow (cfm) is calculated by multiplying the gas velocity (fpm) by 0.045 ft^2 for 3-inch diameter PVC pipe.
(4) Calibration checked January 30, 1993:
99% CH_4 read 99 % CH_4
2.5% CH_4 read 2.6 % CH_4

GW-1 + 2 - Valve setting shut down March 1. 5/13 reading set from Jan. + velocity taken after valve shut down. O_2 readings - decreased from Jan 30 because well now had more vacuum on it.

TABLE 2

REFUSE HIDEAWAY LANDFILL
MONTHLY GAS PROBE MONITORING INFORMATION

Date: March 1, 1993
Temperature: 35° F at 12:00 a. m.
Barometric pressure: 29.96 inches Hg
Monitored by: K. Solberg
Gas Detector Model No.: GA 1.1
Gas Detector Serial No.: 381
Date last calibrated: Factory calibrated June 1992 (4)

Probe	Pressure (inches W.C.)	CH_4 (%)	CH_4 (1) (% LEL)	O_2 (%)
G-1S	0.0	0.0	0.0	20.4
G-1D	0.0	0.0	0.0	20.4
G-6	0.0	0.0	0.0	20.6
G-8	0.0	0.0	0.0	20.1
G-9	0.0	0.0	0.0	16.9
G-10	+0.5	0.0	0.0	20.5
GP-11S	0.0	0.0	0.0	20.6
GP-11D	0.0	0.0	0.0	20.7
GPW-1S	0.0	0.0	0.0	17.7
GPW-1M	+0.5	0.0	0.0	17.7
GPW-1D	+0.5	0.0	0.0	17.7
Speedway Building (2)	NA	0.0	0.0	20.6
Speedway Building (3)	NA	0.0	0.0	20.6

Notes:

(1) Percent of lower explosive limit of CH_4 (100% LEL = 5% CH_4 by volume).
(2) Readings obtained from the northeast corner of the interior of the scale house.
(3) Readings obtained from interior of Mechanic's shop.
(4) See calibration data on Table 1.
NA Not applicable.

TABLE 3

REFUSE HIDEAWAY LANDFILL
MONTHLY BRANCH AND FLARE MONITORING INFORMATION
March 1, 1993

	Pressure (in. W.C.)	CH_4[(1)] (%)	O_2 (%)	Gas Velocity (fpm)	Flow[(2)] (cfm)	Flow[(3)] (scfm)	Gas Temp	Valve Setting (fraction open)
Branch Monitoring Station								
North Branch	-10	46.6	0.2	2000	156.0	159.8	45.8	6/13
Central Branch	-15	44.7	0.6	1200	93.6	94.0	48.3	6/13
South Branch	-15.5	39.3	0.1	2350	183.3	186.5	41.0	6/13
Flare Inlet Pipe								
Port A	+14	43.1	0.2	2400	444.0	464.1	64.5	N/A
Port B	+5.5	43.0	0.3	Not available[(4)]			65.0	1/2
Port C	+4.5	43.0	0.3				63.1	N/A

Notes:

(1) Percent CH_4 (methane).
(2) Gas velocity is converted to gas flow by multiplying fpm x 0.185 @ 6-inch HDPE and fpm x 0.078 @ 4-inch PVC.
(3) Flows have been converted to standard conditions of 70°F and 406.9 inches water.
(4) No measurements were taken. Alnor velometer probe was too large for sample port.
NA Not applicable.

TABLE 4

REFUSE HIDEAWAY LANDFILL
MONTHLY LEACHATE HEAD MONITORING INFORMATION
March 1, 1993

Well	LEACHATE HEAD [2] (ft)			Current Pump Hours		Previous Pump Hours		Elapsed Pump Hours	
	Gas Well Depth	Depth to Leachate	Leachate Head	Total Hours	Time[3]	Total Hours	Time[3]	Total Hours	Pump Hours
GW-1	51.7	49.0	2.7						
GW-2	53.3	48.5	4.8						
GW-3	57	50.0	7.0						
GW-4	65	54.5	10.5						
GW-5	70	59.7	10.3						
GW-6	36	36.4	Dry						
GW-7	60	55.4	4.6						
GW-8[1]	69	45.8	23.2	6427.3	14:45	5703.4	10:43	724	723.9
GW-9[1]	66	66.0	Dry	9117.2	15:40	8477.8	10:06	725	639.4
GW-10	70	65.2	4.8						
GW-11[1]	65	65.0	Dry	328.5	15:30	313.7	10:16	725	14.8
GW-12	81	57.2	23.8						
GW-13	69	61.3	7.7						

Notes:

(1) Wells with leachate extraction pumps and controls.
(2) Gas wells retro-fitted with threaded ports on risers October 1992. Leachate levels measured from retro-fitted port on gas well riser. Gas well depths obtained from Construction Observation Report, November, 1990 and Operation and Maintenance Manual, November 1991.
(3) Time of hour meter reading was recorded on January 30 and March 1, 1993.
Shaded areas do not have reportable information.

GW-9 - hour meter not accurate, but pump is functional - hr meter will be replaced.
GW-8 - pump not functional, hr meter running on.

TABLE 5

REFUSE HIDEAWAY LANDFILL
MONTHLY SUMMARY OF SYSTEM ALARM LOG
February 1993

Alarm Dates	Alarm Cause	Solution (hours flare not operational)
2/14/93	Unknown, no alarm received from Verbatim system. Low temperature alarm disengaged on flare.	Restarted (37 hrs)
2/25/93	Flame out. Possibly due to high winds.	Restarted (4 hrs)

TABLE 6

REFUSE HIDEAWAY LANDFILL
SUMMARY OF WEEKLY MONITORING INFORMATION
February 1993

Description	February 5, 1993				February 14, 1993				February 18, 1993				March 1, 1993			
	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)
Branch Monitoring Station																
North Branch	6/13	-10.5	45.2	0.2	6/13	-6	56.4	0.1	6/13	-11	46.6	0.6	6/13	-10	44.6	0.2
Central Branch	6/13	-14.5	45.6	0.9	6/13	-9	56.2	0.2	6/13	-14.5	47.3	0.9	6/13	-15	44.7	0.6
South Branch	6/13	-16	39.4	0.2	6/13	-11	54.3	0.4	6/13	-15.5	43.4	0.4	6/13	-15.5	39.3	0.1
Blower Inlet Pipe																
Inlet Port A		-21.5	42.6	0.4		-19	55.9	0.3		-22	45.0	0.7		-22	42.4	0.3
Inlet Port B		-22.5	43.1	0.4		-20	55.8	0.2		-23	45.9	0.4		-23	42.4	0.3
Outlet Port A		+17.5	43.3	0.3		+19	57.3	0.0		+16.5	46.0	0.4		+16.5	42.6	0.2
Flare Inlet Pipe																
Sample Port A		+15	43.3	0.4		Monitoring valves frozen				Monitoring valves frozen				+14	43.1	0.2
Sample Port B		+6	43.0	0.4										+5.5	43.0	0.3
Sample Port C		+4	43.4	0.4		+4.5	56.9	0.0		+4	46.1	0.4		+4.5	43.0	0.3
Flare Temperature (°F)	1525				1530				1530				1500			

Notes:

(1) Percent CH_4 (methane).
Shaded areas do not have reportable information.

ECRS
Environmental Construction & Remediation Services, Inc.

May 19, 1993

Ms. Theresa Evanson
Wisconsin Department of Natural Resources
Environmental Response and Repair Section
Bureau of Solid and Hazardous Waste Management
101 South Webster Street, GEF II, SE/3
Madison, Wisconsin 53707

Re: Operation and Maintenance Summary - March 1993
Landfill Gas and Leachate Extraction System
Refuse Hideaway Landfill - Middleton, Wisconsin
ECRS Project No. C6024.01

Dear Ms. Evanson:

This letter summarizes operation and maintenance (O&M) activities performed by Environmental Construction and Remediation Services, Inc. (ECRS), during the month of March 1993, at the Refuse Hideaway Landfill. Specific tasks are discussed in the following sections:

SCHEDULED LEACHATE LOADOUT

Leachate/Condensate was pumped and transported by Al's Modern Sewer Service to the Madison Metropolitan Sewage District Treatment facility. The hauling dates and quantities are as follows:

	Measured Volume (gals)
March 11, 1993	4246
March 25, 1993	4214

WEEKLY/MONTHLY MONITORING SCHEDULE

Weekly/Monthly monitoring of the landfill gas and leachate extraction system was performed on the following dates:

March 6, 1993	Weekly
March 9, 1993	Weekly
March 17, 1993	Weekly
March 26, 1993	Weekly
March 30, 1993	Weekly/Monthly/Quarterly

2201 Vondron Road, Madison, WI 53704-6795 (608) 221-3556 FAX (608) 221-3991

Summary tables for weekly and monthly monitoring schedules are attached. Gas Extraction System - Well Head Monitoring Summary, Ground Flare Inlet Sample Port Monitoring Summary and Leachate Head Monitoring Summary tables are included that contain historical monitoring data. Specific site observations are discussed in the following section:

OBSERVATIONS AND DISCUSSION

The leachate pump in GW-8 was turned off on March 9, 1993 after it was determined that the pump was not operational. The Coyote Control indicated an "underload" condition even though there was 9 feet of leachate head in the well. The pump was removed on March 22, 1993, and broken wire leads were repaired.

The pump's efficiency decreased continuously until April 6, 1993 when it was determined that the pump was no longer pumping liquids. The pump was replaced on April 19, 1993. Continued monitoring during April and May indicated a steady decrease in this pump's efficiency. The pump was removed on May 3, 1993 and disassembled for inspection. Small slivers of duct tape were removed from the pump impellers, and the pump was reinstalled. We anticipate that the pump will continue to become plugged from the material in the well. The next time we remove the pump to clean the impellers, we will install a screen over the pump to prevent material from entering the impellers.

On March 22, 1993, the hour meter at GW-9 was inspected by an electrician to determine the cause of the continuous recording hour meter. The inspection determined that the 120 volt hour meter may not be functioning properly. The change in current (amps) when the pump disengages does not always trip the hour meter switch off. We are currently assessing whether to install a 230 volt hour meter or change the control switch to a different amperage.

The vacuum to the south branch was decreased on March 9, 1993 from -16.5 inches to -13 inches after a decrease in methane content was recorded at the blower house. Gas Wells GW-1 and GW-2 have been shut and the flow from GW-3 has been reduced to prevent stressing this area of the landfill.

On March 26, 1993, ECRS observed that the operational temperature range of the ground flare was fluctuating from 1,400 to 1,700 degrees fahrenheit. The dampers appeared to be overreacting to temperature changes within the flare, possibly caused by winds or oversensitive flare controller settings. ECRS is currently discussing the problems with the flare manufacturer, Linklater Corporation, and will provide the results of the flare inspection in the April monthly report.

The quarterly leachate sample was collected on March 22, 1993. Analytical laboratory results were forwarded to the Madison Metropolitan Sewage District (MMSD) on April 22, 1993.

If you have any questions or comments, please feel free to call.

Sincerely,

ENVIRONMENTAL CONSTRUCTION AND REMEDIATION SERVICES, INC.

Brian J. Hegge
Technical Manager

Enclosures: As Stated

TABLE 1

REFUSE HIDEAWAY LANDFILL
MONTHLY GAS EXTRACTION WELLS MONITORING INFORMATION

Date: March 30, 1993
Temperature: 60° F at 12:00 p.m.
Barometric pressure: 29.93 inches Hg
Monitored by: K. Solberg
Gas Detector Model No./Serial No.: GA 1.1/381
Velometer Model No./Serial No.: 6000AP/N-2-R
Date last calibrated: Factory calibrated March 1993(4)

Well (1)	Well Pressure (inches W.C.)	Header Pressure (inches W.C.)	CH_4(2) (%)	O_2 (%)	CO_2 (%)	Valve Setting (fraction open)	Gas(3) Velocity (fpm)	Gas(4) Flow (cfm)	Gas Temp (°F)
GW-1	+0.5	-7.5	50.1	0.0	32.9	closed	0	0	61.8
GW-2	0	-8	49.4	0.0	31.5	closed	0	0	61.3
GW-3	0	-16	57.6	0.0	40.7	1.5/9	1600	72	61.3
GW-4	-16	-16	50.8	0.0	36.9	5/9	950	42.8	62.2
GW-5	-16	-16	56.7	0.0	43.2	7/9	850	38.3	78.4
GW-6	-2	-16	44.2	0.0	33.9	2.5/9	1100	49.5	70.0
GW-7	-15	-16	55.3	0.0	39.7	4.5/9	1150	51.8	87.2
GW-8(1)	-16	-16	56.6	0.0	43.6	5.5/9	1020	45.9	92.0
GW-9(1)	-15	-16	56.6	0.0	41.4	5/9	875	39.4	104.3
GW-10	+0.25	-14.5	59.1	0.0	43.1	1/9	975	43.9	85.1
GW-11(1)	-14	-14	58.1	0.0	42.8	3.5/9	750	33.8	100.7
GW-12	-10.5	-13	44.3	0.0	33.8	5/9	1600	72.0	95.3
GW-13	-13	-13	48.1	0.0	38.2	6.5/9	1300	58.5	84.5

Notes:

(1) Wells with leachate extraction pump and controls.
(2) Percent CH_4 (methane).
(3) Gas flow (cfm) is calculated by multiplying the gas velocity (fpm) by 0.045 ft^2 for 3-inch diameter PVC pipe.
(4) Calibration checked March 30, 1993:
    99% CH_4 read 102 % CH_4
    2.5% CH_4 read 2.6 % CH_4
    15% CO_2 read 14.5% CO_2

TABLE 2

REFUSE HIDEAWAY LANDFILL
MONTHLY GAS PROBE MONITORING INFORMATION

Date: March 30, 1993
Temperature: 60° F at 12:00 p. m.
Barometric pressure: 29.93 inches Hg
Monitored by: K. Solberg
Gas Detector Model No.: GA 1.1
Gas Detector Serial No.: 381
Date last calibrated: Factory calibrated March 1993 (4)

Probe	Pressure (inches W.C.)	CH_4 (%)	CH_4 (1) (% LEL)	O_2 (%)
G-1S	0.0	0.1	2.0	20.2
G-1D	0.0	0.0	0.0	20.4
G-6	0.0	0.0	0.0	20.9
G-8	0.0	0.0	0.0	20.8
G-9	0.0	0.1	2.0	20.7
G-10	0.0	0.1	2.0	18.5
GP-11S	0.0	0.0	0.0	20.2
GP-11D	0.0	0.0	0.0	21.2
GPW-1S	0.0	0.0	0.0	17.2
GPW-1M	+0.25	0.0	0.0	17.8
GPW-1D	+0.5	0.0	0.0	17.8
Speedway Building (2)	NA	0.0	0.0	20.6
Speedway Building (3)	NA	0.0	0.0	20.6

Notes:

(1) Percent of lower explosive limit of CH_4 (100% LEL = 5% CH_4 by volume).
(2) Readings obtained from the northeast corner of the interior of the scale house.
(3) Readings obtained from interior of Mechanic's shop.
(4) See calibration data on Table 1.
NA Not applicable.

TABLE 3

REFUSE HIDEAWAY LANDFILL
MONTHLY BRANCH AND FLARE MONITORING INFORMATION
March 30, 1993

	Pressure (in. W.C.)	CH_4[(1)] (%)	O_2 (%)	Gas Velocity (fpm)	Flow[(2)] (cfm)	Flow[(3)] (scfm)	Gas Temp	Valve Setting (fraction open)
Branch Monitoring Station								
North Branch	-13.5	49.8	0.0	1500	117	117	50.9	6/13
Central Branch	-16.5	52.8	0.0	1200	93.6	92.7	53.6	6/13
South Branch	-7.5	57.0	0.0	1000	78	80.3	45.3	6/13
Flare Inlet Pipe								
Port A	+10	53.2	0.0	1500	278	284	70.7	N/A
Port B	+4	53.7	0.0	1600	296	299	70.3	1/2
Port C	+3	53.3	0.0	(4)	(4)	(4)	69.8	N/A

Notes:

(1) Percent CH_4 (methane).
(2) Gas velocity is converted to gas flow by multiplying fpm x 0.185 @ 6-inch HDPE and fpm x 0.078 @ 4-inch PVC.
(3) Flows have been converted to standard conditions of 70°F and 406.9 inches water.
(4) No measurements were taken. Alnor velometer probe was too large for sample port.
NA Not applicable.

TABLE 4

REFUSE HIDEAWAY LANDFILL
MONTHLY LEACHATE HEAD MONITORING INFORMATION
March 31, 1993

Well	LEACHATE HEAD [2] (ft)			Current Pump Hours		Previous Pump Hours		Elapsed Pump Hours	
	Gas Well Depth	Depth to Leachate	Leachate Head	Total Hours	Time[3]	Total Hours	Time[3]	Total Hours	Pump Hours
GW-1	51.7	49.0	2.7						
GW-2	53.3	48.8	4.5						
GW-3	57	56.3	0.7						
GW-4	65	54.2	10.8						
GW-5	70	60.0	10.0						
GW-6	36	36.3	DRY						
GW-7	60	54.2	5.8						
GW-8[1]	69	59.1	9.9	6811.9	12:30	6427.3	14:45	694	384.6
GW-9[1]	66	45.4	20.6	9731.5	12:40	9117.2	15:40	693	614.3
GW-10	70	65.1	4.9						
GW-11[1]	65	55.0	10.0	343.3	12:45	328.5	15:30	693	14.8
GW-12	81	63.8	17.2						
GW-13	69	61.0	8.0						

Notes:

(1) Wells with leachate extraction pumps and controls.
(2) Gas wells retro-fitted with threaded ports on risers October 1992. Leachate levels measured from retro-fitted port on gas well riser. Gas well depths obtained from Construction Observation Report, November, 1990 and Operation and Maintenance Manual, November 1991.
(3) Time of hour meter reading was recorded on March 1 and March 31, 1993.
Shaded areas do not have reportable information.

TABLE 5

REFUSE HIDEAWAY LANDFILL
MONTHLY SUMMARY OF SYSTEM ALARM LOG
March 1993

Alarm Dates	Alarm Cause	Solution (hours flare not operational)
3-20-93	Cause Could Not Be Determined	Flare Down for Approximately 2 hours.

TABLE 6

REFUSE HIDEAWAY LANDFILL
SUMMARY OF WEEKLY MONITORING INFORMATION
March 1993

Description	March 6, 1993				March 9, 1993				March 17, 1993				March 26, 1993				March 30, 1993			
	Valve Setting	Pressure (in. W.C.)	CH_4 (%) (1)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (%) (1)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (%) (1)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (%) (1)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (%) (1)	O_2 (%)
Branch Monitoring Station																				
North Branch	6/13	-11.0	43.6	0.5	6/13	-11.5	42.1	0.3	6/13	-13	41.8	0.8	6/13	-16.5	50.8	0.0	6/13	-13.5	49.8	0.0
Central Branch	6/13	-15.0	43.6	0.9	6/13	-16.0	41.3	0.6	6/13	-18	44.3	1.0	6/13	-18.0	50.0	0.0	6/13	-16.5	52.8	0.0
South Branch	6/13	-16.0	37.9	0.4	6/13	-16.5	36.2	0.3	6/13	-17	40.5	0.4	6/13	-17.5	63.3	0.0	6/13	-7.5	57.0	0.0
Blower Inlet Pipe																				
Inlet Port A		-22.5	41.5	0.5		-22.5	40.0	0.5		-25	42.0	0.1		-27.0	57.7	0.0		-25	52.8	0.0
Inlet Port B		-23.0	42.0	0.5		-23.5	41.3	0.7		-26	41.9	0.3		-27.5	57.7	0.0		-26	53.0	0.0
Outlet Port A		+16.0	41.9	0.4		+16.5	42.3	0.4		+13	42.3	0.0		+10.5	57.7	0.0		+12	53.3	0.0
Flare Inlet Pipe																				
Sample Port A		+13.5	41.7	0.5		+12.5	42.7	0.6		(2)	(2)	(2)		+8.5	58.1	0.0		+10	53.2	0.0
Sample Port B		+5.0	41.9	0.4		+5.0	42.2	0.4		(2)	(2)	(2)		+3.5	58.0	0.0		+4	53.7	0.0
Sample Port C		+3.5	41.9	0.4		+3.5	42.7	0.4		(2)	(2)	(2)		+3.0	58.3	0.0		+3	53.3	0.0

Notes:

(1) Percent CH_4 (methane) shaded areas do not have reportable information.

(2) Reading not available due to frozen valves.

TABLE 2
REFUSE HIDEAWAY LANDFILL
GROUND FLARE INLET SAMPLE PORT MONITORING SUMMARY

DATE	PRESSURE (in. WC)	METHANE (%CH4)	OXYGEN (%02)	FLOW (cfm)	FLOW (scfm)	GAS TEMP. (F)
1/22/92	+3.2	50	0	380	387	65
1/30/92	+3.4	47.5	0	390	397	65
2/6/92	+3.5	47.5	0	400	412	59.0
2/13/92	+4.8	45.0	0	470	486	59.0
2/19/92	+3.0	50.0	0	370	380	60.4
2/27/92	+3.3	47.5	0	390	400	61.3
3/5/92	+3.4	47.5	0	395	401	66.0
3/19/92	+3.2	47.5	0	380	385	66.9
3/31/92	+3.5	47.5	0	400	404	68.7
4/20/92	+3.1	47	0	375	374	76.0
4/30/92	+3.2	43	0	380	373	84.5
5/8/92	+3.5	50	0	395	398	
5/14/92	+3.6	49	0	400	394	82.7
5/19/92	+3.4	50	0	390	376	94.4
6/1/92	+3.2	47	0	380	366	95.3
6/8/92	+4.0	41	0	425	411	93.2
6/16/92	+4.3	55	0	440	416	90.5
6/25/92	+4.1	48	0	430	403	95.1
7/24/92	+3.5	49.0	1.0			
8/31/92	+3.5	52.9	1.0	322	313	93.2
10/2/92	+4	46.0	0.9	342	331	93.3

TABLE 2
REFUSE HIDEAWAY LANDFILL
GROUND FLARE INLET SAMPLE PORT MONITORING SUMMARY
(CONTINUED)

DATE	PRESSURE (in. WC)	METHANE (%CH4)	OXYGEN (%02)	FLOW (cfm)	FLOW (scfm)	GAS TEMP. (F)
10/30/92	+4	46.0	0.4	296	297	77.0
11/24/92	+3.5	47.5	0.0	601.3	600	61.1
12/30/92	+3.5	44.8	0.0	481.0	499.5	56.6
1/30/93	+4.5	47.0	0.3	407.0	409.8	55.0
3/1/93	+4.5	43.0	0.3			63.1
3/30/93	+3.0	53.3	0.0	296	298	69.8

TABLE 4
REFUSE HIDEAWAY LANDFILL
LEACHATE HEAD MONITORING SUMMARY

DATE	LEACHATE HEAD (feet)												
	GW-1	GW-2	GW-3	GW-4	GW-5	GW-6	GW-7	GW-8	GW-9	GW-10	GW-11	GW-12	GW-13
10/2/92	0	3.3	0	9.6	8.2	0	3.2	17.8	17	5.1	2.5	13.1	5.6
10/30/92	1.8	4.8	0	9.3	8.5	0	4.4	5.3	17.6	4.1	0	12.9	6.2
11/24/92	1.9	0	0	10.1	9.6	0	4.1	18.1	18.2	4.1	16.6	14.3	6.1
12/30/92	2.4	4.5	0.5	11.2	10.5	0	4.6	19.2	27.2	4.8	19.3	28	7.4
1/30/93	2.5	5.2	1.0	11.2	10.7	0	6.0	17.0	18.5	5.0	16.4	15.6	7.8
3/1/93	2.7	4.8	7.0	10.5	10.3	0	4.6	23.2	0	4.8	0	23.8	7.7
3/30/93	2.7	4.5	0.7	10.8	10.0	0	5.8	9.9	20.6	4.9	10.0	17.2	8.0

TERRA
▲ ENGINEERING & CONSTRUCTION CORPORATION ▲
ENVIRONMENTAL REMEDIATION
MUNICIPAL & UTILITY CONSTRUCTION
SPECIALTY EARTHWORK

June 9, 1993

Wisconsin Department of
Natural Resources
Environmental Response and
Repair Section
Bureau of Solid and Hazardous
Waste Management
101 South Webster Street,
GEF II, SE/3
Madison, Wisconsin 53707

Attn: Ms. Theresa Evanson

Re: Operation and Maintenance
Summary - April 1993
Landfill Gas and Leachate
Extraction System
Refuse Hideaway Landfill -
Middleton, Wisconsin

Dear Ms. Evanson:

This letter summarizes operation and maintenance (O&M) activities performed by Terra Engineering & Construction Corporation (Terra), during the month of April 1993, at the Refuse Hideaway Landfill. Specific tasks are discussed in the following sections:

SCHEDULED LEACHATE LOADOUT

Leachate/Condensate was pumped and transported by Al's Modern Sewer Service to the Madison Metropolitan Sewage District Treatment facility. The hauling dates and quantities are as follows:

	Measured Volume (gals)
April 16, 1993	4536
April 17, 1993	6888
April 20, 1993	4387

WEEKLY/MONTHLY MONITORING SCHEDULE

Weekly/Monthly monitoring of the landfill gas and leachate extraction system was performed on the following dates:

April 6, 1993	Weekly
April 12, 1993	Weekly
April 19, 1993	Weekly
April 26-27, 1993	Weekly/Monthly

2201 VONDRON ROAD
MADISON, WI 53704-6795
608/221-3501 PHONE
608/221-4075 FAX

Summary tables for weekly and monthly monitoring schedules are attached.

OBSERVATIONS AND DISCUSSION

The leachate pump in GW-8 was replaced on April 19, 1993, after several inspections revealed that the pump was not operating correctly and appeared to be plugged. The performance of the new pump was monitored on April 27, 1993, and this pump had also become plugged. The pump was removed, disassembled, and slivers of duct tape removed from the pump impellers on May 3 and May 10, 1993. A stainless steel screen was installed on the pump on May 10, 1993, to prevent further plugging of pump.

The pump hours reported for GW-8 and GW-9 in Table 4 do not reflect realistic operational pump hours. The pump hours reported for GW-8 include hours that the electric motor was running but the pump was plugged. The hourmeter at GW-9 was not resetting due to a malfunctioning circuit switch. The hour meter continued to totalize hours even though the pump was not running. Both pump installations are now working properly after repairs at GW-8 (as described above on May 10, 1993), and the replacement of the circuit switch at GW-9 on May 3, 1993.

Terra was notified by WDNR personnel on April 30, 1993 that an area resident had reported an explosion to the local fire department at approximately 09:30 p.m. on April 29, 1993. Terra contacted the resident to discuss the situation and obtain a description of the events. Coincidentally, Terra had been on-site at 07:00 a.m. April 30, 1993, and no evidence was apparent that would indicate an explosion had occurred at the site. Further conversations with the flare manufacturer indicated that the possibility of an explosion occurring at the flare were very remote.

Terra gathered additional information on the operating condition, at the flare, concerning the operating temperature and the position of the dampers. The information was forwarded to Mr. John Gwinn of Linklater Corporation prior to his arrival at the site on May 3, 1993.

Mr. Gwinn inspected the flare and tuned the controller on May 3, 1993. The immediate results of the re-tuning were a marked decrease in the flare's operating temperature range. Prior to re-tuning, the flare had registered temperature swings of up to 300 °F. After tuning, the temperature range was less than 100 °F. Terra will forward Linklater's field report when it is received.

Landfill gas was observed escaping through the cover near GW-4 and GW-5 during the landfill cap inspection. The newly seeded area is being stressed by this gas. The other seeded portions of the landfill cap, appear to be in good condition. The seeding is established and no bare areas were observed.

The drainageways are in good condition with only minimal siltation noted. The drainageway that passes south of the flare, has a small amount of silt in it where it crosses the access road. The siltation pond is full of runoff.

An area of approximately 20 feet in diameter has subsided near GW-10. The area has approximately 6 to 12 inches of standing water present. We will be forwarding a proposal to regrade or fill this area in order to provide proper drainage and eliminate the standing water.

If you have any questions or comments, please feel free to call.

Sincerely,
TERRA ENGINEERING & CONSTRUCTION CORP.

Brian J. Hegge
Technical Manager

Enclosures: As Stated

TABLE 1

REFUSE HIDEAWAY LANDFILL
MONTHLY GAS EXTRACTION WELLS MONITORING INFORMATION

Date: APRIL 27, 1993
Temperature: 48 °F at 12:30
Barometric pressure: 30.22 inches Hg
Monitored by: K. SOLBERG
Gas Detector Model No./Serial No.: GA 1.1 / 381
Date Gas Detector last calibrated: Factory calibrated: MARCH, 1993 (4)
Velometer Model No./Serial No.: 6000 AP / N-2-R
Date Velometer last calibrated: Factory calibrated: FEBRUARY, 1993

Well (1)	Well Pressure (inches W.C.)	Header Pressure (inches W.C.)	CH_4 (2) (%)	O_2 (%)	CO_2 (%)	Valve Setting (fraction open)	Gas (3) Velocity (fpm)	Gas (4) Flow (cfm)	Gas Temp (°F)
GW-1	-0.5	-7.5	7.1	14.1	6.8	0/13	0	0	55.9
GW-2	-1	-7.5	0.0	20.0	0.0	1/13	0	0	54.3
GW-3	-3.5	-8	51.1	0.0	37.2	3/9	1400	63.0	59.3
GW-4	-7	-7	52.0	0.0	37.4	5/9	450	20.3	61.0
GW-5	-7	-7	56.8	0.0	42.2	7/9	500	22.5	77.0
GW-6	-3	-17	28.2	0.0	28.1	2/9	1450	65.3	68.3
GW-7	-15	-16	56.4	0.0	38.4	5/9	1750	78.8	86.1
GW-8(1)	-16	-16	58.3	0.0	41.4	5/9	1400	63.0	95.0
GW-9(1)	-16	-16	57.3	0.0	41.1	5/9	550	24.8	103.6
GW-10	-3.5	-13	35.4	0.0	31.0	3/9	600	27.0	88.0
GW-11(1)	-13	-13	58.8	0.0	40.8	5/9	700	31.5	100.0
GW-12	-10	-12	45.6	0.0	34.1	5/9	1700	76.5	77.0
GW-13	-12	-12.5	49.6	0.0	37.5	7/9	950	42.8	82.2

Notes:

(1) Wells with leachate extraction pump and controls.
(2) Percent CH_4 (methane).
(3) Gas flow (cfm) is calculated by multiplying the gas velocity (fpm) by 0.045 ft^2 for 3-inch diameter PVC pipe.
(4) Calibration checked: APRIL 26, 1993
99% CH_4 read 101.5 % CH_4
2.5% CH_4 read 2.5 % CH_4
15% CO_2 read 15.0 % CO_2
NA Not Available or Not Applicable

TABLE 2

REFUSE HIDEAWAY LANDFILL
MONTHLY GAS PROBE MONITORING INFORMATION

Date: APRIL 27, 1993
Temperature: 42 F at 8:00
Barometric pressure: 30.22 inches Hg
Monitored by: K. SOLBERG
Gas Detector Model No./Serial No.: GA1.1 / 381
Date Gas Detector last calibrated: Factory calibrated: MARCH, 1993 (4)

Probe	Pressure (inches W.C.)	CH_4 (%)	CH_4 (1) (% LEL)	O_2 (%)
G-1S	0.0	0.0	0	20.0
G-1D	0.0	0.0	0	20.1
G-6	0.0	0.0	0	20.0
G-8	0.0	0.0	0	19.9
G-9	0.0	0.0	0	18.9
G-10	+0.5	0.0	0	20.2
GP-11S	0.0	0.0	0	19.4
GP-11D	0.0	0.0	0	19.1
GPW-1S	0.0	0.0	0	18.1
GPW-1M	+0.25	0.0	0	19.1
GPW-1D	+0.25	0.0	0	17.8
Speedway Building (2)	NA	0.0	0	20.0
Speedway Building (3)	NA	0.0	0	20.0

Notes:

(1) Percent of lower explosive limit of CH_4 (100% LEL = 5% CH_4 by volume).
(2) Readings obtained from the northeast corner of the interior of the scale house.
(3) Readings obtained from interior of Mechanic's shop.
(4) See calibration data on Table 1.
NA Not Available or Not Applicable.

TABLE 3

REFUSE HIDEAWAY LANDFILL
MONTHLY BRANCH AND FLARE MONITORING INFORMATION
Date: APRIL 27, 1993

	Pressure (in. W.C.)	CH_4[1] (%)	O_2 (%)	Gas Velocity (fpm)	Flow[2] (cfm)	Flow[3] (scfm)	Gas Temp	Valve Setting (fraction open)
Branch Monitoring Station								
North Branch	-14.5	47.1	0.0	2150	167.7	168.4	54.3	6/13
Central Branch	-17	48.7	0.0	1600	124.8	124.0	56.6	6/13
South Branch	-8	54.6	0.0	1300	101.4	104.7	48.5	4/13
Flare Inlet Pipe								
Port A	+10							N/A
Port B	+4	49.2	0.0	2000	370.0	375.0	73.4	1/2
Port C	+2.5							N/A

Notes:

(1) Percent CH_4 (methane).
(2) Gas velocity is converted to gas flow by multiplying fpm x 0.185 @ 6-inch HDPE and fpm x 0.078 @ 4-inch PVC.
(3) Flows have been converted to standard conditions of 70°F and 406.9 inches water.
NA Not applicable.

TABLE 4

REFUSE HIDEAWAY LANDFILL
MONTHLY LEACHATE HEAD MONITORING INFORMATION
Date: APRIL 26, 1993

Well	LEACHATE HEAD [2] (ft)			Current Pump Hours		Previous Pump Hours		Elapsed Pump Hours	
	Gas Well Depth	Depth to Leachate	Leachate Head	Total Hours	Time[3]	Total Hours	Time[3]	Total Hours	Pump Hours
GW-1	51.7	48.7	3.0						
GW-2	53.3	48.8	4.5						
GW-3	57	56.3	0.7						
GW-4	65	53.5	8.7						
GW-5	70	59.4	10.6						
GW-6	36	35.9	0.1						
GW-7	60	54.1	5.9						
GW-8[1]	69	56.5	12.5	7448.4	1:55	6811.9	12:30	649.5	636.5
GW-9[1]	66	66.0	0.0	10380.4	2:30	9731.5	12:40	649.5	648.9
GW-10	70	65.2	4.8						
GW-11[1]	65	54.5	10.5	376.4	2:15	343.3	12:45	649.5	33.1
GW-12	81	63.0	18.0						
GW-13	69	60.2	8.8						

Notes:

(1) Wells with leachate extraction pumps and controls.
(2) Gas wells retro-fitted with threaded ports on risers October 1992. Leachate levels measured from retro-fitted port on gas well riser. Gas well depths obtained from Construction Observation Report, November, 1990 and Operation and Maintenance Manual, November 1991.
(3) Time of hour meter reading was recorded on MARCH 30 and APRIL 26.
Shaded areas do not have reportable information.

TABLE 5

REFUSE HIDEAWAY LANDFILL
MONTHLY SUMMARY OF SYSTEM ALARM LOG
Date: April 1993

Alarm Dates	Alarm Cause	Solution (hours flare not operational)
APRIL 12, 1993	GENERAL ALARM CONDITION	RE-START FLARE. FLARE DOWN FOR 8 HOURS.
APRIL 20, 1993	GENERAL ALARM CONDITION DUE TO ELECTRICAL OUTAGE	RE-START FLARE FLARE DOWN FOR 3 HOURS.

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TABLE 6

REFUSE HIDEAWAY LANDFILL
SUMMARY OF WEEKLY MONITORING INFORMATION
Date: APRIL 1993

Description	Date: APRIL 6, 1993				Date: APRIL 12, 1993				Date: APRIL 19, 1993				Date: APRIL 26, 1993				Date:			
	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)
Branch Monitoring Station																				
North Branch	6/13	-14.5	48.4	0.0	6/13	-8.0	55.9	0.0	6/13	-14.0	46.8	0.0	6/13	-14.5	45.4	0.0				
Central Branch	6/13	-17.5	50.5	0.0	6/13	-11.5	57.7	0.0	6/13	-16.0	49.8	0.0	6/13	-17.5	46.8	0.0				
South Branch	4/13	-9.0	57.9	0.0	4/13	-3.5	59.1	0.0	4/13	-8.0	54.8	0.0	4/13	-9.0	52.1	0.0				
Blower Inlet Pipe																				
Inlet Port A		-25.5	53.2	0.0		-23.0	55.9	0.0		-25.0	49.8	0.0		-26.0	48.0	0.0				
Inlet Port B		-26.0				-23.5				-25.0				-26.0						
Outlet Port A		+11.5				+15.0				+12.0				+12.0						
Flare Inlet Pipe																				
Sample Port A		+10.0				+12.0				+10.0				+9.5						
Sample Port B		+4.0	52.3	0.0		+4.5	57.2	0.0		+4.0	50.7	0.0		+4.0	48.4	0.0				
Sample Port C		+3.0				+2.5				+3.0				+2.5						
Flare Temperature (°F)	1575				1540				1520				1620							
Flare Flow (cfm/scfm)	NA				463/475				NA				370/375							

Notes:

(1) Percent CH_4 (methane).
NA Not Available or Not Applicable.
Shaded areas do not have reportable information.

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SPECIALTY EARTHWORK

July 7, 1993

Wisconsin Department of
Natural Resources
Environmental Response and
Repair Section
Bureau of Solid and Hazardous
Waste Management
101 South Webster Street,
GEF II, SE/3
Madison, Wisconsin 53707

Attn: Ms. Theresa Evanson

Re: Operation and Maintenance
Summary - May 1993
Landfill Gas and Leachate
Extraction System
Refuse Hideaway Landfill -
Middleton, Wisconsin

Dear Ms. Evanson:

This letter summarizes operation and maintenance (O&M) activities performed by Terra Engineering & Construction Corporation (Terra), during the month of May 1993, at the Refuse Hideaway Landfill. Specific tasks are discussed in the following sections:

SCHEDULED LEACHATE LOADOUT

Leachate/Condensate was pumped and transported by Al's Modern Sewer Service to the Madison Metropolitan Sewage District Treatment facility. The hauling dates and quantities are as follows:

	Measured Volume (gals)
May 8, 1993	4429 Gallons
May 20, 1993	4473 Gallons

WEEKLY/MONTHLY MONITORING SCHEDULE

Weekly/Monthly monitoring of the landfill gas and leachate extraction system was performed on the following dates:

May 3, 1993	Weekly
May 11, 1993	Weekly
May 18, 1993	Weekly/Monthly (1)
May 25, 1993	Weekly

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MADISON, WI 53704-6795
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608/221-4075 FAX

May 26, 1993	Monthly [1]
May 28, 1993	Weekly [2]

(1) Well Field Flow and Gas Content Measurements taken 5-26-93 as Alnor Velometer was under repair 5-18-93

(2) Weekly Round of Measurements at the Flare due to Flare Temperature Variations.

Summary tables for weekly and monthly monitoring schedules are attached.

OBSERVATION AND DISCUSSION

The manual valve down stream from the blower was opened from ½ to full open on May 3, 1993, in an effort to increase flow to the flare.

The electrical junction boxes on Gas Wells 8, 9 and 11 (GW-8, GW-9, GW-11) were replaced and the electrical conduit leading to the junction boxes drained on May 7, 1993 after water was noticed within the junction boxes and the electrical conduit. The junction boxes had corroded to the point where they were no longer effective against the weather.

The blower belts were replaced on May 10, 1993 as part of a general maintenance routine. The original belts were slightly worn, and are currently stored in the blower house for use as spares.

The two (2) flame arrestors, one located up stream of the blower and one located upstream of the flare, were removed and cleaned with a high pressure, hot water wash on May 25, 1993. The flare and blower were turned off for approximately eight hours during this operation. Terra personnel took this opportunity to install lab cock valves on the flame arrestor located upstream from the flare. This was done in order to assess the condition of the flame arrestor by measuring the pressure drop across the arrestor at the two valves.

Inspection of the two flame arrestors showed them to be relatively clean. There was some discoloration of the honeycomb; however there was no indication of a build-up that would lead to the clogging of the flame arrestor. There were particles of HDPE trapped by the arrestor. The source of these particles was likely the cuttings from drilling into the HDPE during previous installation of the sample ports. Terra also replaced the gaskets associated with each flame arrestor.

A crack was observed in the steel post supporting the 6 inch gas line leading to the flare on May 25, 1993. The post was replaced on May 26, 1993.

On May 28, 1993, the dampers on the flare were observed to be closing, which could be caused by lower flows to the flare. In order to increase flow to the flare, the north and central branch valves were opened from 6/13 to 9/13, and the belts on the blower were tightened.

The verbatim auto dialer alerted Terra personnel of alarm conditions three (3) times during the month of May. The time, dates and likely causes for the alarms are summarized in Table 5.

Terra will continue making adjustments to the branch system and well field valves as needed.

If you have any questions or comments, please feel free to call.

Sincerely,
TERRA ENGINEERING & CONSTRUCTION CORP.

Kirk Solberg

Kirk Solberg,
Environmental Geologist

TABLE 1

REFUSE HIDEAWAY LANDFILL
MONTHLY GAS EXTRACTION WELLS MONITORING INFORMATION

Date: MAY 26 1993
Temperature: 75 °F at 1130
Barometric pressure: 30.13 inches Hg
Monitored by: K. Solberg
Gas Detector Model No./Serial No.: GA 1.1 / 381
Date Gas Detector last calibrated: Factory calibrated: MARCH 1993 (4)
Velometer Model No./Serial No.: ALNOR 6000AP / 52697
Date Velometer last calibrated: Factory calibrated: MAY, 1993

Well (1)	Well Pressure (inches W.C.)	Header Pressure (inches W.C.)	CH_4 (2) (%)	O_2 (%)	CO_2 (%)	Valve Setting (fraction open)	Gas (3) Velocity (fpm)	Gas (4) Flow (cfm)	Gas Temp (°F)
GW-1	0	-18	7.0	15.2	6.2	0/13	<10	<.45	78.6
GW-2	-1	-16	0.0	21.7	0.0	1/13	<10	<.45	78.6
GW-3	-4.5	-9	41.4	0.0	35.6	3/9	1400	63.0	67.2
GW-4	-8.5	-9	40.8	0.0	34.4	5/9	1250	56.3	69.0
GW-5	-9	-9.5	53.7	0.0	43.9	7/9	700	31.5	80.2
GW-6	-4	-20	20.5	0.0	27.3	2/9	200	9.0	71.0
GW-7	-21	-23	49.9	0.0	39.7	5/9	1300	58.5	88.8
GW-8(1)	-28	-23	51.6	0.0	42.4	6/9	1200	54.0	97.1
GW-9(1)	-24	-24	52.7	0.0	43.4	5/9	700	31.5	104.1
GW-10	-10	-15	29.4	0.0	30.0	5/9	1700	76.5	94.4
GW-11(1)	-23	-23	53.3	0.0	32.8	5/9	600	27.0	107.0
GW-12	-13	-17.5	41.0	0.0	35.0	5/9	2500	112.5	89.7
GW-13	-17	-18	49.6	0.0	40.2	7/9	1500	67.5	77.9

Notes:

(1) Wells with leachate extraction pump and controls.
(2) Percent CH_4 (methane).
(3) Gas flow (cfm) is calculated by multiplying the gas velocity (fpm) by 0.045 ft^2 for 3-inch diameter PVC pipe.
(4) Calibration checked: MAY 25, 1993
99% CH_4 read 101.0 % CH_4
2.5% CH_4 read 2.6 % CH_4
15% CO_2 read 14.5 % CO_2
NA Not Available or Not Applicable

TABLE 2

REFUSE HIDEAWAY LANDFILL
MONTHLY GAS PROBE MONITORING INFORMATION

Date: MAY 18 1993
Temperature: 58 °F at 11:00
Barometric pressure: 29.81 inches Hg
Monitored by: K. Solberg
Gas Detector Model No./Serial No.: GA1.1 /381
Date Gas Detector last calibrated: Factory calibrated: MARCH 1993 (4)

Probe	Pressure (inches W.C.)	CH_4 (%)	CH_4 (1) (% LEL)	O_2 (%)
G-1S	0	0.0	0.0	20.8
G-1D	0	0.0	0.0	20.7
G-6	0	0.0	0.0	21.0
G-8	0	0.0	0.0	20.5
G-9	0	0.0	0.0	20.8
G-10	Slight negative	0.0	0.0	21.0
GP-11S	0	0.0	0.0	21.3
GP-11D	0	0.0	0.0	21.3
GPW-1S	0	0.0	0.0	19.0
GPW-1M	0	0.0	0.0	20.7
GPW-1D	0	0.0	0.0	18.6
Speedway Building (2)	NA	0.0	0.0	20.7
Speedway Building (3)	NA	0.0	0.0	20.7

Notes:

(1) Percent of lower explosive limit of CH_4 (100% LEL = 5% CH_4 by volume).
(2) Readings obtained from the northeast corner of the interior of the scale house.
(3) Readings obtained from interior of Mechanic's shop.
(4) See calibration data on Table 1.
NA Not Available or Not Applicable.

TABLE 3

REFUSE HIDEAWAY LANDFILL
MONTHLY BRANCH AND FLARE MONITORING INFORMATION
Date: MAY 25, 1993

	Pressure (in. W.C.)	CH_4[1] (%)	O_2 (%)	Gas Velocity (fpm)	Flow[2] (cfm)	Flow[3] (scfm)	Gas Temp	Valve Setting (fraction open)
Branch Monitoring Station								
North Branch	-12.5	41.3	0.0	2000	156.0	160.6	68.1	6/13
Central Branch	-19	42.0	0.0	1400	109.2	104.9	68.7	6/13
South Branch	-19	42.5	0.0	1700	132.6	124.4	58.5	5/13
Flare Inlet Pipe								
Port A	+5							N/A
Port B	+5	42.0	0.0	2400	444.0	439.0	85.5	FULL
Port C	+3							N/A

Notes:

(1) Percent CH_4 (methane).
(2) Gas velocity is converted to gas flow by multiplying fpm x 0.185 @ 6-inch HDPE and fpm x 0.078 @ 4-inch PVC.
(3) Flows have been converted to standard conditions of 70°F and 406.9 inches water.
NA Not applicable.

TABLE 4

REFUSE HIDEAWAY LANDFILL
MONTHLY LEACHATE HEAD MONITORING INFORMATION
Date: May 18, 1993

Well	LEACHATE HEAD [2] (ft)			Current Pump Hours		Previous Pump Hours		Elapsed Pump Hours	
	Gas Well Depth	Depth to Leachate	Leachate Head	Total Hours	Time[3]	Total Hours	Time[3]	Total Hours	Pump Hours
GW-1	51.7	48.2	3.5						
GW-2	53.3	48.5	4.8						
GW-3	57	56.3	0.7						
GW-4	65	52.3	12.7						
GW-5	70	58.1	11.9						
GW-6	36	35.6	0.4						
GW-7	60	53.4	6.6						
GW-8[1]	69	64.5	4.5	7731.4	10:30	7448.4	13:55	524.5	283
GW-9[1]	66	66.0	0.0	10781.0	11:45	10380.4	14:30	525.25	400.6
GW-10	70	65.7	4.3						
GW-11[1]	65	62.7	2.3	415.6	11:40	376.4	14:15	525.5	39.2
GW-12	81	62.0	19.0						
GW-13	69	59.6	9.4						

Notes:

(1) Wells with leachate extraction pumps and controls.
(2) Gas wells retro-fitted with threaded ports on risers October 1992. Leachate levels measured from retro-fitted port on gas well riser. Gas well depths obtained from Construction Observation Report, November, 1990 and Operation and Maintenance Manual, November 1991.
(3) Time of hour meter reading was recorded on April 26, 1993 and May 18, 1993.
Shaded areas do not have reportable information.

TABLE 5

REFUSE HIDEAWAY LANDFILL
MONTHLY SUMMARY OF SYSTEM ALARM LOG
Date: JUNE 9, 1993

Alarm Dates	Alarm Cause	Solution (hours flare not operational)
May 8, 1993	General Alarm condition due to Thunderstorms in the area.	Re-start Flare later the same day. Flare was down for 8.5 hours.
May 18, 1993	Flame Failure while ECRS personnel on site.	Re-start Flare the same day. Flare was down for 15 minutes.
May 29, 1993	Flame Failure, possibly due to low flow.	Re-start Flare on June 1, 1993 and adjust valve to increase flow. Flare down .73 hours.

TABLE 6

REFUSE HIDEAWAY LANDFILL
SUMMARY OF WEEKLY MONITORING INFORMATION
Date: JUNE 9, 1993

	Date: May 3, 1993				Date: May 11, 1993				Date: MAY 18, 1993				Date: May 25, 1993				Date: May 28, 1993			
Description	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)
Branch Monitoring Station																				
North Branch	6/13	-13.5	55.0	0.0	6/13	-15.0	47.5	0.0	6/13	-15.0	46.2	0.0	6/13	-12.5	41.3	0.0	9/13	-29.0	49.5	0.0
Central Branch	6/13	-16.0	56.0	0.0	6/13	-18.5	46.3	0.0	6/13	-18.0	45.3	0.0	6/13	-19.0	42.0	0.0	9/13	-29.5	52.5	0.0
South Branch	4/13	-3.0	57.4	0.0	6/13	-19.0	49.6	0.0	6/13	-18.0	46.9	0.0	6/13	-19.0	42.5	0.0	5/13	-19.0	51.2	0.0
Blower Inlet Pipe																				
Inlet Port A		-27.0	54.8	0.0		-29.0	48.2	0.0		-28.5	46.1	0.0		-29.0	41.6	0.0		-30.0	50.9	0.0
Inlet Port B		-27.5				-30.0				-29.0				-30.0				-30.5		
Outlet Port A		+8.0				+7.0				+7.0				+8.0				+5.0		
Flare Inlet Pipe																				
Sample Port A		+5.5				+4.5				+5.0				+5.0				+3.5		
Sample Port B		+5.5	56.4	0.0		+4.5	48.0	0.0		+5.0	46.2	0.0		+5.0	42.0	0.0		+3.0	50.9	0.0
Sample Port C		+3.5				+3.0				+3.5				+3.0				+3.0		
Flare Temperature (°F)	1500				1510				1515				1532				1484			
Flare Flow (cfm/scfm)	NA				370/377				NA				444/439				370/366			

Notes:

(1) Percent CH_4 (methane).
NA Not Available or Not Applicable.
Shaded areas do not have reportable information.

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ENVIRONMENTAL REMEDIATION
MUNICIPAL & UTILITY CONSTRUCTION
SPECIALTY EARTHWORK

July 29, 1993

Wisconsin Department of
Natural Resources
Environmental Response and
Repair Section
Bureau of Solid and Hazardous
Waste Management
101 South Webster Street,
GEF II, SE/3
Madison, Wisconsin 53707

Attn: Ms. Theresa Evanson

Re: Operation and Maintenance
Summary - June 1993
Landfill Gas and Leachate
Extraction System
Refuse Hideaway Landfill -
Middleton, Wisconsin

Dear Ms. Evanson:

This letter summarizes operation and maintenance (O&M) activities performed by Terra Engineering & Construction Corporation (Terra), during the month of June 1993, at the Refuse Hideaway Landfill. Specific tasks are discussed in the following sections:

SCHEDULED LEACHATE LOADOUT

Leachate/Condensate was pumped and transported by Al's Modern Sewer Service to the Madison Metropolitan Sewerage District Treatment facility. The hauling dates and quantities are as follows:

	Measured Volume (gals)
June 12, 1993	3905 Gallons
June 18, 1993	2622 Gallons

WEEKLY/MONTHLY MONITORING SCHEDULE

Weekly/Monthly monitoring of the landfill gas and leachate extraction system was performed on the following dates:

June 2, 1993	Weekly
June 14, 1993	Weekly
June 22, 1993	Weekly
June 28 and June 30, 1993	Weekly/Monthly (1)

2201 VONDRON ROAD
MADISON, WI 53704-6795
608/221-3501 PHONE
608/221-4075 FAX

(1) Well Field Flow and Gas Content Measurements taken 6-30-93 as Flare was shutting down periodically on 6-28-93

Summary tables for weekly and monthly monitoring schedules are attached.

OBSERVATION AND DISCUSSION

The quarterly leachate sample was obtained on June 1, 1993 by Terra personnel and submitted to Mid-State laboratories for analysis. The analytical results were sent to Madison Metropolitan Sewerage District (MMSD). A copy of the analytical results were forwarded to you under separate cover.

In an effort to increase the gas flow to the flare, changes were made at the valves in the well field and at the Branch monitoring system on June 2, 1993. The initial and final wellhead pressures in inches water column are shown in parenthesis. The valve at gas well 3 (GW-3) was opened from 2/9 to 3/9 (-1.5; -2.3). The valve at gas well 10 (GW-10) was opened from 1/9 to 3.5/9 (+0.5; -3.0). The valve on gas well 12 (GW-12) was opened from 2/9 to 4/9 (-8.0; -8.5). The branches were adjusted as follows: The initial and final header pressures are shown in parenthesis. The north branch valve opened from 6/13 to 7/13 (-14; -18.5), central branch opened from 6/13 to 8/13 (-11; -20) and the southern branch valve was exercised from 6/13 and back to 6/13 (-14; -17). The result of these adjustments was an increase in flow from 407 cubic feet per minute (cfm) to 463 cfm.

On June 8, 1993, Terra's subcontractor, Clean Air Engineering (CAE) of Palatine, Illinois obtained flare inlet samples for the Bi-annual analysis. A preliminary copy of their report is enclosed. A Terra representative was on-site to observe the operation and took the opportunity to replace valves on gas wells GW-8 and GW-9. Their final report will be submitted when we receive it.

On June 14, 1993, while resetting what turned out to be an erroneous high leachate level alarm, water was observed inside the control panel at the leachate tank. The water was entering the panel through a 1-inch electrical conduit. On June 22, 1993 a small weep hole was drilled into the conduit approximately 1.5 feet below the panel to allow water to drain and keep water from entering the panel.

The false high leachate level alarms may be due to a faulty switch or relay in the leachate panel. Condensate was observed within the switch and maybe causing the faulty alarm. Terra is currently assessing that possibility and the switch may need to be replaced. Please note that high leachate level alarms do not shut down the flare, a general alarm condition is reported and the power to the leachate pumps is turned off to prevent an overflow of the leachate collection tank. The verbatim auto dialer system alerted Terra of two general alarms due to high leachate levels during the month of June. These false alarms are summarized in Table 5.

The flare went down seven times during the month of June due to flame failure. The verbatim system alerted Terra personnel of all flame failures except for one on June 24, 1993. It is unclear why the system did not alert a flame failure on that day. The numerous flame failures may be due to an influx of high concentrations of methane gas, as evidenced by occasional high temperature spikes on the temperature recorder preceding a shut down. The shut down may occur when the flame from the high concentration methane gas rises out of "sight" of the ultra violet (UV) sensor. The system senses that the flame is out and the system shuts down.

Mr. John Gwinn of Linklater Corp. indicated in his report that the UV sensor was working "very well". Another possible cause for shut down due to flame failure is condensate in the pipe leading to flare. If the condensate reaches the burner spud, the liquid will vaporize and produce steam. The steam clouds the U.V. sensor to the point where the sensor cannot "see" the flame and a shut down results. Terra plans to remove and clean the UV sensor prior to the next flare start after a flame failure. A copy of Mr. Gwinn's report is enclosed.

A routine cap inspection during the monthly monitoring noted stressed vegetation in the area around gas well 5 (GW-5). In order to determine if the vegetation stress was due to gas migration or erosion from recent rains, three (3) shallow gas readings were obtained by advancing a probe approximately 18 to 24 inches into the soil. The infra-red gas analyzer was then used to obtain gas readings within the probe hole. Readings ranged from 53% to 55.5% methane in areas of stressed vegetation and 15% methane in areas where there was normal vegetation.

During the monthly monitoring, high methane content was observed at gas probe 11 shallow and deep (GP-11s and GP-11d). Methane concentrations of 40% and 58% respectively are the highest yet observed at these gas probes dating back to June 1992. The previous high readings at GP-11d were 32.3% and 21.9% respectively on July 24, 1992. Terra personnel adjusted the valve on GW-5 to full open in order to draw more gas out of this area. Terra will monitor GP-11s and GP-11d prior to the next monthly monitoring event in order to check the effectiveness of opening GW-5.

Leachate level readings obtained during monthly monitoring showed excessive leachate heads in GW-8 and GW-9. The readings in GW-8 and GW-9 indicated leachate heads of 23.7 and 20.3 feet respectively. These high heads are likely due to the electric tape measure reacting to condensate within the gas wells.

Terra will continue making adjustments to the branch system and well field valves as needed. We will also keep you updated on the conditions of the leachate tank switch, UV sensor at the flare and the gas concentrations at GP-11s and GP-11d and the elevated leachate heads at gas wells GW-8 and GW-9.

If you have any questions or comments, please feel free to call.

Sincerely,
TERRA ENGINEERING & CONSTRUCTION CORP.

Kirk Solberg

Kirk Solberg,
Environmental Geologist

Enclosures: As Stated

TABLE 1

REFUSE HIDEAWAY LANDFILL
MONTHLY GAS EXTRACTION WELLS MONITORING INFORMATION

Date: JUNE 28, 1993
Temperature: 60 °F at 11:00
Barometric pressure: 29.95 inches Hg
Monitored by: K. Solberg
Gas Detector Model No./Serial No.: GA 1.1 / 381
Date Gas Detector last calibrated: Factory calibrated: MARCH 1993 (4)
Velometer Model No./Serial No.: ALNOR 6006AP / 52697
Date Velometer last calibrated: Factory calibrated: MAY 1993

Well (1)	Well Pressure (inches W.C.)	Header Pressure (inches W.C.)	CH_4 (2) (%)	O_2 (%)	CO_2 (%)	Valve Setting (fraction open)	Gas (3) Velocity (fpm)	Gas (4) Flow (cfm)	Gas Temp (°F)
GW-1	0	-16	16.2	13.1	11.1	1/13	<100	<4.5	67.6
GW-2	0	-15	21.1	0.0	26.1	0/13	<100	<4.5	67.6
GW-3	-6.5	-15	48.4	0.0	37.4	3/9	1400	63.0	65.3
GW-4	-10	-17	49.9	0.0	37.8	2/9	750	33.8	68.0
GW-5	-16.5	-16.5	55.7	0.0	43.1	7/9	420	18.9	81.1
GW-6	-3	-20	30.5	0.0	30.3	2/9	700	31.5	75.0
GW-7	-19	-20	54.8	0.0	40.2	5/9	1550	69.8	86.0
GW-8(1)	-16	-18	55.3	0.0	43.1	6/9	1200	54.0	98.2
GW-9(1)	-20	-20	54.7	0.0	43.3	5/9	600	27.0	101.5
GW-10	-4	-20	34.0	0.0	32.8	2/9	1000	45.0	93.3
GW-11(1)	-18	-18	56.3	0.0	42.1	5/9	600	27.0	101.1
GW-12	-10	-19	45.1	0.0	36.4	3/9	2450	110.3	83.1
GW-13	-18.5	-19	50.5	0.0	40.1	7/9	1250	56.3	85.0

Notes:

(1) Wells with leachate extraction pump and controls.
(2) Percent CH_4 (methane).
(3) Gas flow (cfm) is calculated by multiplying the gas velocity (fpm) by 0.045 ft^2 for 3-inch diameter PVC pipe.
(4) Calibration checked: JUNE 28, 1993
99% CH_4 read 100.1 % CH_4
2.5% CH_4 read 2.5 % CH_4
15% CO_2 read 14.5 % CO_2

NA Not Available or Not Applicable

TABLE 2

REFUSE HIDEAWAY LANDFILL
MONTHLY GAS PROBE MONITORING INFORMATION

Date: JUNE 28, 1993
Temperature: 70 F at 11:00
Barometric pressure: 29.94 inches Hg
Monitored by: K. Solberg
Gas Detector Model No./Serial No.: GA 1.1 / 381
Date Gas Detector last calibrated: Factory calibrated: MARCH, 1993 (4)

Probe	Pressure (inches W.C.)	CH_4 (%)	CH_4 (1) (% LEL)	O_2 (%)
G-1S	0	0.0	0	20.9
G-1D	0	0.1	2	20.8
G-6	0	0.0	0	21.2
G-8	0	0.0	0	20.9
G-9	0	0.0	0	20.4
G-10	-0.5	0.0	0	21.0
GP-11S	0	40.0	>100	0.0
GP-11D	0	58.5	>100	0.0
GPW-1S	0	0.0	0	19.6
GPW-1M	-0.5	0.1	2	21.0
GPW-1D	-0.5	0.0	0	20.9
Speedway Building (2)	NA	0.0	0	20.9
Speedway Building (3)	NA	0.0	0	20.9

Notes:

(1) Percent of lower explosive limit of CH_4 (100% LEL = 5% CH_4 by volume).
(2) Readings obtained from the northeast corner of the interior of the scale house.
(3) Readings obtained from interior of Mechanic's shop.
(4) See calibration data on Table 1.
NA Not Available or Not Applicable.

TABLE 3

REFUSE HIDEAWAY LANDFILL
MONTHLY BRANCH AND FLARE MONITORING INFORMATION
Date: JUNE 28, 1993

	Pressure (in. W.C.)	CH_4[(1)] (%)	O_2 (%)	Gas Velocity (fpm)	Flow[(2)] (cfm)	Flow[(3)] (scfm)	Gas Temp	Valve Setting (fraction open)
Branch Monitoring Station								
North Branch	-20	45.1	0.0	2100	163.8	155.2	72.3	6/13
Central Branch	-18.5	48.5	0.0	1500	117.0	110.8	74.6	6/13
South Branch	-19.5	49.8	0.0	1600	124.8	119.8	66.1	6/13
Flare Inlet Pipe								
Port A	+ 4.5							N/A
Port B	+4.0	45.5	0.0	2550	471.8	456.3	94.0	Full
Port C	+3.0							N/A

Notes:

(1) Percent CH_4 (methane).
(2) Gas velocity is converted to gas flow by multiplying fpm x 0.185 @ 6-inch HDPE and fpm x 0.078 @ 4-inch PVC.
(3) Flows have been converted to standard conditions of 70°F and 406.9 inches water.
NA Not applicable.

TABLE 4

REFUSE HIDEAWAY LANDFILL
MONTHLY LEACHATE HEAD MONITORING INFORMATION
Date: JUNE 30, 1993

Well	LEACHATE HEAD [2] (ft)			Current Pump Hours		Previous Pump Hours		Elapsed Pump Hours	
	Gas Well Depth	Depth to Leachate	Leachate Head	Total Hours	Time[3]	Total Hours	Time[3]	Total Hours	Pump Hours
GW-1	51.7	47.8	4.1						
GW-2	53.3	48.1	5.2						
GW-3	57	56.2	0.8						
GW-4	65	53.0	12.0						
GW-5	70	57.6	12.4						
GW-6	36	35.7	0.3						
GW-7	60	54.1	5.9						
GW-8[1]	69	45.3	23.7	7967.1	1:55	7731.4	10:30	1035.5	235.7
GW-9[1]	66	45.7	20.3	10798.1	1:50	10781.0	11:45	1034.25	17.1
GW-10	70	64.9	5.1						
GW-11[1]	65	62.7	2.3	476.4	2:00	415.6	11:40	1034.3	60.8
GW-12	81	60.9	20.1						
GW-13	69	59.7	9.3						

Notes:

(1) Wells with leachate extraction pumps and controls.
(2) Gas wells retro-fitted with threaded ports on risers October 1992. Leachate levels measured from retro-fitted port on gas well riser. Gas well depths obtained from Construction Observation Report, November, 1990 and Operation and Maintenance Manual, November 1991.
(3) Time of hour meter reading was recorded on MAY 18, 1993 and JUNE 30, 1993.
Shaded areas do not have reportable information.

TABLE 5

REFUSE HIDEAWAY LANDFILL
MONTHLY SUMMARY OF SYSTEM ALARM LOG
Date: July 22, 1993

Alarm Dates	Alarm Cause	Solution (hours flare not operational)
06/07/93	General alarm condition possibly due to thunder storms in the area.	Re-start flare. Flare was down for 3.25 hrs.
06/12/93	Flame failure alarm - cause not determined	Re-start flare. Flare was down for 23.25 hrs.
06/14/93	General alarm condition due to Erroneous High Leachate alarm. Flare did not shut down.	Re-set alarm on leachate tank control panel.
06/17/93 06/17/93	General alarm condition due to false High Leachate alarm. Flame failure - cause not determined.	Re-start flare, re-set High Leachate Level alarm. Flare was down 19.5 hrs.
06/25/93	No alarm condition alerted. Cause for flare shut down and absence of alarm not determined.	Re-start flare. Flare was down approximately 21.0 hrs.
06/28/93	Flame failure three times this date. Cause not determined.	Re-start flare. Flare was down approximately 0.5 hrs.
06/30/93 06/30/93	Flame failure - cause not determined. General alarm and flame failure likely due to high winds and lightning in area.	Re-start flare. Flare was down approximately 0.25 hrs. Re-start flare, flare was down approximately 5.0 hrs.

TABLE 6

REFUSE HIDEAWAY LANDFILL
SUMMARY OF WEEKLY MONITORING INFORMATION
Date: July 8, 1993

Description	Date: June 2, 1993				Date: June 14, 1993				Date: June 22, 1993				Date: June 28, 1993				Date:			
	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)
Branch Monitoring Station																				
North Branch	6/13	-20.5	55.5	0.0	7/13	-20.0	46.7	0.0	6/13	-20.0	46.1	0.0	6/13	-20.0	45.1	0.0				
Central Branch	6/13	-26.5	56.7	0.0	8/13	-23.0	48.5	0.0	6/13	-18.0	47.9	0.0	6/13	-18.5	48.5	0.0				
South Branch	5/13	-18.0	57.6	0.0	6/13	-23.0	49.1	0.0	6/13	-19.0	50.0	0.0	6/13	-19.5	49.8	0.0				
Blower Inlet Pipe																				
Inlet Port A		-30.5	57.0	0.0		-27.0	48.8	0.0		-27.5	47.3	0.0		-28.0	46.5	0.0				
Inlet Port B		-31.0				-28.0				-28.0				-28.5						
Outlet Port A		+4.5				+8.0				+6.5				+6.5						
Flare Inlet Pipe																				
Sample Port A		+3.0				+5.5				+4				+4.5						
Sample Port B		+2.8	57.2	0.0		+5.0	48.4	0.0		+4	46.7	0.0		+4.0	45.5	0.0				
Sample Port C		+2.0				+3.5				+2.5				+3.0						
Flare Temperature (°F)	1500				1494				1510				1493							
Flare Flow (cfm/scfm)	407/401.7				407/NA				379/366				771/456							

Notes:

(1) Percent CH_4 (methane).
NA Not Available or Not Applicable.
Shaded areas do not have reportable information.

ECRS\Refuse\forms1.bjh

ENVIRONMENTAL CONSTRUCTION & REMEDIATION SERVICES, INC.
CAE Project No: 6671
Flare Inlet

VOLATILE ORGANICS PARAMETERS

Run No.			1	2	3
Date (1993)			June 8	June 8	June 8
Start Time (approx.)			09:25	10:55	12:23
Stop Time (approx.)			10:25	11:55	13:33
Sampling Locations					
P_b	Barometric pressure (in. Hg)		28.76	28.76	28.76
V_m	Volume metered, meter conditions (liter)		56.38	51.85	49.73
V_m	Volume metered, meter conditions (ft^3)		1.991	1.831	1.756
ΔH	Meter box orifice pressure drop (in. H_2O)		1.0	0.8	0.8
Y_d	Dry gas meter correction factor		0.9991	0.9991	0.9991
T_m	Dry gas meter temperature (°F)		79	84	81
Calculated Results					
V_{mstd}	Volume metered, standard (ft^3)		1.877	1.710	1.649
Flow Results from Velocity and Moisture Parameters					
Q_a	Volumetric flow rate, actual (acfm)		341	340	345
Q_{std}	Volumetric flow rate, standard (dscfm)		311	310	316
Benzene		Blank			
	mg	<0.002	0.401	0.339	0.322
C	Concentration (ppm)		2.32	2.16	2.12
E	Emission rate (lb/hr)		8.80E-03	8.13E-03	8.16E-03
Vinyl Chloride					
	mg	<0.003	<0.003	<0.003	<0.003
C	Concentration (ppm)		<0.022	<0.024	<0.025
E	Emission rate (lb/hr)		<6.58E-05	<7.20E-05	<7.60E-05

< Indicates below detection limit.

PRELIMINARY

CAE Project No: 6671
Flare Inlet

VELOCITY AND MOISTURE PARAMETERS

Run No.		1	2	3
Date (1993)		June 8	June 8	June 8
Start Time (approx.)		09:22	10:55	12:23
Stop Time (approx.)		10:22	11:55	13:33
Sampling Conditions				
Y_d	Dry gas meter correction factor	0.9865	0.9865	0.9865
C_p	Pitot tube coefficient	0.99	0.99	0.99
	Static pressure (in. H_2O)	6.4	6.6	6.5
A_s	Sample location area (ft^2)	0.15	0.15	0.15
P_b	Barometric pressure (in. Hg)	28.76	28.76	28.76
O_2[1]	Oxygen (dry volume %)	20.9	20.9	20.9
CO_2[1]	Carbon dioxide (dry volume %)	0.0	0.0	0.0
V_{lc}	Liquid collected (ml)	18.0	21.0	16.0
V_m	Volume metered, meter conditions (ft^3)	48.83	48.47	48.04
T_m	Dry gas meter temperature (°F)	91	92	91
T_s	Stack temperature (°F)	94	93	93
ΔH	Meter box orifice pressure drop (in. H_2O)	2.00	2.00	2.00
Flow Results				
V_{wstd}	Volume of water collected (ft^3)	0.85	0.99	0.75
V_{mstd}	Volume metered, standard (ft^3)	44.60	44.15	43.89
P_s	Sample gas pressure, absolute (in. Hg)	29.23	29.25	29.24
P_v	Vapor pressure, actual (in. Hg)	1.58	1.55	1.54
B_{wo}	Moisture in sample (% by volume)	1.86	2.19	1.69
B_{ws}	Saturated moisture (% by volume)	5.42	5.32	5.26
$\sqrt{\Delta P}$	Velocity head ($\sqrt{}$in. H_2O)	0.550	0.549	0.557
M_d	MW of sample gas, dry (lb/lb-mole)	28.84	28.84	28.84
M_s	MW of sample gas, wet (lb/lb-mole)	28.63	28.60	28.65
V_s	Velocity of sample (ft/sec)	37.9	37.8	38.3
Q_a	Volumetric flow rate, actual (acfm)	341	340	345
Q_{std}	Volumetric flow rate, standard (dscfm)	311	310	316

[1] Oxygen and carbon dioxide values were assumed.

PRELIMINARY

SUMMARY OF TEST RESULTS - Table 1

EPA Methods 18 and 25C
Benzene, Vinyl Chloride and TGNMO
Flare Inlet

Run No.		1	2	3	Average
Date (1993)		June 8	June 8	June 8	
Start Time (approx.)		09:25	10:55	12:23	
Stop Time (approx.)		10:25	11:55	13:33	
Gas Conditions					
T_s	Temperature (°F)	94	93	93	93
B_{wo}	Moisture (volume %)	1.86	2.19	1.69	1.91
O_2[1]	Oxygen (dry volume %)	20.9	20.9	20.9	20.9
CO_2[1]	Carbon dioxide (dry volume %)	0.0	0.0	0.0	0.0
Volumetric Flow Rate					
Q_a	Actual conditions (acfm)	341	340	345	342
Q_{std}	Standard conditions (dscfm)	311	310	316	313
Volatile Organics					
Benzene					
	mg	0.401	0.339	0.322	0.354
C	Concentration (ppm)	2.32	2.16	2.12	2.20
E	Emission rate (lb/hr)	8.80E-03	8.13E-03	8.16E-03	8.37E-03
Vinyl Chloride					
	mg	<0.003	<0.003	<0.003	<0.003
C	Concentration (ppm)	<0.022	<0.024	<0.025	<0.023
E	Emission rate (lb/hr)	<8.58E-05	<7.20E-05	<7.60E-05	<7.13E-05
TGNMO as carbon					
C	Concentration (ppm)	1,207.2	1,558.3	1,271.1	1,345.5
E	Emission rate (lb/hr)	0.703	0.904	0.751	0.786

[1] Oxygen and carbon dioxide values were assumed.
< Indicates below detection limit.

8.37E-03 = 73.3 lb/yr

PRELIMINARY

ECRS
2201 VONDRON RD.
MADISON, WI. 73704-6795

6-29-93

ATTN:KIRK SOLBERG
REFUGE HIDEAWAY LANDFILL FLARE
SERVICE CALL

DEAR BRIAN:

I AM VERY PLEASED WITH WHAT WE WERE ABLE TO ACCOMPLISH MONDAY ON SITE WITH THE FLARE. I DO APPRECIATE THE COURTESY AND HELP YOU AND BRIAN HEGGE EXTENDED TO ME WHILE I WAS THERE.

ENCLOSED PLEASE FIND THE FOLLOWING:

MY TRIP REPORT INCLUDING FLARE CONDITION AND SUGGESTED SPARE PARTS LIST.

PAINTING SPECIFICATION AND DATA SHEET FOR SHERWIN WILLIAMS RUST INHIBITIVE, HEAT RESISTANT PAINT.

OUR INVOICE FOR THE SERVICE CALL.

1 - SET OF KEYS FOR REFUSE HIDEAWAY WHICH I FAILED TO RETURN TO YOU ON MONDAY.

AS PER OUR CONVERSATION ON MONDAY I AM VERY INTERESTED IN A COPY OF THE GAS TEST REPORT THAT THE DNR IS CONDUCTING AND THE QUANTITY OF H2S IN THE GAS.

I WOULD LIKE A COPY OF 24 HR. SECTION OF THE TEMPERATURE RECORDER CHART AFTER YOUR NEXT GOOD STORM. THIS WILL ALLOW ME TO ANALYZE HOW WELL THE TEMPERATURE CONTROLLER IS RESPONDING TO SEVERE CHANGES.

AS IN THE PAST, PLEASE IF YOU HAVE ANY QUESTIONS, OR IF WE CAN BE OF SERVICE IN THE FUTURE DO NOT HESITATE TO CONTACT US.

BEST REGARDS,

JOHN W GWINN
MGR. OF TECHNICAL SERVICE

ENCLS:

SERVICE REPORT

REFUSE HIDEAWAY LANDFILL SITE

5-2-93 I ARRIVED MADISON WI. 9:30 P.M. AND MET KIRK AT THE HAMPTON INN ABOUT 10:30 P.M. WE WENT TO THE REFUSE HIDEAWAY LANDFILL SITE AND STARTED THE FLARE. IT STARTED OK THE PILOT WAS A LITTLE HESITANT ON THE FIRST ATTEMPT TO LIGHT BUT IGNITED OK ON THE SECOND ATTEMPT.

THE BURNER LIT OFF AS QUIET AND SMOOTH AS EVER, WITH A VERY INTENSE, SHORT, BLUE FLAME. THERE WAS A SMALL AMOUNT OF YELLOW/ORANGE TINGE TO THE ENDS OF THE FLAME INTERMITTENTLY WHEN IT FIRST IGNITED AND REMAINED FOR ABOUT 2-4 MINUTES. AS SOON AS THE BURNER BLOCKS & STACK WARMED UP, THESE YELLOW/ORANGE FLAME TAILS DISAPPEARED COMPLETELY.

WE OBSERVED THE OPERATION FOR ABOUT ONE HALF HOUR, AND THE TEMPERATURE CONTROLLER WAS NOT HOLDING TEMPERATURE WELL.

WE SHUT-DOWN THE FLARE AND CLOSED THE PANEL AND RETURNED TO THE HOTEL.

WE WILL START AGAIN AT 7:00 A.M. TOMORROW.

5-3-93 I ARRIVED ON SITE AT REFUSE HIDEAWAY LANDFILL AT 7:00 A.M. WE OPENED THE HIGH FIRE DAMPER AND INSPECTED THE INSIDE OF THE FLARE, OUR FINDINGS WERE AS FOLLOWS:

1. CERAMIC FIBER LINING IS IN EXCELLENT CONDITION SOME DISCOLORATION AT AND ABOVE THE BURNER LEVEL.

2. NO VISIBLE SIGNS OF MISSING OR DAMAGED LINING, OR HOT SPOTS ON THE EXTERIOR OF THE STACK.

3. THE BURNER TILES ARE ALSO IN EXCELLENT CONDITION. THERE IS ONLY ONE OUTER TILE CRACKED. THE CRACKED TILE HAS NOT MOVED AND IS SECURELY HELD IN PLACE BY THE RETAINING CLIPS.

4. THE ORIFICES ON THE BURNER SPUDS ARE ALL CLEAR AND SHOW NO SIGN OF CLOGGING, EXCESSIVE DISCOLORATION FROM EXCESSIVE TEMPERATURE OR EROSION.

5. THE PILOT CAN & ORIFICE ALSO ARE CLEAN AND CLEAR. THE IGNITOR ROD WAS WARPED AND OUT OF ADJUSTMENT.

6. THERE IS SOME MATERIAL, ASH & REFRACTORY MORTAR (VERY SMALL AMOUNT) ON THE FLOOR OF THE FLARE. THIS MATERIAL IS OF NO CONSEQUENCE.

THEN WE INSPECTED THE FLARE EXTERIOR AND OUR FINDINGS WERE AS FOLLOWS:

1. THE FLARE IS RUSTING IN SOME AREAS MAINLY AROUND THE TEST PORTS AND PILOT HOUSING, WHICH ARE EXPOSED TO HIGHER HEAT. THERE ARE SEVERAL OTHER AREAS THAT ARE SHOWING SIGNS OF WEAR BUT NO SIGNS OF SERIOUS CORROSION.

2. THE HIGH FIRE DAMPER MOTOR ACTUATION ARM WAS BENT. I DISCONNECTED THE LINKAGE AND STRAIGHTENED THE CRANK ARM AND RE-ADJUSTED THE DAMPER FOR PROPER OPERATION.

3. THE PILOT ASSEMBLY WAS DISCONNECTED AND REMOVED. WE RE-ADJUSTED THE SPARK ROD GAP AND ALIGNMENT AND RE-ASSEMBLED THE PILOT. WE THEN TESTED THE PILOT AND THE UV SYSTEM. ALL OF THE PILOT SYSTEM WORKS VERY WELL.

NEXT WE CHECKED THE BLOWER AND RE-TENSIONED THE BELTS. THE FINDINGS WERE:

1. ONE OF THE TWO BELTS IS STRETCHED AND THEY WILL NOT TIGHTEN EQUALLY . THIS LEAVES ONE BELT CARRYING MOST OF THE LOAD.

2. I LATER CHECKED THE BEARINGS, AND THEY DO NOT SEEM TO BE RUNNING HOT AND ARE OPERATING QUIETLY. THE BLOWER ALSO SEEMS TO BE IN GOOD RUNNING ORDER.

WE THEN STARTED THE FLARE AND WITH THE FOLLOWING RESULTS:

THE PILOT LIT AND MAINTAINED U.V. SIGNAL ON THE FIRST ATTEMPT.

I THEN TURNED THE OPERATE SWITCH TO AUTOMATIC AND THE BLOWER STARTED AND THE BURNER IGNITED VERY WELL, LIGHT BLUE FLAME WITH A VERY INTERMITTENT YELLOW/ORANGE TIPS. AS SOON AS THE FLARE WARMED UP THE YELLOW/ORANGE COLORATION LEFT.

WE CHECKED THE PRESSURE ON THE BURNER, AND IT WAS 2.5" W.C. THE PRESSURE AT THE BLOWER WAS OVER 4.5" LEAVING A 2" W.C. DROP ACROSS THE PIPING AND THE FLAME ARRESTOR.

I BELIEVE THAT THE FLAME ARRESTOR IS GETTING DIRTY AND NEEDS TO BE CLEANED.

WITH THE FLARE WELL WARMED UP, I STARTED RE-TUNING THE CONTROLLER. IT HAD BEEN OPERATING WITH A 75 DEGREE F TO 200 DEGREE F TEMPERATURE SWING. I FINALLY SET THE CONTROLLER AND IT IS HOLDING ABOUT A 50 DEGREE TO 75 DEGREE TOTAL SWING WITH A VERY FAST RECOVERY (LESS THAN 4 MINUTES).

DURING THE TUNING PROCESS I CHANGED THE MANUAL GAS VALVE SETTING TO CAUSE A TEMPERATURE UPSET TO WATCH THE CONTROLLERS RESPONSE.

DURING THESE VALVE CHANGES THE FOLLOWING OBSERVATIONS WERE MADE.

MAXIMUM BURNER PRESSURE 3.5 W.C. AT THE BURNER. THE BURNER OPERATION VERY STABLE LIGHT BLUE IN COLOR AND NO YELLOW OR ORANGE TAILS.

BURNER PRESSURE REDUCED TO 1.0" W.C. BURNER REMAINED VERY STABLE AND WITH GOOD COLOR (NO YELLOW FLARE TAILS)

BURNER PRESSURE REDUCED TO 0.5" W.C. AND STILL STABLE LIGHT BLUE IN COLOR WITH VERY INTERMITTENT YELLOW/ORANGE FLAME TAILS BUY VERY SPORADIC.

BURNER PRESSURE REDUCED TO LESS THAN 0.5" W.C. WITH STILL GOOD BURNER COMBUSTION, BUT NOT AS STABLE AS BEFORE, STILL A GOOD CLEAN FLAME.

PRESSURE REDUCED TO 0.25" W.C. AND FLAME BECAME UN-STABLE WITH SOME CIRCULAR SWIRLING AND YELLOW FLAME TAILS. THE FLARE DID NOT HOLD TEMPERATURE AT THIS LOW FLOW RATE, AND WHEN THE DAMPERS WENT COMPLETELY CLOSED, THE FLAME RAISED UP OFF OF THE BURNER AND OUT OF THE LINE OF SIGHT OF THE U.V. SENSOR THE U.V. LOST SIGHT OF THE FLAME AND SHUT THE SYSTEM DOWN.

I RE-SET THE FLAME SAFEGUARD AND RE-SET THE GAS FLOW TO ABOUT 0.50" W.C. AND STARTED THE FLARE AGAIN. IT IGNITED WITHOUT A PROBLEM AND WOULD MAINTAIN TEMPERATURE AT 0.50" W.C..

IF THE NEED EVER ARISES TO OPERATE THE FLARE ON A CONTINUAL BASIS AT A FLOW RATE LESS THAN THAT OF 0.5" W.C., IT WILL BE NECESSARY TO RE-ADJUST THE LOW FIRE DAMPER. AT THIS LOWER FLOW THE FLARE MAY NOT MAINTAIN MINIMUM OPERATING TEMPERATURE OF 1400 DEGREE F.

IF THE METHANE CONTENT DROPS TO BELOW 42% IT WILL BE NECESSARY TO RE-ADJUST THE SHUTTERS ON THE BURNER. IF THIS DOES OCCUR CONTACT LINKLATER CORPORATION/CUSTOM COMBUSTION ENGINEERING FOR THE PROPER SETTING.

FROM MY OBSERVATION AT THIS SITE, HAVING INSUFFICIENT GAS SUPPLY TO OPERATE PROPERLY IS A LONG WAY OFF, THERE SEEMS TO BE AN ABUNDANCE OF GAS AS THE FIELD GOES POSITIVE IN A VERY SHORT TIME WHEN THE FLARE IS SHUT DOWN.

I WAS VERY PLEASED WITH THE CONDITIONS OF THE FLARE AND ITS OPERATIONS, ESPECIALLY FOR BEING IN SERVICE FOR 2 YEARS. THE FLARE AND CONTROLS ARE IN <u>EXCELLENT CONDITION.</u>

WE HAVE THE FOLLOWING SUGGESTIONS:

1. PURCHASE 2 SETS OF GASKETS (4 TOTAL) FOR EACH OF THE TWO FLAME ARRESTORS. AFTER THE NEW GASKETS HAVE ARRIVED, DISASSEMBLE THE FLAME ARRESTORS AND STEAM CLEAN THE CENTER FLAME BANK AND INSPECT. THE CELLS SHOULD ALL BE CLEAR AFTER CLEANING.
   AFTER CLEANING, RE-ASSEMBLE USING NEW GASKETS AND CAREFULLY RE-TIGHTEN THE BOLTS. THE BOLTS ARE MUCH LARGER THAN NEEDED AND OVER TORQUING WILL CAUSE DAMAGE TO THE FLAME ARRESTOR HOUSING.

2. RETURN THE OLD THERMOCOUPLE TO LINKLATER CORPORATION/CUSTOM COMBUSTION ENGINEERING TO BE RE-BUILT. THIS WILL SERVE AS A SPARE AND RE-BUILDING WILL BE MUCH CHEAPER THAN A NEW THERMOCOUPLE.

3. RE-PAINT THE EXTERIOR OF THE FLARE, OR AT LEAST TOUCH UP THE RUSTED AREAS. PAINT THE PILOT GAS SUPPLY LINE SAFETY YELLOW.

WE RECOMMEND THAT THE FOLLOWING PARTS BE KEPT ON HAND AS SPARES:

1 - SPARE DUAL ELEMENT THERMOCOUPLE

1 - U.V. SENSOR REPLACEMENT TUBE

1 - SET OF "V" BELTS FOR THE BLOWER DRIVE

2 - REPLACEMENT SWIVEL JOINT FOR THE DAMPER ACTUATOR RODS

1 - SET (2) GASKETS FOR EACH FLAME ARRESTOR

10 - CONTROL PANEL REPLACEMENT LAMPS

1- IGNITER ELECTRODE AND INSULATOR ASSEMBLY

ECRS

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   AFTER CLEANING, RE-ASSEMBLE USING NEW GASKETS AND CAREFULLY RE-TIGHTEN THE BOLTS. THE BOLTS ARE MUCH LARGER THAN NEEDED AND OVER TORQUING WILL CAUSE DAMAGE TO THE FLAME ARRESTOR HOUSING.

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1- IGNITER ELECTRODE AND INSULATOR ASSEMBLY

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TERRA
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ENVIRONMENTAL REMEDIATION
MUNICIPAL & UTILITY CONSTRUCTION
SPECIALTY EARTHWORK

August 12, 1993

Wisconsin Department of
Natural Resources
Environmental Response and
Repair Section
Bureau of Solid and Hazardous
Waste Management
101 South Webster Street,
GEF II, SE/3
Madison, Wisconsin 53707

Attn: Ms. Theresa Evanson

Re: Operation and Maintenance
Summary - July 1993
Landfill Gas and Leachate
Extraction System
Refuse Hideaway Landfill -
Middleton, Wisconsin
Terra Job # 468

Dear Ms. Evanson:

This letter summarizes operation and maintenance (O&M) activities performed by Terra Engineering & Construction Corporation (Terra), during the month of July, 1993, at the Refuse Hideaway Landfill. Specific tasks are discussed in the following sections:

SCHEDULED LEACHATE LOADOUT

Leachate/Condensate was pumped and transported by Al's Modern Sewer Service to the Madison Metropolitan Sewerage District Treatment facility. The hauling dates and quantities are as follows:

	Measured Volume (gals)
July 07, 1993	2,383 Gallons
July 14, 1993	15,311 Gallons(3.5 Loads)

WEEKLY/MONTHLY MONITORING SCHEDULE

Weekly/Monthly monitoring of the landfill gas and leachate extraction system was performed on the following dates:

July 07, 1993	Weekly
July 13, 1993	Weekly
July 21, 1993	Weekly
July 27 and July 30, 1993	Weekly/Monthly(1)

(1) Leachate head measurement taken 7/30/93

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MADISON, WI 53704-6795
608/221-3501 PHONE
608/221-4075 FAX

Summary tables for weekly and monthly monitoring schedules are attached.

OBSERVATION AND DISCUSSION

Heavy rains in the area during the month of July (9.34 inches) [2] caused minor wash-out areas of the gravel access road on the site. Heavy rains also had an impact on leachate hauling quantities. On July 13, 1993 the collection tank contained a measured volume of 22,080 gallons. Al's Modern Sewer Service was called immediately and on July 14, 1993 a total 15,311 gallons was pumped from the collection tank and hauled to Madison Metropolitan Sewerage District Treatment facility. The total volume hauled from the site during the month of July was 17,694 gallons.

Gas probes GP-11s and GP-11d continued to show elevated methane concentrations. The methane concentration in GP-11s ranged from 37.1% to 52.9% The methane concentrations in GP-11d ranged from 53.1% to 58.2%. Gas probe GP-6 also showed an elevated reading of 2.6% methane on July 27, 1993. Terra will continue to monitor these gas probes on a weekly basis until methane levels subside.

The pump hour meter in gas well GW-9 recorded a running time of zero (0) hours from June 30 to July 27. Monthly leachate head monitoring indicated a "non-response" with the electric water level indicator, which would indicate zero head. The Coyote Control in GW-9 indicated an underload condition which is also consistent with zero head. Terra will be monitoring the leachate head at GW-9 prior to the next monthly monitoring event in an effort to determine if the hour meter or pump is in need of replacement or repair.

The verbatim auto dialer system alerted Terra of five (5) alarms during the month of July. One of the alarms was a "false" high leachate alarm which occurred an July 5. Condensate observed in a relay switch located in the leachate tank control panel may be the cause. A replacement relay has been ordered, however there were no further "false alarms" during the remainder of July. The five alarms are summarized in Table 5.

(2) Information provided by Weather Central.

The July weather also had an impact on the growth of grass and weeds on the site. Terra is currently planning to cut the tall grass and weeds with-in the cages at each gas well, as well as in the leachate collection tank area. This will be done to allow for easier access to these areas as the grass and weeds have exceeded a height of 6-feet in some areas.

Terra is also planning to paint the flare. Mr. John Gwinn of Linklater Corporation stated in his service report that, "the flare is rusting in some areas mainly around the test ports and pilot housing, which are exposed to higher heat. There are several other areas that are showing signs of wear but no signs of serious corrosion". We believe that it would be prudent to paint the exterior of the flare while the weather conditions are favorable. Terra will also paint the existing exposed pilot light gas pipe yellow. The flare will be manually shut down during painting operations. The Wisconsin Department of Natural Resources (WDNR) will be notified of the date of painting. The estimated cost for the flare painting task is $1,200.00.

Terra will keep the WDNR informed of the progress of the above mentioned tasks, as well as the conditions encountered at gas probes GP-11s, GP-11d and GP-6.

If you have any questions regarding this report, please do not hesitate to contact us.

Sincerely,
TERRA ENGINEERING & CONSTRUCTION CORP.

Kirk Solberg

Kirk Solberg,
Environmental Geologist

TABLE 1

REFUSE HIDEAWAY LANDFILL
MONTHLY GAS EXTRACTION WELLS MONITORING INFORMATION

Date: July 27, 1993
Temperature: 69 °F at 8:30 am
Barometric pressure: 29.91 inches Hg
Monitored by: K. Solberg
Gas Detector Model No./Serial No.: GA 1.1 / 381
Date Gas Detector last calibrated: Factory calibrated: March 1993 (4)
Velometer Model No./Serial No.: Alnor 60064P / 52697
Date Velometer last calibrated: Factory calibrated: May 1993

Well (1)	Well Pressure (inches W.C.)	Header Pressure (inches W.C.)	CH_4 (2) (%)	O_2 (%)	CO_2 (%)	Valve Setting (fraction open)	Gas (3) Velocity (fpm)	Gas (4) Flow (cfm)	Gas Temp (°F)
GW-1	0	-16	17.1	12.4	10.5	1/13	<100	<4.5	70.0
GW-2	0	-15	20.0	0.0	28.7	0/13	<100	<4.5	70.0
GW-3	-8	-15	38.8	0.0	33.2	3/9	2000	90	64.7
GW-4	-15	-17	43.9	0.0	35.1	4/9	750	33.8	69.9
GW-5	-17	-17	55.4	0.0	42.9	9/9	750	33.8	82.5
GW-6	-4	-19	18.4	0.0	25.9	2/9	800	36	73.0
GW-7	-20	-20	51.2	0.0	38.3	5/9	1100	49.5	83.5
GW-8(1)	-21	-21	56.0	0.0	41.4	6/9	700	31.5	104.5
GW-9(1)	-21	-21	55.2	0.0	41.4	4/9	700	31.5	104.0
GW-10	-4	-20	33.6	0.0	31.1	2/9	750	33.8	90.5
GW-11(1)	-16	-18	57.3	0.0	41.5	6/9	400	18	90.5
GW-12	-14	-15	44.3	0.0	35.0	5/9	2150	96.8	95.1
GW-13	-18	-19	49.5	0.0	38.6	7/9	1100	49.5	81.5

Notes:

(1) Wells with leachate extraction pump and controls.
(2) Percent CH_4 (methane).
(3) Gas flow (cfm) is calculated by multiplying the gas velocity (fpm) by 0.045 ft^2 for 3-inch diameter PVC pipe.
(4) Calibration checked: July 27, 1993
99% CH_4 read 98.7 % CH_4
2.5% CH_4 read 2.2 % CH_4
15% CO_2 read 14.4 % CO_2
NA Not Available or Not Applicable

TABLE 2

REFUSE HIDEAWAY LANDFILL
MONTHLY GAS PROBE MONITORING INFORMATION

Date: July 27, 1993
Temperature: 69 F at 8:30 am
Barometric pressure: 29.91 inches Hg
Monitored by: K. Solberg
Gas Detector Model No./Serial No.: GA1.1 / 381
Date Gas Detector last calibrated: Factory calibrated: March 1993 (4)

Probe	Pressure (inches W.C.)	CH_4 (%)	CH_4(1) (% LEL)	O_2 (%)
G-1S	0.0	0.0	0	20.5
G-1D	0.0	0.0	0	20.4
G-6	0.0	2.6	52	0.0
G-8	0.0	0.0	0	20.3
G-9	0.0	0.0	0	20.9
G-10	0.0	0.0	0	20.4
GP-11S	0.0	42.3	> 100	0.0
GP-11D	0.0	53.1	> 100	0.0
GPW-1S	0.0	0.0	0	18.1
GPW-1M	0.0	0.0	0	20.7
GPW-1D	0.0	0.0	0	18.0
Speedway Building (2)	NA	0.0	0	20.4
Speedway Building (3)	NA	0.0	0	20.4

Notes:

(1) Percent of lower explosive limit of CH_4 (100% LEL = 5% CH_4 by volume).
(2) Readings obtained from the northeast corner of the interior of the scale house.
(3) Readings obtained from interior of Mechanic's shop.
(4) See calibration data on Table 1.
NA Not Available or Not Applicable.

TABLE 3

REFUSE HIDEAWAY LANDFILL
MONTHLY BRANCH AND FLARE MONITORING INFORMATION
Date: July 27, 1993

	Pressure (in. W.C.)	CH_4[1] (%)	O_2 (%)	Gas Velocity (fpm)	Flow[2] (cfm)	Flow[3] (scfm)	Gas Temp	Valve Setting (fraction open)
Branch Monitoring Station								
North Branch	-20	45.0	0.0	2250	175.5	134.7	78.2	6/13
Central Branch	-22	45.2	0.0	1500	117.0	87.4	78.8	6/13
South Branch	-16	43.1	0.0	2000	156.0	120.3	700	6/13
Flare Inlet Pipe								
Port A	+6							N/A
Port B	+5.5	44.4	0.0	3100	573.5	556.4	93.5	Full
Port C	+4							N/A

Notes:

(1) Percent CH_4 (methane).
(2) Gas velocity is converted to gas flow by multiplying fpm x 0.185 @ 6-inch HDPE and fpm x 0.078 @ 4-inch PVC.
(3) Flows have been converted to standard conditions of 70°F and 406.9 inches water.
NA Not applicable.

TABLE 4

REFUSE HIDEAWAY LANDFILL
MONTHLY LEACHATE HEAD MONITORING INFORMATION
Date: July 30, 1993

Well	LEACHATE HEAD [2] (ft)			Current Pump Hours		Previous Pump Hours		Elapsed Pump Hours	
	Gas Well Depth	Depth to Leachate	Leachate Head	Total Hours	Time[3]	Total Hours	Time[3]	Total Hours	Pump Hours
GW-1	51.7	47.8	3.9						
GW-2	53.3	48.3	5.0						
GW-3	57	56.3	0.7						
GW-4	65	52.8	12.2						
GW-5	70	57.8	12.2						
GW-6	36	35.5	0.5						
GW-7	60	52.6	7.4						
GW-8[1]	69	56.3	12.7	8576.3	11:35	7967.1	1:55	645.5	609.2
GW-9[1]	66	No Response	0	10798.1	12:15	10798.1	1:50	646.25	0
GW-10	70	65.2	4.8						
GW-11[1]	65	No Response	0	513.4	12:05	476.4	2:00	646.0	37.0
GW-12	81	59.8	21.2						
GW-13	69	59.3	9.7						

Notes:

(1) Wells with leachate extraction pumps and controls.
(2) Gas wells retro-fitted with threaded ports on risers October 1992. Leachate levels measured from retro-fitted port on gas well riser. Gas well depths obtained from Construction Observation Report, November, 1990 and Operation and Maintenance Manual, November 1991.
(3) Time of hour meter reading was recorded on June 30, 1993 and July 27, 1993.
Shaded areas do not have reportable information.

TABLE 5

REFUSE HIDEAWAY LANDFILL
MONTHLY SUMMARY OF SYSTEM ALARM LOG
Date: AUGUST 5, 1993

Alarm Dates	Alarm Cause	Solution (hours flare not operational)
July 5, 1993	General alarm. "False" high leachate alarm	Attempted to re-set leachate tank alarm on 7/5/93, but it would not reset. Able to re-set alarm on 7/7/93.* Flare did not shut down.
July 6, 1993	Flame failure possibly due to U.V. Sensor or due to time relay switch which shuts system down if leachate tank alarm is not re-set after a certain period of time,	Re-acknowledge leachate tank alarm, re-start flare on 7/6/93. Flare was down for 9 hours.
July 7, 1993*	No alarm. Able to re-set high leachate alarm	N/A
July 15, 1993	Flame failure possibly due to a dirty U.V. Sensor at the flare.	Clean U.V. Sensor. Re-start Flare. Flare was down for 4.5 hours.
July 28, 1993	General alarm, possibly due to U.V. Sensor	Re-start flare. Flare was down for 4.0 hours.
July 30, 193	Flare went down while KJS on sight due to possible U.V. Sensor.	Re-start flare. Flare was down for 1.0 hours.

TABLE 6

REFUSE HIDEAWAY LANDFILL
SUMMARY OF WEEKLY MONITORING INFORMATION
Date: August 5, 1993

Description	Date: July 7, 1993				Date: July 13, 1993				Date: July 21, 1993				Date: July 27, 1993				Date:			
	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)
Branch Monitoring Station																				
North Branch	6/13	-20.5	47.9	0.0	6/13	-21.0	44.0	0.0	6/13	-21.0	43.7	0.0	6/13	-20.0	45.0	0.0				
Central Branch	6/13	-21.5	50.1	0.0	6/13	-23.0	45.1	0.0	6/13	-23.0	45.4	0.0	6/13	-22.0	45.2	0.0				
South Branch	6/13	-19.5	49.5	0.0	6/13	-20.0	43.7	0.0	6/13	-20.0	42.6	0.0	6/13	-16.0	43.1	0.0				
Blower Inlet Pipe																				
Inlet Port A		-26.0	48.4	0.0		-26.5	44.0	0.0		-27.0	43.7	0.0		-26.0	44.4	0.0				
Inlet Port B		-26.5				-27.0				-28.0				-26.5						
Outlet Port A		+ 8.0				+ 8.0				+ 8.0				+ 8.5						
Flare Inlet Pipe																				
Sample Port A		+ 6.0				+5.7				+5.7				+ 6.0						
Sample Port B		+ 5.5				+5.0	44.1	0.0		+5.5	43.2	0.0		+ 5.5	44.4	0.0				
Sample Port C		+3.5				+4.0				+3.7				+4.0						
Flare Temperature (°F)	1500				1500				1500				1500							
Flare Flow (cfm/scfm)	499.5/435				555/540				444/437.4				593.9/556							

Notes:

(1) Percent CH_4 (methane).
NA Not Available or Not Applicable.
Shaded areas do not have reportable information.

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ENVIRONMENTAL REMEDIATION
MUNICIPAL & UTILITY CONSTRUCTION
SPECIALTY EARTHWORK

September 17, 1993

Wisconsin Department of
Natural Resources
Environmental Response and
Repair Section
Bureau of Solid and Hazardous
Waste Management
101 South Webster Street,
GEF II, SE/3
Madison, Wisconsin 53707

Attn: Ms. Theresa Evanson

Re: Operation and Maintenance
Summary - August 1993
Landfill Gas and Leachate
Extraction System
Refuse Hideaway Landfill -
Middleton, Wisconsin
Terra Job # 468

Dear Ms. Evanson:

This letter summarizes operation and maintenance (O&M) activities performed by Terra Engineering & Construction Corporation (Terra), during the month of August, 1993, at the Refuse Hideaway Landfill. Specific tasks are discussed in the following sections:

SCHEDULED LEACHATE LOADOUT

Leachate/Condensate was pumped and transported by Al's Modern Sewer Service to the Madison Metropolitan Sewerage District Treatment facility. The hauling dates and quantities are as follows:

	Measured Volume (gals)
August 13, 1993	2,633 Gallons
August 23, 1993	2,461 Gallons
August 24, 1993	4,791 Gallons
August 26, 1993	5,032 Gallons

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MADISON, WI 53704-6795
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WEEKLY/MONTHLY MONITORING SCHEDULE

Weekly/Monthly monitoring of the landfill gas and leachate extraction system was performed on the following dates:

August 4, 1993	Weekly
August 10, 1993	Weekly
August 20, 1993	Weekly
August 26, 1993	Weekly
August 30, 1993	Monthly

Summary tables for weekly and monthly monitoring schedules are attached.

OBSERVATION AND DISCUSSION

There was a reduction in Methane content observed in Gas Probe 6P-11d. A summary of the gas probe readings observed during the month of August is as follows.

Date	Gas Probe GP-6	GP-11s	GP-11d
8-4-93	0.1%	22.0%	42.9%
8-10-93	0.8%	36.3%	37.7%
8-20-93	0.0%	24.8%	28.1%
8-26-93	0.6%	30.1%	27.8%
8-30-93	0.0%	28.1%	24.0%

Fluctuations in methane content could be due, in part, to barometric pressure changes. Terra Engineering & Construction Corp. will continue to monitor gas probes GP-11s and GP-11d on a weekly basis. It appears that probe GP-6 has stabilized, and we will return to a monthly monitoring schedule at that location.

In response to numerous false high leachate alarms, the relay switch located in the leachate tank panel was replaced on August 10, 1993. The relay switch was replaced due to the presence of condensate observed within the switch. The result of changing the switch was that there were no further false high leachate alarm readings.

The hour meter at gas well GW-9 is believed to be malfunctioning. There has been no change in the hour meter reading since the July monthly reading on June 30, 1993. However, the leachate head in GW-9 has decreased , indicating the pump has been working. We will have Town & Country Electric, Inc. evaluate the pump meter and repair or replace it while they are working on-site wiring the new leachate pumps.

The flare shut down on three different occasions during the month of August (see table 5). On two occasions, the shut down was likely due to vacuum switches VS1-VS4 in the gas header, reaction to minor changes in header pressure. Those two shut downs occurred after a nipple cup was removed to allow access to the well for monitoring of flow and/or depth to leachate measurements. The third shut down occurred over a weekend and we have not verified a reason for the shutdown. We are currently assessing the possibility that one or more of the vacuum switches need to be serviced or replaced.

On August 11, 1993 Terra Engineering & Construction Corp. personnel cut down the weeds and tall grass in the leachate collection tank area, the blower/flare area, and in and around the gas wells. This was done for aesthetic reasons and to allow access to the gas wells for monitoring.

On August 30, 1993 the quarterly leachate sample was obtained by Terra Engineering & Construction Corp. personnel and submitted to Mid-State Associates, Inc., laboratories for analysis. The analytical results will be sent to Madison Metropolitan Sewerage District (MMSD). A copy of the analytical results will be sent to you under separate cover.

If you have any questions regarding this report, please do not hesitate to contact us.

Sincerely,
TERRA ENGINEERING & CONSTRUCTION CORP.

Kirk Solberg,
Environmental Geologist

TABLE 1

REFUSE HIDEAWAY LANDFILL
MONTHLY GAS EXTRACTION WELLS MONITORING INFORMATION

Date: AUGUST 30, 1993
Temperature: 84 °F at 10:30
Barometric pressure: 30.04 inches Hg
Monitored by: J. Falco
Gas Detector Model No./Serial No.: GA 1.1 / 381
Date Gas Detector last calibrated: Factory calibrated: MARCH 1993 (4)
Velometer Model No./Serial No.: Alnor 6006AP / 52697
Date Velometer last calibrated: Factory calibrated: MAY 1993

Well (1)	Well Pressure (inches W.C.)	Header Pressure (inches W.C.)	CH_4 (2) (%)	O_2 (%)	CO_2 (%)	Valve Setting (fraction open)	Gas (3) Velocity (fpm)	Gas (4) Flow (cfm)	Gas Temp (°F)
GW-1	0.0	-16.0	0.3	20.3	0.0	0/13	25	4.6	70.3
GW-2	0.0	-17.0	0.8	20.1	0.0	0/13	25	4.6	76.1
GW-3	-7.0	-16.0	40.5	0.0	33.3	4/9	2600	481	69.0
GW-4	-14.0	-16.0	42.2	0.0	34.0	3.5/9	1200	222	77.1
GW-5	-16.0	-16.0	55.7	0.0	42.6	9/9	1000	185	83.8
GW-6	-1.5	-23.0	37.4	0.0	33.6	1/9	1200	222	84.0
GW-7	-21.0	-21.0	51.5	0.0	38.6	7/9	1550	287	87.0
GW-8(1)	-21.0	-22.0	54.3	0.0	41.6	6/9	1100	203.5	98.6
GW-9(1)	-22.0	-22.0	56.0	0.0	42.4	5/9	1200	222	98.6
GW-10	-4.5	-19.0	35.1	0.0	32.2	2/9	1150	212.75	96.2
GW-11(1)	-18.5	-18.5	57.2	0.0	41.2	6/9	1950	361	99.6
GW-12	-15.0	-18.0	42.3	0.0	35.1	5/9	2550	472	98.6
GW-13	-18.0	-18.0	51.2	0.0	39.8	6/9	1450	268	84.3

Notes:

(1) Wells with leachate extraction pump and controls.
(2) Percent CH_4 (methane).
(3) Gas flow (cfm) is calculated by multiplying the gas velocity (fpm) by 0.045 ft^2 for 3-inch diameter PVC pipe.
(4) Calibration checked: AUGUST 30, 1993
99% CH_4 read 96.5 % CH_4
2.5% CH_4 read 1.7 % CH_4
15% CO_2 read 14.4 % CO_2

NA Not Available or Not Applicable

TABLE 2

REFUSE HIDEAWAY LANDFILL
MONTHLY GAS PROBE MONITORING INFORMATION

Date: AUGUST 30, 1993
Temperature: 86 F at 10:30
Barometric pressure: 30.04 inches Hg
Monitored by: J. Falco
Gas Detector Model No./Serial No.: GA 1.1 /381
Date Gas Detector last calibrated: Factory calibrated: MARCH 1993 (4)

Probe	Pressure (inches W.C.)	CH_4 (%)	CH_4 (1) (% LEL)	O_2 (%)
G-1S	0.0	0.0	0	16.5
G-1D	0.0	0.0	0	18.4
G-6	0.0	0.0	0	20.5
G-8	0.0	0.0	0	20.8
G-9	0.0	0.0	0	20.5
G-10	-0.5	0.0	0	20.6
GP-11S	0.0	28.1	>100	0.0
GP-11D	0.0	24.0	>100	0.0
GPW-1S	0.0	0.0	0	17.9
GPW-1M	-0.5	0.0	0	19.2
GPW-1D	-0.5	0.0	0	17.1
Speedway Building (2)	NA	0.0	0	20.9
Speedway Building (3)	NA	0.0	0	21.0

Notes:

(1) Percent of lower explosive limit of CH_4 (100% LEL = 5% CH_4 by volume).
(2) Readings obtained from the northeast corner of the interior of the scale house.
(3) Readings obtained from interior of Mechanic's shop.
(4) See calibration data on Table 1.
NA Not Available or Not Applicable.

TABLE 3

REFUSE HIDEAWAY LANDFILL
MONTHLY BRANCH AND FLARE MONITORING INFORMATION
Date: August 30, 1993

	Pressure (in. W.C.)	CH_4[(1)] (%)	O_2 (%)	Gas Velocity (fpm)	Flow[(2)] (cfm)	Flow[(3)] (scfm)	Gas Temp	Valve Setting (fraction open)
Branch Monitoring Station								
North Branch	-21.5	42.7	0.0	2550	198.9	184.4	83.8	6/13
Central Branch	-23.5	45.1	0.0	1550	120.9	111.6	83.4	6/13
South Branch	-19.5	41.2	0.0	2500	195.0	185.0	74.1	6/13
Flare Inlet Pipe								
Port A	+5.5							N/A
Port B	+5.0	42.6	0.0	3000	555	536.9	96.8	Full
Port C	+3.5							N/A

Notes:

(1) Percent CH_4 (methane).
(2) Gas velocity is converted to gas flow by multiplying fpm x 0.185 @ 6-inch HDPE and fpm x 0.078 @ 4-inch PVC.
(3) Flows have been converted to standard conditions of 70°F and 406.9 inches water.
NA Not applicable.

TABLE 4

REFUSE HIDEAWAY LANDFILL
MONTHLY LEACHATE HEAD MONITORING INFORMATION
Date: August 30, 1993

Well	LEACHATE HEAD [2] (ft)			Current Pump Hours		Previous Pump Hours		Elapsed Pump Hours	
	Gas Well Depth	Depth to Leachate	Leachate Head	Total Hours	Time[3]	Total Hours	Time[3]	Total Hours	Pump Hours
GW-1	51.7	48.1	3.6						
GW-2	53.3	47.8	5.5						
GW-3	57	55.9	1.1						
GW-4	65	52.5	12.5						
GW-5	70	50.2	19.8						
GW-6	36	35.9	0.1						
GW-7	60	52.1	7.9						
GW-8[1]	69	NA	NA	9389.6	1:20 pm	8576.3	11:35am	818	813.3
GW-9[1]	66	66	0.0	10798.1	1:50pm	10798.1	12:15pm	817.5	0.0
GW-10	70	64.7	5.3						
GW-11[1]	65	62.5	2.5	526.4	1:45pm	513.4	12:05pm	818	13.0
GW-12	81	75.0	6.0						
GW-13	69	57.9	11.1						

Notes:

(1) Wells with leachate extraction pumps and controls.
(2) Gas wells retro-fitted with threaded ports on risers October 1992. Leachate levels measured from retro-fitted port on gas well riser. Gas well depths obtained from Construction Observation Report, November, 1990 and Operation and Maintenance Manual, November 1991.
(3) Time of hour meter reading was recorded on July 27, 1993 and August 30, 1993.
Shaded areas do not have reportable information.

TABLE 5

REFUSE HIDEAWAY LANDFILL
MONTHLY SUMMARY OF SYSTEM ALARM LOG
Date: September 14, 1993

Alarm Dates	Alarm Cause	Solution (hours flare not operational)
08/10/93	Flame failure possibly due to a sensitive vacuum switch.	Flare went down while gas wells were being monitored. Restart flare. (Time down: 20 minutes).
08/14/93	Flame failure possibly due to a sensitive vacuum switch.	Re-start flare on August 15, 1993. (Time down: 21 hours 50 minutes).
08/30/93	Flame failure possibly due to a sensitive vacuum switch.	Flare went down while gas wells were being monitored. Restart flare. (Time down: 1 hour).

TABLE 6

REFUSE HIDEAWAY LANDFILL
SUMMARY OF WEEKLY MONITORING INFORMATION
Date: SEPTEMBER 14, 1993

Description	Date: AUGUST 4, 1993				Date: AUGUST 10, 1993				Date: AUGUST 20, 1993				Date: AUGUST 26, 1993				Date: AUGUST 30, 1993			
	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)
Branch Monitoring Station																				
North Branch	6/13	-21.0	43.6	0.0	6/13	-18.0	41.8	0.0	6/13	-21.0	41.4	0.0	6/13	-20.5	42.4	0.0	6/13	-21.5	42.7	0.0
Central Branch	6/13	-22.5	44.0	0.0	6/13	-20.0	40.3	0.0	6/13	-22.0	36.5	0.0	6/13	-23.5	33.2	0.0	6/13	-23.5	45.1	0.0
South Branch	6/13	-20.0	41.5	0.0	6/13	-18.0	40.7	0.0	6/13	-19.0	38.1	0.0	6/13	-19.5	39.7	0.0	6/13	-19.5	41.2	0.0
Blower Inlet Pipe																				
Inlet Port A		-26.5	42.2	0.0		-25.0	40.9	0.0		-26.0	38.7	0.0		-26.5	42.0	0.0		-26.5	43.3	0.0
Inlet Port B		-27.0				-25.5				-27.0				-27.0				-27.5		
Outlet Port A		+ 8.5				+10.0				+ 8.5				+ 8.0				+8.5		
Flare Inlet Pipe																				
Sample Port A		+5.5				+6.5				+6.5				+5.5				+5.5		
Sample Port B		+5.5	42.7	0.0		+6.5	40.7	0.0		+6.0	38.9	0.0		+5.0	41.8	0.0		+5.0	42.6	0.0
Sample Port C		+4.0				+4.5				+4.0				+3.5				+3.5		
Flare Temperature (°F)	1504				1500				1500				1500				1500			
Flare Flow (cfm/scfm)	481/470				582/539				564/546				518/NA				555/538			

Notes:

(1) Percent CH_4 (methane).
NA Not Available or Not Applicable.
Shaded areas do not have reportable information.

TERRA
▲ ENGINEERING & CONSTRUCTION CORPORATION ▲

ENVIRONMENTAL REMEDIATION
MUNICIPAL & UTILITY CONSTRUCTION
SPECIALTY EARTHWORK

October 20, 1993

Wisconsin Department of
Natural Resources
Environmental Response and
Repair Section
Bureau of Solid and Hazardous
Waste Management
101 South Webster Street,
GEF II, SE/3
Madison, Wisconsin 53707

Attn: Ms. Theresa Evanson

Re: Operation and Maintenance
Summary - September 1993
Landfill Gas and Leachate
Extraction System
Refuse Hideaway Landfill -
Middleton, Wisconsin
Terra Job # 468

Dear Ms. Evanson:

This letter summarizes operation and maintenance (O&M) activities performed by Terra Engineering & Construction Corporation (Terra), during the month of September, 1993, at the Refuse Hideaway Landfill. Specific tasks are discussed in the following sections:

SCHEDULED LEACHATE LOADOUT

Leachate/Condensate was pumped and transported by Al's Modern Sewer Service to the Madison Metropolitan Sewerage District Treatment facility. The hauling dates and quantities are as follows:

	Measured Volume (gals)
September 16, 1993	4,848 Gallons
September 24, 1993	2,658 Gallons

2201 VONDRON ROAD
MADISON, WI 53704-6795
608/221-3501 PHONE
608/221-4075 FAX

WEEKLY/MONTHLY MONITORING SCHEDULE

Weekly/Monthly monitoring of the landfill gas and leachate extraction system was performed on the following dates:

September 13, 1993	Weekly
September 24, 1993	Weekly
September 28, 1993	Monthly

Summary tables for weekly and monthly monitoring schedules are attached.

OBSERVATION AND DISCUSSION

During the week of September 6, 1993 the blower and flare were shut down to facilitate the installation of two shallow horizontal gas recovery wells. The wells are connected to the vacuum header pipe at gas well GW-5. One horizontal well trends Northwest from GW-5, the other trends East Northeast from GW-5.

The wells were installed to recover shallow gas from the areas which had exhibited stressed vegetation and shallow gas concentrations of up to 55.5% (see June 1993 Monthly Report). The gas wells were also placed in order to intercept shallow gas that may have been migrating to gas probes GP-11s and GP-11d. A construction observation report discussing the lateral recovery well installation, cap repair and the placement of permanent leachate head reduction pumps is forth coming pending the completion of pump installation and electrical hook-up.

There was a reduction in methane content observed in Gas Probe 11s & 11d. A summary of the gas probe readings observed during the month of September is as follows.

Date	GP-11s	GP-11d
9-24-93	1.0%	3.9%
9-28-93	0.1%	2.5%

Terra Engineering & Construction will continue to monitor gas probes GP-11s and GP-11d on a weekly basis.

On September 13, 1993 Terra Engineering & Construction was alerted to a general alarm condition and a low temperature alarm. The shut down was likely due to the "damper override" switch being placed in the "off" position after re-starting the flare following the installation of lateral wells at gas well GW-5. The flare was down for approximately 1.5 hours. A second alarm was received later on September 13 which was the result an erroneous high leachate alarm. Attempts to re-set the high leachate alarm at the leachate tank were unsuccessful until September 14, 1993. The flare continued to operate during the false high leachate alarm condition. Terra is currently investigating the possibility of a wiring problem within the leachate tank panel as the cause for the false alarm.

During monthly monitoring, the pump located in gas well GW-9 showed no change in pump hours. The pump was later removed and the lead wires to the pump were discovered to be broken. The pump was removed for inspection and cleaning. The lead wires will be checked for continuity and the pump re-set as soon as possible.

The blower/flare shut down on two occasions during monthly monitoring. In each case the flare was re-started within ten minutes of shut down. As discussed in the August monthly report, the shut downs were likely due to sensitive vacuum switches located within the vacuum header circuit. The shutdowns would occur while opening the 1-inch leachate head monitoring port. This would cause a slight decrease in header pressure and would cause the vacuum switch to activate and shut the system down. To remedy this, the well head valves were closed prior to leachate measurements and slowly reopened after the monitoring port was closed. An inspection of vacuum switches may be necessary if system shut downs continue.

Minor adjustments were made to five (5) gas wells during the September 1993 monthly monitoring. These adjustments are based on comparisons between gas well readings of August 30, 1993 and September 28, 1993. The adjustments are as follows:

GAS WELL	INITIAL VALVE SETTING	FINAL VALVE SETTING	REASON FOR CHANGE
GW-2	0/13	2/13	Decrease in oxygen content from 20.1% to 0% methane increase from 0.8% to 11.8%
GW-5	9/9	7/9	Decrease in methane from 55.7% to 49.5%
GW-11	6/9	5/9	Decrease in methane from 57.2% to 55.5%
GW-12	6/9	5/9	Decrease in methane from 51.2% to 48.5%
GW-13	5/9	7/9	Increase in methane from 42.3% to 57.3%

The valve on gas well GW-6 remained slightly open (1/9) to prevent a built up of positive pressure. The gas readings at gas well GW-6 indicate 0.4% methane and 0% CO_2. It is possible that the meter hose became disconnected during this reading.

If you have any questions or comments regarding this report, please do not hesitate to contact us.

Sincerely,
TERRA ENGINEERING & CONSTRUCTION CORP.

Kirk Solberg

Kirk Solberg,
Environmental Geologist

TABLE 1

REFUSE HIDEAWAY LANDFILL
MONTHLY GAS EXTRACTION WELLS MONITORING INFORMATION

Date: SEPTEMBER 28, 1993
Temperature: 52 °F at 11:00
Barometric pressure: 30.01 inches Hg
Monitored by: K. Solberg
Gas Detector Model No./Serial No.: GA 1.1 /381
Date Gas Detector last calibrated: Factory calibrated: MARCH 1993 (4)
Velometer Model No./Serial No.: ALNOR 6006AP
Date Velometer last calibrated: Factory calibrated: MAY 1993

Well (1)	Well Pressure (inches W.C.)	Header Pressure (inches W.C.)	CH_4 (2) (%)	O_2 (%)	CO_2 (%)	Valve Setting (fraction open)	Gas (3) Velocity (fpm)	Gas (4) Flow (cfm)	Gas Temp (°F)
GW-1	-1.0	-15.0	8.3	12.6	9.3	0/13	<100	<4.5	55.5
GW-2	-2.0	-15.0	11.8	0.0	13.3	2/13	<100	<4.5	55.5
GW-3	-8.5	-14.5	42.1	0.0	32.3	4/9	1700	76.5	64.0
GW-4	-13.0	-14.5	44.8	0.0	34.0	4/9	750	33.8	62.2
GW-5	-14.5	-15.0	49.5	0.0	33.4	7/9	600	27.0	80.7
GW-6	-1.5	-15.0	0.4	19.8	0.0	1/9	<100	<4.5	57.5
GW-7	-22.5	-22.5	55.6	0.0	38.2	7/9	750	33.8	84.5
GW-8(1)	-22.0	-22.5	58.8	0.0	40.5	6/9	1150	51.8	95.6
GW-9(1)	-20.0	-20.0	56.5	0.0	41.5	5/9	600	27.0	97.8
GW-10	-2.0	-20.0	35.6	0.0	30.2	2/9	900	40.5	91.0
GW-11(1)	-21.0	-21.0	55.5	0.0	32.8	5/9	600	27.0	89.4
GW-12	-17.5	-20.0	48.5	0.0	33.6	5/9	900	40.5	99.5
GW-13	-21.0	-21.5	57.3	0.0	38.5	7/9	900	40.5	80.4

Notes:

(1) Wells with leachate extraction pump and controls.
(2) Percent CH_4 (methane).
(3) Gas flow (cfm) is calculated by multiplying the gas velocity (fpm) by 0.045 ft^2 for 3-inch diameter PVC pipe.
(4) Calibration checked: SEPTEMBER 28, 1993
99% CH_4 read 102.1 % CH_4
2.5% CH_4 read 2.4 % CH_4
15% CO_2 read 14.5 % CO_2

NA Not Available or Not Applicable

TABLE 2

REFUSE HIDEAWAY LANDFILL
MONTHLY GAS PROBE MONITORING INFORMATION

Date: SEPTEMBER 28 1993
Temperature: 52° F at 9³⁰
Barometric pressure: 30.01 inches Hg
Monitored by: K. Solberg
Gas Detector Model No./Serial No.: GA1.1 / 381
Date Gas Detector last calibrated: Factory calibrated: MARCH 1993 (4)

Probe	Pressure (inches W.C.)	CH_4 (%)	CH_4 (1) (% LEL)	O_2 (%)
G-1S	0	0.2	4	19.6
G-1D	slight negative	0.1	2	19.9
G-6	0	0.0	0	20.4
G-8	0	0.0	0	20.2
G-9	0	0.0	0	20.4
G-10	0	0.0	0	20.4
GP-11S	0	0.1	2	19.5
GP-11D	0	2.5	50	17.2
GPW-1S	0	0.0	0	16.6
GPW-1M	0	0.0	0	20.8
GPW-1D	0	0.0	0	17.9
Speedway Building (2)	NA	0.0	0	20.2
Speedway Building (3)	NA	0.0	0	20.2

Notes:

(1) Percent of lower explosive limit of CH_4 (100% LEL = 5% CH_4 by volume).
(2) Readings obtained from the northeast corner of the interior of the scale house.
(3) Readings obtained from interior of Mechanic's shop.
(4) See calibration data on Table 1.
NA Not Available or Not Applicable.

TABLE 3

REFUSE HIDEAWAY LANDFILL
MONTHLY BRANCH AND FLARE MONITORING INFORMATION
Date: SEPTEMBER 28, 1993

	Pressure (in. W.C.)	CH_4[(1)] (%)	O_2 (%)	Gas Velocity (fpm)	Flow[(2)] (cfm)	Flow[(3)] (scfm)	Gas Temp	Valve Setting (fraction open)
Branch Monitoring Station								
North Branch	-23.5	46.6	0.0	1850	144.3	146.3	70.7	6/13
Central Branch	-25.0	46.0	0.0	1300	101.4	103.0	69.9	6/13
South Branch	-19.0	43.9	0.0	2350	183.3	188.7	67.6	6/13
Flare Inlet Pipe								
Port A	+5.5							N/A
Port B	+5.0	46.0	0.0	2450	453.3	453.3	78.0	Full
Port C	+3.5							N/A

Notes:

(1) Percent CH_4 (methane).
(2) Gas velocity is converted to gas flow by multiplying fpm x 0.185 @ 6-inch HDPE and fpm x 0.078 @ 4-inch PVC.
(3) Flows have been converted to standard conditions of 70°F and 406.9 inches water.
NA Not applicable.

TABLE 4

REFUSE HIDEAWAY LANDFILL
MONTHLY LEACHATE HEAD MONITORING INFORMATION
Date: SEPTEMBER 28, 1993

Well	LEACHATE HEAD [2] (ft)			Current Pump Hours		Previous Pump Hours		Elapsed Pump Hours	
	Gas Well Depth	Depth to Leachate	Leachate Head	Total Hours	Time[3]	Total Hours	Time[3]	Total Hours	Pump Hours
GW-1	51.7	47.9	3.8						
GW-2	53.3	48.4	4.9						
GW-3	57	56.2	0.8						
GW-4	65	52.8	12.2						
GW-5	70	56.9	13.1						
GW-6	36	36.0	0						
GW-7	60	52.3	7.7						
GW-8[1]	69	53.0	16.0	9907.3	12:50	9389.6	1:20	695.5	517.7
GW-9[1]	66	No Response	NA	10798.1	1:50	10798.1	1:50	696.0	—
GW-10	70	64.5	5.5						
GW-11[1]	65	46.7	18.3	580.8	1:35	526.4	1:45	696.0	54.4
GW-12	81	59.6	21.4						
GW-13	69	59.0	10.0						

Notes:

(1) Wells with leachate extraction pumps and controls.
(2) Gas wells retro-fitted with threaded ports on risers October 1992. Leachate levels measured from retro-fitted port on gas well riser. Gas well depths obtained from Construction Observation Report, November, 1990 and Operation and Maintenance Manual, November 1991.
(3) Time of hour meter reading was recorded on August 30, 1993 and September 28 1993.
Shaded areas do not have reportable information.

TABLE 5

REFUSE HIDEAWAY LANDFILL
MONTHLY SUMMARY OF SYSTEM ALARM LOG
Date: October 18, 1993

Alarm Dates	Alarm Cause	Solution (hours flare not operational)
09/13/93	Low temperature alarm due to damper over switch was in the "off" position.	Re-start flare, switch damper override switch to "auto" position.(Flare down 1.25 hours).
09/13/93	General alarm condition due to false high leachate alarm.	Re-set alarm. Flare does not shut down due to high leachate alarm. Electricity to pumps is shut down during a high leachate alarm condition.
09/28/93	Two general alarms due to flare failure likely caused by sensitive vacuum switch.	Re-start flare. Terra personnel on-site during shut downs. (Flare down .25 hours).

TABLE 6

REFUSE HIDEAWAY LANDFILL
SUMMARY OF WEEKLY MONITORING INFORMATION
Date: SEPTEMBER 28, 1993

Description	Date: SEPTEMBER 13, 1993				Date: SEPTEMBER 24, 1993				Date: SEPTEMBER 28, 1993				Date:				Date:			
	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)
Branch Monitoring Station																				
North Branch	6/13	-19.5	56.5	0.0	7/13	-22.0	48.0	0.0	6/13	-23.5	46.6	0.0								
Central Branch	6/13	-22.0	52.4	0.0	7/13	-24.0	51.8	0.0	6/13	-25.0	46.0	0.0								
South Branch	6/13	-17.5	53.8	0.0	7/13	-18.0	46.2	0.0	6/13	-19.0	43.9	0.0								
Blower Inlet Pipe																				
Inlet Port A		-25.0	56.6	0.0		-26.0	48.5	0.0		-26.5	45.8	0.0								
Inlet Port B		-24.5				-27.0				-27.5										
Outlet Port A		+ 8.5				+ 9.0				+ 8.5										
Flare Inlet Pipe																				
Sample Port A		+ 6.0				+ 6.0				+ 5.5										
Sample Port B		+ 5.5	55.9	0.0		+ 6.0	48.0	0.0		+ 5.0	46.0	0.0								
Sample Port C		+ 4.0				+ 4.0				+ 3.5										
Flare Temperature (°F)	1500				1500				1510											
Flare Flow (cfm/scfm)	545.75/512.7				556/547				453/453											

Notes:

(1) Percent CH_4 (methane).
NA Not Available or Not Applicable.
Shaded areas do not have reportable information.

ECRS\Refuse\forms1.bjh

TERRA
▲ ENGINEERING & CONSTRUCTION CORPORATION ▲

ENVIRONMENTAL REMEDIATION
MUNICIPAL & UTILITY CONSTRUCTION
SPECIALTY EARTHWORK

November 15, 1993

Wisconsin Department of Natural Resources
101 S. Webster Street
P.O. Box 7921
Madison, WI 53707-7921

Attn: Ms. Terry Evanson

RE: Refuse Hideaway Landfill
Terra Job #468

Dear Ms. Evanson:

Due to a computer error, one (1) leachate hauling event was omitted from the September monthly report.

The leachate hauling event omitted occurred on September 8, 1993 at which time 3268 gallons of leahchate was pumped from the leachate/condensate collection tank and hauled to Madison Metropolitan Sewerage District Treatment facility.

Please amend your copy of the September monthly report accordingly.

I am sorry for any inconvenience, if you have any questions please do not hesitate to call.

Sincerely,
TERRA ENGINEERING & CONSTRUCTION CORP.

Kirk J. Solberg
Environmental Geologist

KIRK93\kaj10

2201 VONDRON ROAD
MADISON, WI 53704-6795
608/221-3501 PHONE
608/221-4075 FAX

TERRA
▲ ENGINEERING & CONSTRUCTION CORPORATION ▲
ENVIRONMENTAL REMEDIATION
MUNICIPAL & UTILITY CONSTRUCTION
SPECIALTY EARTHWORK

November 29, 1993

Wisconsin Department of
Natural Resources
Environmental Response and
Repair Section
Bureau of Solid and Hazardous
Waste Management
101 South Webster Street,
GEF II, SE/3
Madison, Wisconsin 53707

Attn: Ms. Theresa Evanson

Re: Operation and Maintenance
Summary - October 1993
Landfill Gas and Leachate
Extraction System
Refuse Hideaway Landfill -
Middleton, Wisconsin
Terra Job # 468

Dear Ms. Evanson:

This letter summarizes operation and maintenance (O&M) activities performed by Terra Engineering & Construction Corporation (Terra), during the month of October 1993, at the Refuse Hideaway Landfill. Specific tasks are discussed in the following sections:

SCHEDULED LEACHATE LOADOUT

Leachate/Condensate was pumped and transported by Al's Modern Sewer Service to the Madison Metropolitan Sewerage District Treatment facility. The hauling dates and quantities are as follows:

	Measured Volume (gals)
October 20, 1993	4,695 Gallons

REFUSE\780CT93.RPT
2201 VONDRON ROAD
MADISON, WI 53704-6795
608/221-3501 PHONE
608/221-4075 FAX

WEEKLY/MONTHLY MONITORING SCHEDULE

Weekly/Monthly monitoring of the landfill gas and leachate extraction system was performed on the following dates:

October 5, 1993	Weekly
October 13, 1993	Weekly
October 20, 1993	Weekly
October 26, 1993	Weekly/Monthly Gas Probes
October 27, 1993	Monthly Leachate Levels
October 29, 1993	Monthly Gas Wells & Blower

The monthly monitoring was split up over three days as a site visit was necessary on each date to observe the progress of the electricians who were on site.

Summary tables for weekly and monthly monitoring schedules are attached.

OBSERVATION AND DISCUSSION

In order to comply with our waste water discharge permit (Permit No. NTO-5A), with Madison Metropolitan Sewerage District (MMSD), an annual leachate/condensate sample was obtained on October 5, 1993. Part 1, Section 2, paragraph (a) of Permit No. NTO-5A states "All wastewaters discharged to the MMSD shall not exceed the limitations of the Toxicity Characteristics Leaching Procedure (TCLP) as specified in the Federal Register of March 29, 1990." The samples obtained are to be analyzed for TCLP-Volatile organic compounds (VOC's); TCLP-Semi-volatile organic compounds (SVOC's); TCLP-Pesticides; TCLP-Herbicides and TCLP-Metals. Analytical results are pending and will be forwarded to MMSD and a copy to the Wisconsin Department of Natural Resources under a separate cover.

During the month of October, electricians from Town and Country Electric were on-site to provide permanent electric power to the five (5) gas wells (GW-4, GW-5, GW-7, GW-12 and GW-13) which were to receive permanent leachate pumps. Town and Country's work included running electrical conduct from the power panel, located adjacent to the blower flare control panel, to the individual gas wells and installing weather proof electrical panels at each gas well. The weather proof panels house pump controls for the individual gas wells. The five gas wells were retro-fitted to allow leachate to be discharged into the existing header line. A description of the well head retro-fit and electrical work will be included in the forth coming construction observation report.

Gas readings at gas probe 11 shallow (GP-11s) continued to show slight decrease in methane content. While the methane content in gas probe 11 deep (GP-11d) appeared to rebound.

Terra will continue to monitor these gas probes on a weekly basis. The gas probe readings from GP-11s and GP-11d are as follows.

	GP-11s %Methane	GP-11d %Methane
*September 28, 1993	0.1%	2.5%
October 5, 1993	0.2%	1.3%
October 20, 1993	0.0%	2.1%
October 26, 1993	0.0%	3.4%

*Previously reported readings

Gas content readings for the week of October 11, 1993 were not available, as the GA1.1 infra-red gas analyzer went down. A rental unit of the same model was used for the monitoring events for the remainder of the month while the Terra unit was repaired and recalibrated. Terra will continue to use the rental meter until the Terra unit is returned.

Terra Engineering was alerted to three (3) alarm conditions during the month of October. Alarm conditions are summarized in Table 5. On October 17, and October 21, 1993 Terra was alerted to a general alarm condition. The causes were an erroneous high leachate alarms. The flare was still operating during these general alarms. The alarms would not reset immediately, a loose connection at the leachate tank panel was discovered after the second alarm and tightened allowing for the alarm to be re-set.

A flame failure alarm condition occurred on October 20, 1993. The cause of the flame failure has not been determined.

During a site visit with electricians on October 22, 1993, flames were observed exiting the top of the flare while both dampers were closed. The flare was manually shut down at this time in order to evaluate the problem of fluctuating temperatures and the closing of dampers.

Mr. John Gwinn of Linklater Corporation was contacted and informed of the conditions at the flare. He informed us that there was no need for concern over high temperatures in the flare and that flames exiting the top of the flare was due to a lack of oxygen with-in the flare. The flames occur where there is enough oxygen for combustion and with the dampers closed, the only available oxygen is located at the top of the flare. The flare was re-started on October 25, 1993. Temperature recorder strips were obtained at Mr. Gwinns request for evaluation. It should be noted that work was being conducted on gas wells during this time and fluctuations could have been caused by the closing of some gas wells while the work was being done. Once the work has been completed if temperature fluctuations continue, a temperature recorder strip will be forwarded to Mr. Gwinn for evaluation.

During the October monthly monitoring, valve adjustments were made on four gas wells. These adjustments are summarized as follows.

Gas Well	Initial Valve Setting	Final Valve Setting	Reason for Change[1]
GW-2	1/13	0/13	Decrease any vacuum on well as oxygen is present.
GW-5	7/9	2/9	Oxygen increase from 0.0 to 7.2%
GW-6	1/9	0/9	Oxygen present at 15.5%
GW-10	2/9	4/9	Methane increase from 35.6% to 51.1%

[1]Gas composition comparisons were made between September 28, 1993 and October 29, 1993.

The pump located in gas well nine (GW-9) was removed for inspection. The lead wires were in need of replacement and the pump should be functional with new wires. The pump was reset with new wires, however, the lead wires have not been connected to the panel due to a break in the connection from the gas well riser to the junction box located on the riser. We are currently waiting for parts to arrive so that the wires can be connected and leachate pumping may continue from GW-9.

If you have any questions or comments regarding this report, please do not hesitate to contact us.

Sincerely,
TERRA ENGINEERING & CONSTRUCTION CORP.

Kirk Solberg

Kirk Solberg,
Environmental Geologist

TABLE 1

REFUSE HIDEAWAY LANDFILL
MONTHLY GAS EXTRACTION WELLS MONITORING INFORMATION

Date: October 29, 1993
Temperature: 35 °F at 9:30
Barometric pressure: 29.79 inches Hg
Monitored by: K. Solberg
Gas Detector Model No./Serial No.: GA 1.1 / 147
Date Gas Detector last calibrated: Factory calibrated: NA (4)
Velometer Model No./Serial No.: Alnor 6006 AP / 52697
Date Velometer last calibrated: Factory calibrated: MAY 1993

Well (1)	Well Pressure (inches W.C.)	Header Pressure (inches W.C.)	CH_4 (2) (%)	O_2 (%)	CO_2 (%)	Valve Setting (fraction open)	Gas (3) Velocity (fpm)	Gas (4) Flow (cfm)	Gas Temp (°F)
GW-1	-1.0	-15.5	5.0	20.0	4.1	0/13	<100	<4.5	37.0
GW-2	-1.0	-15.0	5.0	20.0	3.9	1/13	<100	<4.5	37.0
GW-3	-7.5	-14.0	54.0	0.0	39.1	4/9	2300	103.5	62.6
GW-4	-13.0	-14.0	48.2	0.0	38.0	4/9	1500	67.5	73.0
GW-5	-13.0	-13.0	41.0	7.2	31.0	7/9	800	36.0	77.0
GW-6	-2.0	-18.0	13.9	15.5	10.5	1/9	<100	<4.5	32.1
GW-7	-22.0	-23.0	55.0	0.0	41.6	7/9	1300	58.5	84.0
GW-8(1)	-22.5	-22.5	60.4	0.5	44.3	6/9	900	40.5	80.0
GW-9(1)	-22.0	-22.0	62.0	0.0	46.4	5/9	500	22.5	99.0
GW-10	-4.0	-19.0	51.1	0.0	42.6	2/9	650	29.25	93.0
GW-11(1)	-16.0	-16.0	64.1	0.0	45.2	4/9	600	27.0	94.0
GW-12	-14.5	-16.0	45.6	0.0	38.3	6/9	1400	63.0	101.0
GW-13	-16.0	-16.0	64.4	0.0	44.7	7/9	500	22.5	76.6

Notes:

(1) Wells with leachate extraction pump and controls.
(2) Percent CH_4 (methane).
(3) Gas flow (cfm) is calculated by multiplying the gas velocity (fpm) by 0.045 ft^2 for 3-inch diameter PVC pipe.
(4) Calibration checked: October 29, 1993
99% CH_4 read 100.5 % CH_4
2.5% CH_4 read 2.3 % CH_4
15% CO_2 read 15 % CO_2
NA Not Available or Not Applicable

TABLE 2

REFUSE HIDEAWAY LANDFILL
MONTHLY GAS PROBE MONITORING INFORMATION

Date: October 26, 1993
Temperature: 53 °F at 3:00
Barometric pressure: 29.98 inches Hg
Monitored by: K. Solberg
Gas Detector Model No./Serial No.: GA1.1 / 147
Date Gas Detector last calibrated: Factory calibrated: NA (4)

Probe	Pressure (inches W.C.)	CH_4 (%)	CH_4 (1) (% LEL)	O_2 (%)
G-1S	0.0	0.0	0	20.4
G-1D	0.0	0.0	0	20.4
G-6	0.0	0.0	0	20.5
G-8	0.0	0.0	0	20.5
G-9	0.0	0.0	0	20.9
G-10	slight negative	0.0	0	20.6
GP-11S	0.0	0.0	0	18.3
GP-11D	0.0	3.4	68	15.6
GPW-1S	0.0	0.0	0	18.6
GPW-1M	slight negative	0.0	0	20.6
GPW-1D	slight negative	0.0	0	20.9
Speedway Building (2)	NA	0.0	0	20.4
Speedway Building (3)	NA	0.0	0	20.4

Notes:

(1) Percent of lower explosive limit of CH_4 (100% LEL = 5% CH_4 by volume).
(2) Readings obtained from the northeast corner of the interior of the scale house.
(3) Readings obtained from interior of Mechanic's shop.
(4) See calibration data on Table 1.
NA Not Available or Not Applicable.

TABLE 3

REFUSE HIDEAWAY LANDFILL
MONTHLY BRANCH AND FLARE MONITORING INFORMATION
Date: October 29, 1993

	Pressure (in. W.C.)	CH_4[(1)] (%)	O_2 (%)	Gas Velocity (fpm)	Flow[(2)] (cfm)	Flow[(3)] (scfm)	Gas Temp	Valve Setting (fraction open)
Branch Monitoring Station								
North Branch	-23.0	51.8	0.0	2100	163.8	155	64.1	6/13
Central Branch	-24.0	50.8	2.1	1300	101.4	95.9	64.5	6/13
South Branch	-19.0	54.8	0.0	2700	210.6	204.8	57.2	6/13
Flare Inlet Pipe								
Port A	+5.5							N/A
Port B	+5.25	53.1	0.5	2900	536.5	536.5	74.5	Full
Port C	+3.5							N/A

Notes:

(1) Percent CH_4 (methane).
(2) Gas velocity is converted to gas flow by multiplying fpm x 0.185 @ 6-inch HDPE and fpm x 0.078 @ 4-inch PVC.
(3) Flows have been converted to standard conditions of 70°F and 406.9 inches water.
NA Not applicable.

TABLE 4

REFUSE HIDEAWAY LANDFILL
MONTHLY LEACHATE HEAD MONITORING INFORMATION
Date: October 27, 1993

Well	LEACHATE HEAD [2] (ft)			Current Pump Hours		Previous Pump Hours		Elapsed Pump Hours	
	Gas Well Depth	Depth to Leachate	Leachate Head	Total Hours	Time[3]	Total Hours	Time[3]	Total Hours	Pump Hours
GW-1	51.7	47.8	3.9						
GW-2	53.3	48.2	5.1						
GW-3	57	56.1	0.9						
GW-4	65	58.3	6.7						
GW-5	70	57.0	13.0						
GW-6	36	36.0	0						
GW-7	60	50.2	9.8						
GW-8[1]	69	55.2	13.8	10450.6	10:00	9907.3	12:50	718.8	543.3
GW-9[1]	66	43.8	22.2	10798.1	10:40	10798.1	1:50	720.5	0
GW-10	70	65.7	4.3						
GW-11[1]	65	62.6	2.4	929.0	10:30	580.8	1:35	720.1	348.2
GW-12	81	58.5	22.5						
GW-13	69	57.2	11.8						

Notes:

(1) Wells with leachate extraction pumps and controls.
(2) Gas wells retro-fitted with threaded ports on risers October 1992. Leachate levels measured from retro-fitted port on gas well riser. Gas well depths obtained from Construction Observation Report, November, 1990 and Operation and Maintenance Manual, November 1991.
(3) Time of hour meter reading was recorded on September 28, 1993 and October 29, 1993.
Shaded areas do not have reportable information.

TABLE 5

REFUSE HIDEAWAY LANDFILL
MONTHLY SUMMARY OF SYSTEM ALARM LOG
Date: November 11, 1993

Alarm Dates	Alarm Cause	Solution (hours flare not operational)
10/17/93	General alarm erroneous high leachate alarm	Re-set alarm at leachate tank panel. Flare did not shut down.
10/20/93	General alarm - flame failure	Re-start flare, cause for shut down not (2 hrs)
10/21/93	General alarm erroneous high leachate alarm	Re-set alarm after tightening electrical connections. Flare did not shut down.
10/22/93	Manual shut down of flare due to flame exiting the top of the flare.	Re-start flare (76 hrs.)

TERRA
▲ ENGINEERING & CONSTRUCTION CORPORATION ▲
ENVIRONMENTAL REMEDIATION
MUNICIPAL & UTILITY CONSTRUCTION
SPECIALTY EARTHWORK

December 21, 1993

Wisconsin Department of
Natural Resources
Environmental Response and
Repair Section
Bureau of Solid and Hazardous
Waste Management
101 South Webster Street,
GEF II, SE/3
Madison, Wisconsin 53707

Attn: Ms. Theresa Evanson

Re: Operation and Maintenance
Summary - November 1993
Landfill Gas and Leachate
Extraction System
Refuse Hideaway Landfill -
Middleton, Wisconsin
Terra Job # 468

Dear Ms. Evanson:

This letter summarizes operation and maintenance (O&M) activities performed by Terra Engineering & Construction Corporation (Terra), during the month of November 1993, at the Refuse Hideaway Landfill. Specific tasks are discussed in the following sections:

SCHEDULED LEACHATE LOADOUT

Leachate/Condensate was pumped and transported by Al's Modern Sewer Service to the Madison Metropolitan Sewerage District Treatment facility. The hauling dates and quantities are as follows:

	Measured Volume (gals)
November 10, 1993	5,140 Gallons
November 11, 1993	4,889 Gallons
November 23, 1993	4,878 Gallons
Total	14,907 Gallons

2201 VONDRON ROAD
MADISON, WI 53704-6795
608/221-3501 PHONE
608/221-4075 FAX

WEEKLY/MONTHLY MONITORING SCHEDULE

Weekly/Monthly monitoring of the landfill gas and leachate extraction system was performed on the following dates:

November 4, 1993	Weekly
November 12, 1993	Weekly
November 19, 1993	Weekly
November 23, 1993	Weekly
December 3, 1993	Monthly

Summary tables for weekly and monthly monitoring schedules are attached.

OBSERVATION AND DISCUSSION

During the month of November, five (5) permanent leachate pumps were installed in gas wells GW-4, 5, 7, 12 and 13. Following the pump start-up activities on November 8, 1993, pumps in gas wells GW-5 and GW-13 were found to be not working. An electrical problem (fuse) was found in GW-5 and corrected. The pump in gas well GW-13 appeared to be faulty and was replaced.

The permanent pump in gas well GW-9 was removed on November 4, 1993 and found to be in need of new lead wires. Replacement wires were installed on November 11, 1993. During pump installation, the connection between the well riser and the electrical junction box at the riser was damaged. A 6" x 3/4" saddle was placed on the riser to allow for reconnection of the electrical conduit to the riser. The pump was started on December 3, 1993, however, there was little to no leachate head in the well, possibly due to the effects of the other pumps. The power to the pump was turned off in order to save any wear on the pump as a leachate head is necessary to adjust the pump controls. Leachate levels will be checked during December Monthly Monitoring Activities and if a leachate head has developed in gas well GW-9, the pump will be energized and the pump controls adjusted.

The ground flare was manually shut down on November 10, 1993 to allow painters to prime and paint the flare. The flare was restarted on November 11, 1993. The flare went "down" due to alarm conditions on 5 occasions during the month of November. Terra personnel were on-site at the time of all but two shut downs and were able to re-start the flare after minimal down time. The shut downs are summarized in TABLE 5.

On November 10, 1993, a "vent hole" was discovered on the natural side slope located East of gas well GW-12. The vent is approximately two feet wide and can be seen emitting steam from time to time.

On November 19, 1993 a gas reading was taken inside the "vent hole", the results are as follows:

Methane - 1%
Carbon Dioxide - 5.6%
Oxygen - 16%

The vent hole does not appear to be causing any problems to the extraction system at this time, however, conditions may change which could warrant further attention to the vent.

Gas content readings from the Blower to the Flare were not available for the week of November 22, 1993 as the rental GA 1.1 gas analyzer experienced sensor problems.

Gas readings obtained from gas probes 11 shallow and deep (GP-11s amd GP-11d) showed negligible methane concentrations. Terra will continue to monitor GP-11s and GP-11d on a monthly basis.

Gas readings from gas probes GP-11s and GP-11d are as follows:

	GP-11s % Methane	GP-11d % Methane
November 4, 1993	NA	NA
November 9, 1993	0.1	0.0
November 19, 1993	0.0	0.0
November 23, 1993	NA	NA
December 3, 1993	0.0	0.0

The ground flare continues to experience eratic temperature fluctuations with the temperature varying from 1450°F to 1650°F. The fluctuations have not caused the flare to shut down. It appears that adjustments are necessary to the actuator motor controls and/or the thermocouple may need to be replaced in order to maintain the target temperature of 1500°F. We will keep you up to date on developements in regards to this as we continue trouble shooting the problem.

During the November Monthly Monitoring, valve adjustments were made on three gas wells. These adjustments are summarized as follows.

Gas Well	Initial Valve Setting	Final Valve Setting	Reason for Change[1]
GW-6	0/9	2/9	Increased from 13.9% to 44.49
GW-9	0/9	4/9	Well modifications completed. Methane content 68.7%.

GW-10	4/9	3/9	Methane decreased from 51.1% to 34.7%

(1)Gas composition comparisons were made between October 29, 1993 and December 3, 1993.

The cover of the landfill appears to be in good condition, the seed placed in the area of the lateral gas wells in the Southwest corner of the landfill will not likely sprout until Spring.

If you have any questions or comments regarding this report, please do not hesitate to contact us.

Sincerely,
TERRA ENGINEERING & CONSTRUCTION CORP.

Kirk Solberg

Kirk Solberg,
Environmental Geologist

TABLE 1

REFUSE HIDEAWAY LANDFILL
MONTHLY GAS EXTRACTION WELLS MONITORING INFORMATION

Date: DECEMBER 3, 1993
Temperature: 34 °F at 11 00 AM
Barometric pressure: 30.22 inches Hg
Monitored by: K. Solberg
Gas Detector Model No./Serial No.: GA 1.1 / GA 616
Date Gas Detector last calibrated: Factory calibrated: 11-24-93 (4)
Velometer Model No./Serial No.: Alnor 6000AP / 52697
Date Velometer last calibrated: Factory calibrated: May 1993

Well (1)	Well Pressure (inches W.C.)	Header Pressure (inches W.C.)	CH_4 (2) (%)	O_2 (%)	CO_2 (%)	Valve Setting (fraction open)	Gas (3) Velocity (fpm)	Gas (4) Flow (cfm)	Gas Temp (°F)
GW-1	-1.0	-15.0	5.0	20.0	4.3	0/13	<100	<4.5	36
GW-2	-1.0	-15.0	5.0	20.0	4.4	0/13	<100	<4.5	37
GW-3	-7.0	-14.0	45.0	0.0	35.0	4/9	2450	110.25	66
GW-4	-14.0	-15.0	45.2	0.0	34.3	4/9	1300	58.5	68.7
GW-5	-14.0	-15.0	57.0	0.9	37.0	5/9	900	40.5	67
GW-6	-1.0	-24.0	44.4	0.0	35.6	0/9	900	40.5	72
GW-7	-23.0	-23.0	55.6	0.0	37.7	7/9	800	36.0	82
GW-8(1)	-22.0	-23.5	62.4	0.0	38.6	6/9	800	36.0	85
GW-9(1)	0	-23.0	68.7	0.0	42.4	0/9	400	18.0	96
GW-10	-11.5	-16.5	34.7	0.0	31.5	4/9	2000	90.0	103
GW-11(1)	-16.0	-16.0	68.5	0.0	40.0	5/9	450	20.25	77.3
GW-12(1)	-14.0	-15.0	41.7	0.0	33.7	6/9	2500	112.5	102
GW-13(1)	-16	-16.0	62.1	0.0	38.7	7/9	800	36.0	82

Notes:

(1) Wells with leachate extraction pump and controls.
(2) Percent CH_4 (methane).
(3) Gas flow (cfm) is calculated by multiplying the gas velocity (fpm) by 0.045 ft^2 for 3-inch diameter PVC pipe.
(4) Calibration checked: 12-3-93
99% CH_4 read 113 % CH_4
2.5% CH_4 read 2.5 % CH_4
15% CO_2 read 14.8 % CO_2

NA Not Available or Not Applicable

TABLE 2

REFUSE HIDEAWAY LANDFILL
MONTHLY GAS PROBE MONITORING INFORMATION

Date: DECEMBER 3, 1993
Temperature: 25 °F at 7:13 am
Barometric pressure: 30.22 inches Hg
Monitored by: K. Solberg
Gas Detector Model No./Serial No.: GA1.1 / GA616
Date Gas Detector last calibrated: Factory calibrated: 11-24-93 (4)

Probe	Pressure (inches W.C.)	CH_4 (%)	CH_4 (1) (% LEL)	O_2 (%)
G-1S	0	0.0	0	20.5
G-1D	0	0.0	0	20.5
G-6	0	0.0	0	20.6
G-8	0	0.0	0	20.2
G-9	0	0.0	0	20.1
G-10	slight -	0.0	0	20.6
GP-11S	0	0.0	0	20.4
GP-11D	0	0.0	0	20.4
GPW-1S	0	0.0	0	18.5
GPW-1M	slight -	0.0	0	20.9
GPW-1D	slight -	0.0	0	20.9
Speedway Building (2)	NA	0.0	0	20.5
Speedway Building (3)	NA	0.0	0	20.5

Notes:

(1) Percent of lower explosive limit of CH_4 (100% LEL = 5% CH_4 by volume).
(2) Readings obtained from the northeast corner of the interior of the scale house.
(3) Readings obtained from interior of Mechanic's shop.
(4) See calibration data on Table 1.
NA Not Available or Not Applicable.

TABLE 3

REFUSE HIDEAWAY LANDFILL
MONTHLY BRANCH AND FLARE MONITORING INFORMATION
Date: DECEMBER 3, 1993

	Pressure (in. W.C.)	CH_4[1] (%)	O_2 (%)	Gas Velocity (fpm)	Flow[2] (cfm)	Flow[3] (scfm)	Gas Temp	Valve Setting (fraction open)
Branch Monitoring Station								
North Branch	-19	41.5	0.0	3000	234.0	228.6	62.6	6/13
Central Branch	-24	44.9	1.8	1900	148.2	146.0	51.8	6/13
South Branch	-19	46.8	0.0	2400	187.2	189.3	44.9	6/13
Flare Inlet Pipe								
Port A	+6.5							N/A
Port B	+6.0	44.1	0.0	2800	518.0	539.9	61.1	Full
Port C	+4.5							N/A

Notes:

(1) Percent CH_4 (methane).
(2) Gas velocity is converted to gas flow by multiplying fpm x 0.185 @ 6-inch HDPE and fpm x 0.078 @ 4-inch PVC.
(3) Flows have been converted to standard conditions of 70°F and 406.9 inches water.
NA Not applicable.

TABLE 4

REFUSE HIDEAWAY LANDFILL
MONTHLY LEACHATE HEAD MONITORING INFORMATION
Date: DECEMBER 3 1993

Well	LEACHATE HEAD [2] (ft)			Current Pump Hours		Previous Pump Hours		Elapsed Pump Hours	
	Gas Well Depth	Depth to Leachate	Leachate Head	Total Hours	Time[3]	Total Hours	Time[3]	Total Hours	Pump Hours
GW-1	51.7	47.5	4.2						
GW-2	53.3	47.8	5.5						
GW-3	57	56.8	0.2						
GW-4[1]	65	NR	—	882.4	10^{30}	42.1	11^{10}	840.5	840.3
GW-5[1]	70	51.7	18.3	568.9	10^{00}	0.0	11^{00}	841.0	568.9
GW-6	36	36.0	0						
GW-7[1]	60	57.5	2.5	878.8	11^{00}	36.7	10^{00}	839.0	842.1
GW-8[1]	69	72.0	0	11069.1	11^{30}	10450.6	10^{00}	838.5	618.5
GW-9[1]	66	NR	—	10798	1^{00}	10798	10^{40}	837.75	0.0
GW-10	70	65.3	4.7						
GW-11[1]	65	NR	—	1121.2	12^{30}	929.0	10^{30}	838.0	192.2
GW-12[1]	81	60.2	20.8	667.8	12^{15}	5.0	10^{25}	838.25	662.8
GW-13[1]	69	62.9	6.1	14.0	12^{00}	0.0	10^{25}	838.5	14.0

Notes:

(1) Wells with leachate extraction pumps and controls.
(2) Gas wells retro-fitted with threaded ports on risers October 1992. Leachate levels measured from retro-fitted port on gas well riser. Gas well depths obtained from Construction Observation Report, November, 1990 and Operation and Maintenance Manual, November 1991.
(3) Time of hour meter reading was recorded on October 29, 1993 and DECEMBER 3, 1993.
Shaded areas do not have reportable information.

TABLE 5

REFUSE HIDEAWAY LANDFILL
MONTHLY SUMMARY OF SYSTEM ALARM LOG
Date: December 4, 1993

Alarm Dates	Alarm Cause	Solution (hours flare not operational)
11/08/93	Flame Failure likely due to vacuum switch.	Terra personnel on-site. Re-start Flare. (Flare down 0.5 hrs.)
11/09/93	Flame Failure likely due to low Flow to Flare.	Re-start flare. (Flare down 1.25 hrs.)
11/09/93	Flame Failure likely due to low Flow to Flare.	Re-start flare. (Flare down 0.33 hrs.)
11/10/93	Manual shut down for Flare painting.	Re-start flare after painting. (Flare down 24.5 hrs.)
12/03/93	Flare shut down four (4) times due to vacuum switches which are occassionally activated during well monitoring.	Re-start flare. (Flare was down for a total of 0.25 hrs.)

TABLE 6

REFUSE HIDEAWAY LANDFILL
SUMMARY OF WEEKLY MONITORING INFORMATION
Date: December 4, 1993

Description	Date: November 4, 1993				Date: November 12, 1993				Date: November 19, 1993				Date: November 23, 1993				Date: December 3, 1993			
	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)
Branch Monitoring Station																				
North Branch	6/13	-18.0	40.9	0.0	6/13	-18.0	43.0	0.0	6/13	-18.0	39.0	0.0	6/13	-18.0	38.5	0.0	6/13	-19.0	41.5	0.0
Central Branch	6/13	-23.0	47.3	2.0	6/13	-23.5	46.8	2.3	6/13	-24.0	44.0	3.1	6/13	-24.0	42.3	2.8	6/13	-24.0	44.9	1.8
South Branch	6/13	-18.0	45.1	0.2	6/13	-17.5	46.0	1.0	6/13	-18.0	45.1	0.2	6/13	-18.0	42.7	0.3	6/13	-19.0	46.8	0.0
Blower Inlet Pipe																				
Inlet Port A		-25.0	44.7	0.1		-26.0	46.5	0.9		-25.0	41.7	1.2		-26.0	NA	NA		-26.0	44.0	0.0
Inlet Port B		-26.5				-27.0				-27.0				-27.0				-27.5		
Outlet Port A		+9.0				+9.0				+9.0				+9.5				+9.0		
Flare Inlet Pipe																				
Sample Port A		+6.5				+7.0				+6.0				+6.5				+6.5		
Sample Port B		+6.5	45.0	0.1		+6.5	48.1	0.2		+6.0	44.4	0.2		+6.5	NA	NA		+6.0	44.1	0.0
Sample Port C		+4.25				+4.5				+4.0				+4.5				+4.5		
Flare Temperature (°F)	1460-1717				1460-1500				1500				1500				1590-1689			
Flare Flow (cfm/scfm)	555/548				499.5/504				555/559				518/519.7				518/540			

Notes:

(1) Percent CH_4 (methane).
NA Not Available or Not Applicable.
Shaded areas do not have reportable information.

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TERRA
▲ ENGINEERING & CONSTRUCTION CORPORATION ▲
ENVIRONMENTAL REMEDIATION
MUNICIPAL & UTILITY CONSTRUCTION
SPECIALTY EARTHWORK

January 19, 1994

Wisconsin Department of
Natural Resources
Environmental Response and
Repair Section
Bureau of Solid and Hazardous
Waste Management
101 South Webster Street,
GEF II, SE/3
Madison, Wisconsin 53707

Attn: Ms. Theresa Evanson

Re: Operation and Maintenance
Summary - December 1993
Landfill Gas and Leachate
Extraction System
Refuse Hideaway Landfill -
Middleton, Wisconsin
Terra Job # 468

Dear Ms. Evanson:

This letter summarizes operation and maintenance (O&M) activities performed by Terra Engineering & Construction Corporation (Terra), during the month of December 1993, at the Refuse Hideaway Landfill. Specific tasks are discussed in the following sections:

SCHEDULED LEACHATE LOADOUT

Leachate/Condensate was pumped and transported by Al's Modern Sewer Service to the Madison Metropolitan Sewerage District Treatment facility. The hauling dates and quantities are as follows:

	Measured Volume (gals)
December 4, 1993	5,139 Gallons
December 6, 1993	5,123 Gallons
December 10, 1993	4,887 Gallons
December 10, 1993	2,114 Gallons
December 16, 1993	5,020 Gallons
December 23, 1993	3,062 Gallons
December 31, 1993	3,243 Gallons
Total	28,588 Gallons

2201 VONDRON ROAD
MADISON, WI 53704-6795
608/221-3501 PHONE
608/221-4075 FAX

WEEKLY/MONTHLY MONITORING SCHEDULE

Weekly/Monthly monitoring of the landfill gas and leachate extraction system was performed on the following dates:

December 9, 1993	Weekly
December 16, 1993	Weekly
December 23, 1993	Weekly
December 23, 1993	Monthly Leachate Levels
December 29, 1993	Monthly Gas Probe Readings

Well field adjustments were not made to the gas wells during the month of December due to a thermocouple failure. The thermocouple failure is further discussed in this report.

Summary tables for weekly and monthly monitoring schedules are attached.

OBSERVATION AND DISCUSSION

Quarterly leachate samples were obtained from the leachate holding tank on December 9, 1993. Samples were sent to Mid-States Associates, for analysis. The quarterly leachate analytical results have been forwarded to Madison Metropolitan Sewerage District and a copy to you under separate cover.

On December 16, 1993 gas readings were taken from Gas Probes 11 shallow and deep. No methane was detected in either Gas Probe. Terra will continue to monitor Gas Probes 11 shallow and deep on a monthly basis.

On December 16 and 23, 1993, the power to the leachate pump in GW-9 was turned on. No leachate head was detected in the gas well so the power to the pump was turned off to prevent the pump from burning out. In the future if a leachate head is discovered in the gas well, the power to the leachate pumps will be turned on.

On three (3) occasions during weekly blower monitoring, oxygen was observed in the central branch ranging in concentration from 1.0% to 1.6%: During the November round of monthly monitoring, no oxygen was detected in any of the gas wells on the central branch. The source of the oxygen in the central branch has not been determined.

It appears that the pumps in gas wells GW-4, 5 and 12 have been running nearly continuously. The pumps in gas wells GW-7 and 8 have been running approximately 90% of the time. Although there was a marked increase in the volume of leachate pumped from the collection tank during the month of December, we will evaluate these pump hour meters during the next round of readings.

During the month of December, Terra was alerted to three (3) alarm conditions. The alarm conditions are summarized in Table 5. The high temperature alarm condition occurring on December 25, 1993 is of interest as it was the result of a failure of the thermocouple with-in the flare.

The failure of the thermocouple, which along with the dampers, controls the temperature of the flare, has kept the flare shut down until the thermocouple can be repaired and replaced.

Terra has sent the thermocouple to Linklater Corporation for repair. This thermocouple was installed on January 23, 1993 as a replacement for the original thermocouple that failed on January 5, 1993. Mr. John Gwinn of Linklater believes that some constituent of the landfill gas is "attacking" the thermocouple as the thermocouple wire appears corroded. A report of Mr. Gwinns findings is pending and will be forwarded to you upon receipt. It is hoped that the replacement of the thermocouple will lead to fewer temperature fluctuations of the flare. We will keep you informed of developments concerning the thermocouple situation.

Monthly gas well monitoring was not conducted this month due to the aforementioned thermocouple problem. Monthly monitoring will be conducted as soon as the thermocouple is replaced and the flare is restarted.

If you have any questions or comments regarding this report, please do not hesitate to contact us.

Sincerely,
TERRA ENGINEERING & CONSTRUCTION CORP.

Kirk Solberg

Kirk Solberg,
Environmental Geologist

TABLE 1

REFUSE HIDEAWAY LANDFILL
MONTHLY GAS EXTRACTION WELLS MONITORING INFORMATION

Thermocouple failure has the Blower/Flare shut down
Date: Until repairs can be made to the Thermocouple.
Temperature: F at
Barometric pressure: inches Hg No monthly readings of gas wells
Monitored by: were obtained, as no adjustments
Gas Detector Model No./Serial No.: could be made.
Date Gas Detector last calibrated: Factory calibrated: (4)
Velometer Model No./Serial No.:
Date Velometer last calibrated: Factory calibrated:

Well (1)	Well Pressure (inches W.C.)	Header Pressure (inches W.C.)	CH_4 (2) (%)	O_2 (%)	CO_2 (%)	Valve Setting (fraction open)	Gas (3) Velocity (fpm)	Gas (4) Flow (cfm)	Gas Temp (°F)
GW-1									
GW-2									
GW-3									
GW-4									
GW-5									
GW-6									
GW-7									
GW-8(1)									
GW-9(1)									
GW-10									
GW-11(1)									
GW-12									
GW-13									

Notes:

(1) Wells with leachate extraction pump and controls.
(2) Percent CH_4 (methane).
(3) Gas flow (cfm) is calculated by multiplying the gas velocity (fpm) by 0.045 ft^2 for 3-inch diameter PVC pipe.
(4) Calibration checked: _____
99% CH_4 read _____ % CH_4
2.5% CH_4 read _____ % CH_4
15% CO_2 read _____ % CO_2

NA Not Available or Not Applicable

TABLE 3

REFUSE HIDEAWAY LANDFILL
MONTHLY BRANCH AND FLARE MONITORING INFORMATION
Date: December 23, 1993

	Pressure (in. W.C.)	CH_4[(1)] (%)	O_2 (%)	Gas Velocity (fpm)	Flow[(2)] (cfm)	Flow[(3)] (scfm)	Gas Temp	Valve Setting (fraction open)
Branch Monitoring Station								
North Branch	-19.5	53.1	0.0	2800	218.4	213.1	60.6	6/13
Central Branch	-23.5	39.4	1.6	1200	93.6	92.05	51.2	6/13
South Branch	-20.0	42.2	0.0	2050	159.9	160.5	45.3	6/13
Flare Inlet Pipe								
Port A	FROZEN							N/A
Port B	+6.0	40.5	0.0	2950	545.75	565.5	62.3	Full
Port C	FROZEN							N/A

Notes:

(1) Percent CH_4 (methane).
(2) Gas velocity is converted to gas flow by multiplying fpm x 0.185 @ 6-inch HDPE and fpm x 0.078 @ 4-inch PVC.
(3) Flows have been converted to standard conditions of 70°F and 406.9 inches water.
NA Not applicable.

TABLE 4

REFUSE HIDEAWAY LANDFILL
MONTHLY LEACHATE HEAD MONITORING INFORMATION
Date: DECEMBER 23, 1993

Well	LEACHATE HEAD [2] (ft)			Current Pump Hours		Previous Pump Hours		Elapsed Pump Hours	
	Gas Well Depth	Depth to Leachate	Leachate Head	Total Hours	Time[3]	Total Hours	Time[3]	Total Hours	Pump Hours
GW-1	51.7	49.3	2.4						
GW-2	53.3	48.6	4.7						
GW-3	57	56.5	05						
GW-4[1]	65	54.5	10.5	1366.9	3:00 PM	882.4	10:30 AM	484.5	484.5
GW-5[1]	70	36.3 *	33.7	1053.6	2:50 PM	568.9	10:00 AM	484	484.7
GW-6	36	35.0	1.0						
GW-7[1]	60	53.3	6.7	1309.3	2:00 PM	878.8	11:00 AM	483	430.5
GW-8[1]	69	39.0 *	30.0	11505.2	2:15 PM	11069.1	11:30 AM	483	436.1
GW-9[1]	66	NR	—	10798.1	2:45 PM	10798.1	1:00 PM	482	0 - Power Off
GW-10	70	63.3	6.7						
GW-11[1]	65	58.8	6.2	1183.3	2:30 PM	1121.2	12:30 PM	482	62.1
GW-12[1]	81	59.0	22.0	1150.1	2:30 PM	667.8	12:15 PM	482	482.3
GW-13[1]	69	62.5	6.5	23.5	2:30 PM	14.0	12:00 PM	482.5	9.5

Notes:

(1) Wells with leachate extraction pumps and controls.
(2) Gas wells retro-fitted with threaded ports on risers October 1992. Leachate levels measured from retro-fitted port on gas well riser. Gas well depths obtained from Construction Observation Report, November, 1990 and Operation and Maintenance Manual, November 1991.
(3) Time of hour meter reading was recorded on December 3, 1993 and December 23, 1993.
Shaded areas do not have reportable information.

* Possible erroneous depth to leachate reading.

TABLE 2

REFUSE HIDEAWAY LANDFILL
MONTHLY GAS PROBE MONITORING INFORMATION

Date: December 29, 1993
Temperature: 17 °F at 9:30 am
Barometric pressure: 30.03 inches Hg
Monitored by: J. Falco
Gas Detector Model No./Serial No.: GA 1.1
Date Gas Detector last calibrated: Factory calibrated: DEC 1993 (4)

Probe	Pressure (inches W.C.)	CH_4 (%)	CH_4 (1) (% LEL)	O_2 (%)
G-1S	0.0	0.0	0.0	21.5
G-1D	0.0	0.0	0.0	21.6
G-6	0.0	0.0	0.0	21.1
G-8	NA - LOCK	FROZEN		
G-9	NA - LOCK	FROZEN		
G-10	NA - LOCK	FROZEN		
GP-11S	0.0	NR	NR	21.3
GP-11D	0.0	NR	NR	21.0
GPW-1S	0.0	0.0	0.0	18.2
GPW-1M	0.0	NR	NR	17.7
GPW-1D	0.0	0.0	0.0	17.4
Speedway Building (2)	NA	0.0	0.0	22.1
Speedway Building (3)	NA	0.0	0.0	21.0

Notes:

(1) Percent of lower explosive limit of CH_4 (100% LEL = 5% CH_4 by volume).
(2) Readings obtained from the northeast corner of the interior of the scale house.
(3) Readings obtained from interior of Mechanic's shop.
(4) See calibration data on Table 1.
NA Not Available or Not Applicable.
NR No Reading, GA 1.1 gas meter malfunction.

TABLE 5

REFUSE HIDEAWAY LANDFILL
MONTHLY SUMMARY OF SYSTEM ALARM LOG
Date: January 17, 1994

Alarm Dates	Alarm Cause	Solution (hours flare not operational)
12/23/1993	Flame failure likely due to vacuum switch sensing change in header pressure while obtaining leachate head measurements.	Re-start flare after obtaining leachate head measurements. (Flare down 1 hour)
12/25/1993	Low Temperature alarm condition alerted at 12:15 am.	Flare operational re-set alarm.
12/25/1993	High Temperature alarm condition at 8:25 pm.	Flare shut down. Thermocouple failure. Replace thermocouple (pending).

TABLE 6

REFUSE HIDEAWAY LANDFILL
SUMMARY OF WEEKLY MONITORING INFORMATION
Date: JANUARY 17, 1993

Description	Date: December 9, 1993				Date: December 16, 1993				Date: December 23, 1993				Date:				Date:			
	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O_2 (%)	Valve Setting	Pressure (in. W.C.)	CH_4 (1) (%)	O. (%
Branch Monitoring Station																				
North Branch	6/13	-18.5	41.5	0.0	6/13	-20.0	40.2	0.0	6/13	-19.5	53.1	0.0								
Central Branch	6/13	-23.0	43.5	1.0	6/13	-24.0	41.6	1.3	6/13	-23.5	39.4	1.6								
South Branch	6/13	-19.5	47.9	0.0	6/13	-21.0	44.7	0.0	6/13	-20.0	42.2	0.0								
Blower Inlet Pipe																				
Inlet Port A		-26.0	45.0	0.0		-27.0	44.0	0.0		-26.5	40.0	0.0								
Inlet Port B		-27.0				-28.0				-28.0										
Outlet Port A		+ 8.5				+9.0				+9.0										
Flare Inlet Pipe																				
Sample Port A		+5.0				+5.5				NA										
Sample Port B		+5.0	46.1	0.0		+5.0	44.6	0.0		+6.0	40.5	0.0								
Sample Port C		+3.0				+3.5				NA										
Flare Temperature (°F)	1500				1439→1716				1500→1600											
Flare Flow (cfm/scfm)	564/566				546/557				546/565											

Notes:

(1) Percent CH_4 (methane).
NA Not Available or Not Applicable.
Shaded areas do not have reportable information.