

EXPLORING EARTH'S MYSTERIES
...PROTECTING ITS FUTURE

Waste Management Facility

Facility Environmental Monitoring Report

Calendar Year 2002



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Brookhaven National Laboratory Waste Management Facility

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Summary of Results

Environmental monitoring conducted at the Waste Management Facility during 2002 continues to indicate that waste management operations are not impacting environmental quality. No contaminants related to Waste Management Facility operations were identified in groundwater samples, or in water samples collected from SPDES Outfall 003. Environmental TLD ambient measurements indicate that dose in the vicinity of the WMF are equivalent to background values.

Background

The Waste Management Facility (WMF) is designed to safely handle, repackage, and temporarily store BNL-derived wastes prior to shipment to an off-site disposal or treatment facility. The WMF has been designed with engineering controls that meet all applicable federal, state, and local environmental protection requirements. Moreover, institutional controls such as spill prevention plans, operations management plans, maintenance, and personnel training ensure that the facility operates in a manner that protects the environment and human health.

The WMF is adjacent to BNL Potable Supply Wells 11 and 12, which are located south of East Fifth Avenue and just north of the WMF site (Figure 1). Because of the close proximity of the WMF to Potable Wells 11 and 12, it is imperative that the engineered and institutional controls discussed above are effective in ensuring that waste handling operations do not degrade the quality of the soils and groundwater in this area. The groundwater monitoring program for the WMF is designed to supplement the engineered and institutional controls by providing additional means of detecting potential contaminant releases.

Environmental Monitoring Program

BNL has established an environmental monitoring program at the WMF to evaluate potential impacts to environmental quality and to demonstrate compliance with DOE requirements and applicable federal, state, and local laws, regulations, and permits. Groundwater monitoring is a requirement of the RCRA Part B permit issued for Waste Management Facility operations. The environmental monitoring program for the WMF is described in the *BNL Environmental Monitoring Plan* (BNL, 2002a). Monitoring results for CY 2002 are summarized below.

Monitoring Results

Groundwater

The WMF's groundwater monitoring program is designed to provide a secondary means of detecting groundwater contamination in the event that a spill or leak from the WMF goes undetected using the (primary) engineered and institutional controls. Eight wells are used to monitor for potential contaminant releases from the three main waste handling and storage buildings, and to assess background water quality (Figure 1). Groundwater monitoring results for CY 2002 are consistent with previous monitoring, and continue to show that WMF operations are not affecting groundwater quality.

Radiological Analyses: Radioactivity levels in samples collected from the WMF wells were generally typical of ambient (background) levels (Table 1). No Laboratory-related radionuclides were detected in the WMF wells during CY 2002.

Non-radiological Analyses: All water quality and most metals concentrations were below applicable New York State Ambient Water Quality Standards (NYSAWQS) (see Tables 2 and 3). As in past years, sodium was detected at a concentration above the NYSAWQS of 20 mg/L in upgradient well 055-03, with a concentration of 29.5 mg/L. Compared to previous years when low levels of VOCs (namely 1,1,1-trichloroethane and chloroform) were periodically detected in several of the upgradient wells, no VOCs were detected during 2002 (Table 4). Furthermore, the gasoline additive methyl tertiary butyl ether (MTBE), which was detected in the February 2001 sample from well 056-22, was not detected in any of the WMF wells during 2002.

Potable Water Supply Wells

The Environmental Services and Plant Engineering Divisions jointly monitor Potable Supply Wells 11 and 12. Sampling frequency and analyses are described in the annual *BNL Potable Water System Sampling Plan* (BNL, 2002b) and the *BNL Environmental Monitoring Plan* (BNL, 2002a). In addition to the required Safe Drinking Water Act monitoring, the supply wells are monitored quarterly for gross alpha/beta, gamma, tritium, and Sr-90.

During CY 2002, treated water (using granulated activated carbon) from Potable Supply Wells 11 and 12 tested positive for total coliform on July 1 and October 10, respectively. The systems tested negative for total coliform after sterilization of the sampling ports on July 15 and October 14. Potable Supply Well 11 tested above the NYS secondary drinking water standard for iron on July 11, with a concentration of 0.35 mg/L (the drinking water standard is 0.3 mg/L). Subsequent sampling and analysis resulted in an iron concentration of 0.01 mg/L. The July 11 analysis is therefore considered a false positive, because natural levels of iron in the groundwater in this portion of the BNL site have historically been very low. No radionuclides attributable to BNL operations were found during 2002. Potable water system analytical results are provided to the Suffolk County Department of Health Services on a monthly basis and are summarized in the annual *BNL Site Environmental Report*.

Stormwater Discharges

State Pollutant Discharge Elimination System (SPDES): Storm water runoff from the Waste Management Facility roofs and pavement is conveyed to SPDES-permitted outfall 003 (HO). In late 2001, the Laboratory petitioned NYSDEC to remove the monitoring requirement for outfall 003 from the Laboratory's SPDES discharge permit. These changes were approved by NYSDEC and a revised SPDES permit was received in February 2002. Discharges were monitored for the first two months of 2002. No contaminants that could be attributed to Waste Management operations were observed. Although NYSDEC is not requiring monitoring at this outfall, the Environmental Services Division still monitors the flow and pH on a weekly basis.

Environmental Surveillance: Under the BNL Environmental Surveillance Program, the discharge is sampled quarterly for volatile organics, metals, water chemistry parameters (chlorides, nitrates, and sulfates), radionuclides, and field-measured parameters (pH, conductivity).

During 2002, no radionuclides related to Laboratory operations were detected in the discharges to Outfall 003 (HO). The majority of the gross alpha and beta concentrations were below the MDL. The maximum alpha concentration was 5.1 pCi/L, whereas the maximum beta concentration was 3.0 pCi/L, both detected in July. Tritium was not detected in any of the samples, and only naturally occurring gamma-emitting radionuclides were observed.

Analyses for metals and water chemistry parameters did not find any parameters above the MDL during either test on discharges from Outfall 003 throughout 2002. Low levels of trihalomethanes (common potable water disinfection byproducts, < 2.0 µg/L) were sporadically detected in the discharges to Outfall 003.

Environmental TLDs

Measurements of environmental background radiation are conducted through a network of on-site and off-site environmental TLDs placed in different grids and wind sectors. The TLDs measure radiation from cosmic and terrestrial sources of radiation, as well as any contribution from Laboratory operations. One of the TLDs (066-TLD1) is located between the WMF and Recharge Basin HO, to measure any contribution from the Waste Management Facility (Figure 2). The environmental TLDs are collected and read quarterly. The ambient dose rates for the first, second, third, and fourth quarters were 16.7, 12.8, 11.7, and 16.8 mrem, respectively. The annual external dose at this location was estimated to be 58 ± 21 mrem, and was similar to normal background rates found in the area.

Evaporator Facility

Some of BNL's liquid wastes contain residual radionuclides. Many of these radionuclides are removed from the liquid waste by using a reverse osmosis process conducted at the Waste Concentration Facility (Bldg. 811). However, because of the chemical properties of tritium, it cannot be removed from the water using this process. The tritiated water is delivered to the BNL Evaporator Facility (Bldg. 802B), where it is converted to steam

and released as airborne emission. The evaporator facility was constructed to reduce the total amount of tritiated water released to the Peconic River from BNL operations. The evaporator facility has not operated since 2001 and, therefore, there were no air emissions from this facility during 2002.

Future Monitoring Actions

The following actions are recommended:

- Petition NYSDEC to modify the RCRA Part B Permit groundwater monitoring requirements. With NYSDEC concurrence (anticipated by August 2003), reduce monitoring frequency to semiannual, and analyze samples for gross alpha, gross beta, gamma, and VOCs. Analyze samples annually for metals and anions.
- Continue the TLD monitoring program on its current schedule.

References

BNL. 2002a. *Brookhaven National Laboratory Environmental Monitoring Plan CY2002 Update*. BNL-52584 (Update). Brookhaven National Laboratory, Upton, NY. January 2002.

BNL. 2002b. Letter from L. Cunniff to K. Newcomer. *Brookhaven National Laboratory 2002 Potable Water Sampling Plan*. Brookhaven National Laboratory, Upton, NY. February 2002.

Table 1A. WMF Gross Alpha, Gross Beta, Tritium and Gamma Spectroscopy Results, First Half of CY 2002.

Well	Sample Period	Gross Alpha (pCi/L)	Gross Beta (pCi/L)	Tritium (pCi/L)	Gamma Spectroscopy Results
55-03 (a)	February	<1.0	<2.5	<384	NOR
	June	<0.6	<1.8	<311	Be-7 = 15.5 +/- 11.4 (c)
55-10 (a)	February	<1.0	5.3 +/- 1.6	<384	ND
	June	<0.6	<1.8	<311	ND
56-21	February	<1.0	<2.5	<384	NOR
	June	<0.6	<1.8	<369	Be-7 = 13.9 +/- 11.1 (c)
56-22	February	<1.0	<2.5	<384	NOR
	June	<0.6	<2.6 (d)	<369	NOR
56-23	February	<1.0	<2.5	<384	NOR
	June	<0.6	<1.8	<369	NOR
66-07 (b)	February	<1.0	<2.5	<384	NOR
	June	2.2 +/- 0.6	<1.8	<311	ND
66-83 (b)	February	<1.0	<2.5	<384	ND
	June	<0.6	9.1 +/- 1.4	<369	NOR
66-84	February	<1.0	<2.5	<384	NOR
	June	<0.6	<1.8	<369	NOR
Typical MDL		1.1	2.2	300	--
SDWA Limit		15	50	20,000	--

NOR = Only naturally occurring radionuclides were detected (e.g., K-40, Bi-214, Pb-212, and Pb-214).

ND = No gamma emitting radionuclides detected.

MDL = Minimum Detection Limit.

(a) Upgradient well in all potential groundwater flow patterns.

(b) Upgradient or side gradient well during this sample period.

(c) Be-7 detected in this sample is probably due to sample cross contamination. Be-7 is an activation product typically associated with accelerator facilities, and has a half-life of only 53 days. Drinking water limit based upon 4 mrem/yr dose is 6,000 pCi/L.

(d) Initial analysis of June sample indicated 78 pCi/L gross beta. Subsequent duplicate re-analysis of the sample indicated gross beta at <2.6 pCi/L

Note: SDWA Limit is based upon 40 CFR 141 Safe Drinking Water Act

Table 1B. WMF Gross Alpha, Gross Beta, Tritium and Gamma Spectroscopy Results, Second Half of CY 2002.

Well	Sample Period	Gross Alpha (pCi/L)	Gross Beta (pCi/L)	Tritium (pCi/L)	Gamma Spectroscopy Results
55-03 (a)	August	7.3 +/- 0.9	<2.6	<345	ND
	November	<0.6	<1.6	<318	NOR
55-10 (a)	August	0.6 +/- 0.4	<2.6	<345	NOR
	November	0.6 +/- 0.4	1.6 +/- 1.0	<318	NOR
56-21	August	4.6 +/- 0.8	<2.6	<345	ND
	November	<0.6	3.7 +/- 1.1	<318	NOR
56-22	August	3.1 +/- 0.6	<2.6	<345	ND
	November	<0.6	2.1 +/- 1.0	<318	NOR
56-23	August	<0.5	<2.6	<345	NOR
	November	2.5 +/- 0.6	4.6 +/- 1.5	<318	NOR
66-07 (b)	August	0.5 +/- 0.4	<2.6	412 +/- 236	NOR
	November	3.6 +/- 0.7	5.6 +/- 1.2	326 +/- 187	NOR
66-83 (b)	August	<0.5	<2.6	<345	ND
	November	1.4 +/- 0.5	<1.7	<289	NOR
66-84	August	<0.5	<2.6	<345	NOR
	November	2.5 +/- 0.6	2.4 +/- 1.1	<318	NOR
Typical MDL		1.1	2.2	300	--
SDWA Limit		15	50	20,000	--

NOR = Only naturally occurring radionuclides were detected (e.g., K-40, Bi-214, Ra-226, Pb-212, and Pb-214).

ND = No gamma emitting radionuclides detected.

MDL = Minimum Detection Limit.

(a) Upgradient well in all potential groundwater flow patterns.

(b) Upgradient or side gradient well during this sample period.

Note: SDWA Limit is based upon 40 CFR 141 Safe Drinking Water Act

Table 2. Water Quality Results for CY 2002

Well	Sample Period	Chloride	Sulfates	Nitrate
		-----(mg/L)-----		
55-03 (a)	June	14.3	9.7	<1.0
	August	51.6	13.3	<1.0
	November	47.1	7.0	<1.0
55-10 (a)	June	17.8	11.8	<1.0
	August	14.0	14.3	<1.0
	November	11.8	15.0	<1.0
56-21	June	9.3	13.9	1.2
	August	18.3	15.3	1.4
	November	17.8	16.5	<1.0
56-22	June	13.0	21.6	2.9
	August	13.7	19.5	2.5
	November	13.2	19.9	2.4
56-23	June	15.4	10.7	<1.0
	August	9.5	18.6	2.0
	November	13.6	19.4	2.5
66-07 (b)	June	27.4	17.9	1.3
	August	22.1	24.7	1.2
	November	22.2	15.7	1.4
66-83 (b)	June	15.2	7.7	<1.0
	August	14.3	14.1	<1.0
	November	13.5	8.8	<1.0
66-84	June	14.7	8.5	<1.0
	August	14.6	9.3	<1.0
	November	6.7	7.8	<1.0
Typical MDL		4.0	4.0	1.0
NYSAWQS		250	250	10

(a) Upgradient well in all potential groundwater flow patterns.
(b) Upgradient or side gradient well during this sample period.
MDL = Minimum Detection Limit
J = Estimated value

Table 3. Waste Management Facility Metals Analytical Results for CY 2002.

Well	Period	Ag	Al	Cd	Cr	Cu	Fe	Hg	Mn	Na	Pb	Zn
-----(mg/L)-----												
55-03 (a)	November	<0.001	<0.002	<0.001	<0.001	0.003	<0.075	<0.0001	<0.002	29.5	<0.0013	0.006
55-10 (a)	November	<0.001	<0.002	<0.001	<0.001	<0.002	<0.075	<0.0001	<0.002	11.3	<0.0013	0.007
56-21	November	<0.001	<0.002	<0.001	<0.001	<0.002	<0.075	<0.0001	0.013	12.8	<0.0013	0.006
56-22	November	<0.001	<0.002	<0.001	<0.001	<0.002	<0.075	<0.0001	0.002	9.5	<0.0013	0.007
56-23	November	<0.001	<0.002	<0.001	<0.001	<0.002	<0.075	<0.0001	<0.002	9.8	<0.0013	0.006
66-07 (b)	November	<0.001	<0.002	<0.001	<0.001	<0.002	<0.075	0.0001	<0.002	13.1	<0.0013	0.011
66-83 (b)	November	<0.001	<0.002	<0.001	<0.001	<0.002	<0.075	<0.0001	<0.002	5.8	<0.0013	0.005
66-84	November	<0.001	<0.002	<0.001	<0.001	<0.002	<0.075	<0.0001	<0.002	11.1	<0.0013	0.008
Typical MDL		0.001	0.002	0.001	0.001	0.002	0.075	0.0001	0.002	1.0	0.001	0.004
NYSAWQS		0.05	0.2(c)	0.01	0.05	0.2	0.3	0.0007	0.3	20	0.025	2.0(d)

Note: Primary potential contaminants shown. Other metals were analyzed for – see database for complete data set

MDL = Minimum Detection Limit

NA = Not analyzed for.

- (a) Upgradient well in all potential groundwater flow patterns.
- (b) Upgradient or side gradient well during this sample period.
- (c) Drinking water standard – Secondary MCL for aesthetic quality.
- (d) NYSDEC Guidance Value.

Table 4A. WMF Volatile Organic Compound Analytical Results, First Half of CY 2002. Note that only the primary contaminants of concern are shown. Samples were analyzed by modified EPA Method 624. No compounds were detected above the MDL.

Well	Sample Period	1,1,1-TCA	Chloroform	1,1-DCE	1,1-DCA	MTBE
		-----(ug/L)-----				
55-03 (a)	February	<2.0	<2.0	<2.0	<2.0	<2.0
	June	<2.0	<2.0	<2.0	<2.0	<2.0
55-10 (a)	February	<2.0	<2.0	<2.0	<2.0	<2.0
	June	<2.0	<2.0	<2.0	<2.0	<2.0
56-21	February	<2.0	<2.0	<2.0	<2.0	<2.0
	June	<2.0	<2.0	<2.0	<2.0	<2.0
56-22	February	<2.0	<2.0	<2.0	<2.0	<2.0
	June	<2.0	<2.0	<2.0	<2.0	<2.0
56-23	February	<2.0	<2.0	<2.0	<2.0	<2.0
	June	<2.0	<2.0	<2.0	<2.0	<2.0
66-07 (b)	February	<2.0	<2.0	<2.0	<2.0	<2.0
	June	<2.0	<2.0	<2.0	<2.0	<2.0
66-08 (b, c)	February	<2.0	<2.0	<2.0	<2.0	<2.0
	June	NS	NS	NS	NS	NS
66-83 (b)	February	<2.0	<2.0	<2.0	<2.0	<2.0
	June	<2.0	<2.0	<2.0	<2.0	<2.0
66-84	February	<2.0	<2.0	<2.0	<2.0	<2.0
	June	<2.0	<2.0	<2.0	<2.0	<2.0
Typical MDL		2	2	2	2	2
NYSAWQS		5	7	5	5	10

MDL = Minimum Detection Limit

NS = Well not sampled during this period.

(a) Upgradient well in all potential groundwater flow patterns.

(b) Upgradient or side gradient well during this sample period.

(c) Well 66-08 is not part of the routine monitoring program for the WMF.

Table 4B. WMF Volatile Organic Compound Analytical Results, Second Half of CY 2002. Note that only the primary contaminants of concern are shown. Samples were analyzed by modified EPA Method 624. No compounds were detected above the MDL.

Well	Sample Period	1,1,1-TCA	Chloroform	1,1-DCE	1,1-DCA	MTBE
		(ug/L)				
55-03 (a)	August	<2.0	<2.0	<2.0	<2.0	<2.0
	November	<2.0	<2.0	<2.0	<2.0	<2.0
55-10 (a)	August	<2.0	<2.0	<2.0	<2.0	<2.0
	November	<2.0	<2.0	<2.0	<2.0	<2.0
56-21	August	<2.0	<2.0	<2.0	<2.0	<2.0
	November	<2.0	<2.0	<2.0	<2.0	<2.0
56-22	August	<2.0	<2.0	<2.0	<2.0	<2.0
	November	<2.0	<2.0	<2.0	<2.0	<2.0
56-23	August	<2.0	<2.0	<2.0	<2.0	<2.0
	November	<2.0	<2.0	<2.0	<2.0	<2.0
66-07 (b)	August	<2.0	<2.0	<2.0	<2.0	<2.0
	November	<2.0	<2.0	<2.0	<2.0	<2.0
66-08 (b, c)	August	NS	NS	NS	NS	NS
	November	NS	NS	NS	NS	NS
66-83 (b)	August	<2.0	<2.0	<2.0	<2.0	<2.0
	November	<2.0	<2.0	<2.0	<2.0	<2.0
66-84	August	<2.0	<2.0	<2.0	<2.0	<2.0
	November	<2.0	<2.0	<2.0	<2.0	<2.0
Typical MDL		2	2	2	2	2
NYSAWQS		5	7	5	5	10

MDL = Minimum Detection Limit.

NS = Well not sampled during this period.

(a) Upgradient well in all potential groundwater flow patterns.

(b) Upgradient or side gradient well during this sample period.

(c) Well 66-08 is not part of the routine monitoring program for the WMF.

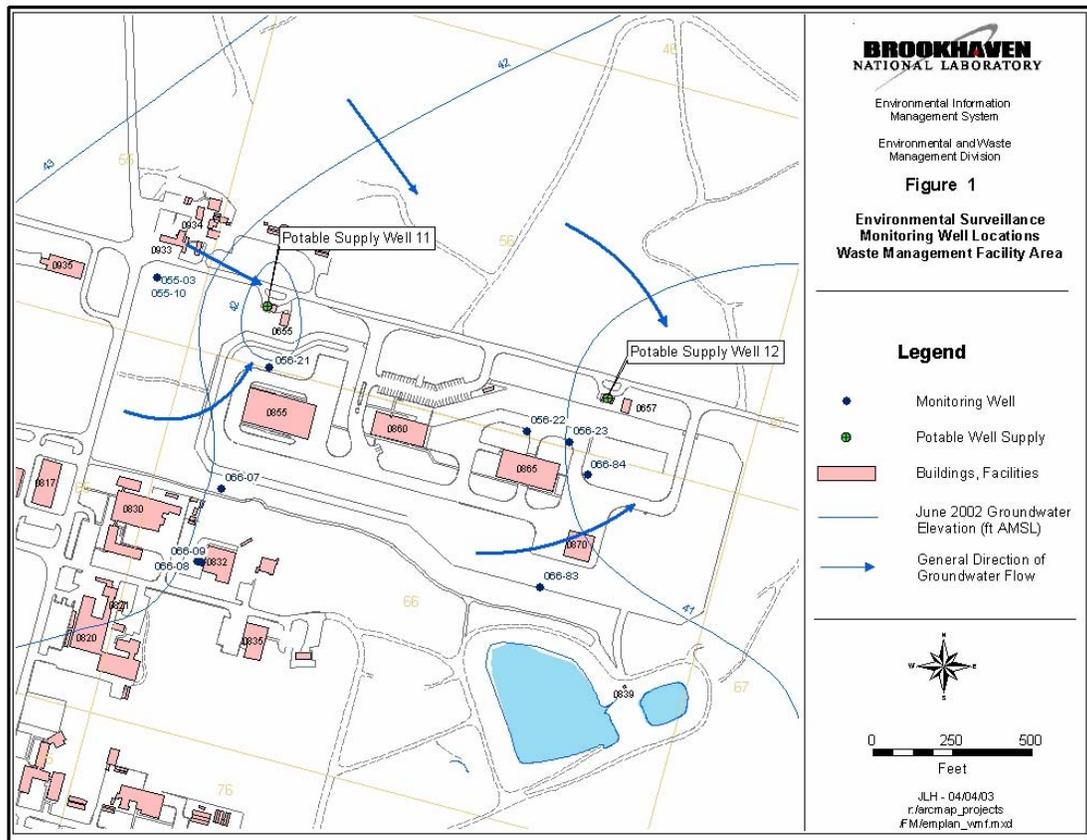


Figure 1. Locations of Monitoring Wells Near the Waste Management Facility.

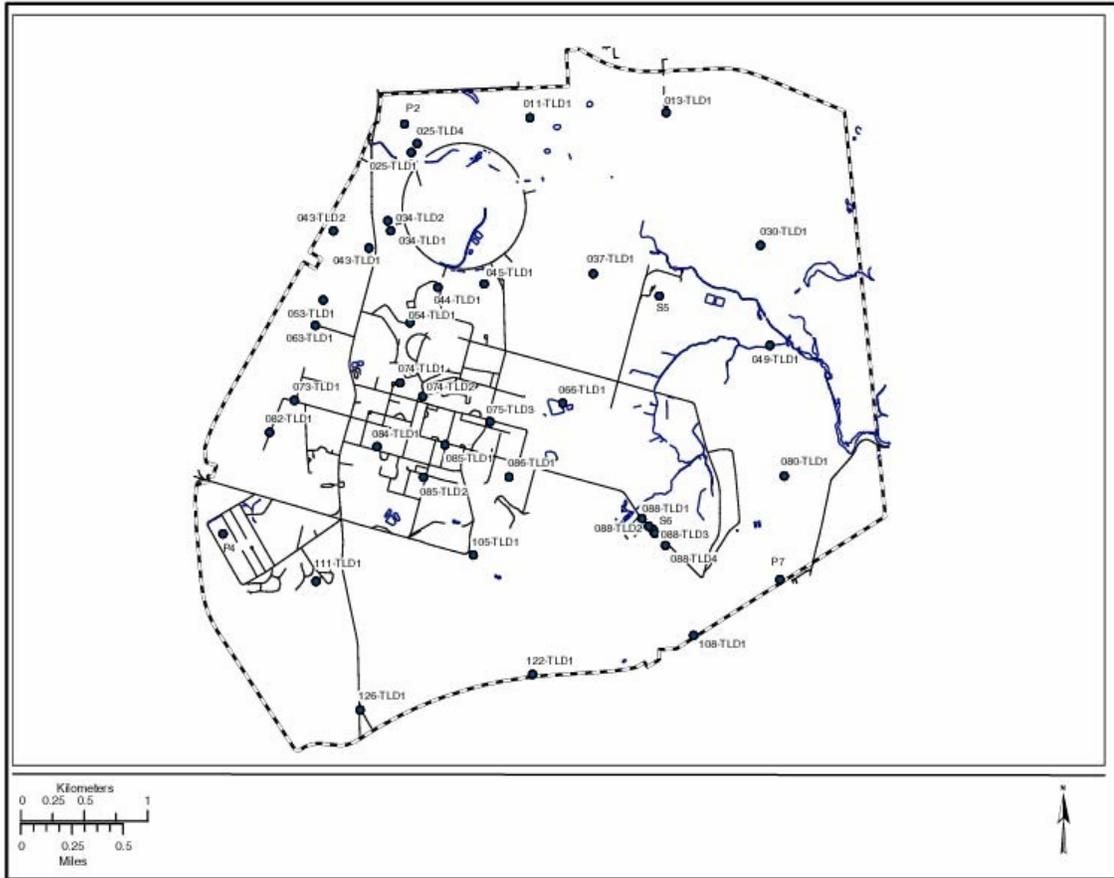


Figure 2: Locations of Environmental TLDs.