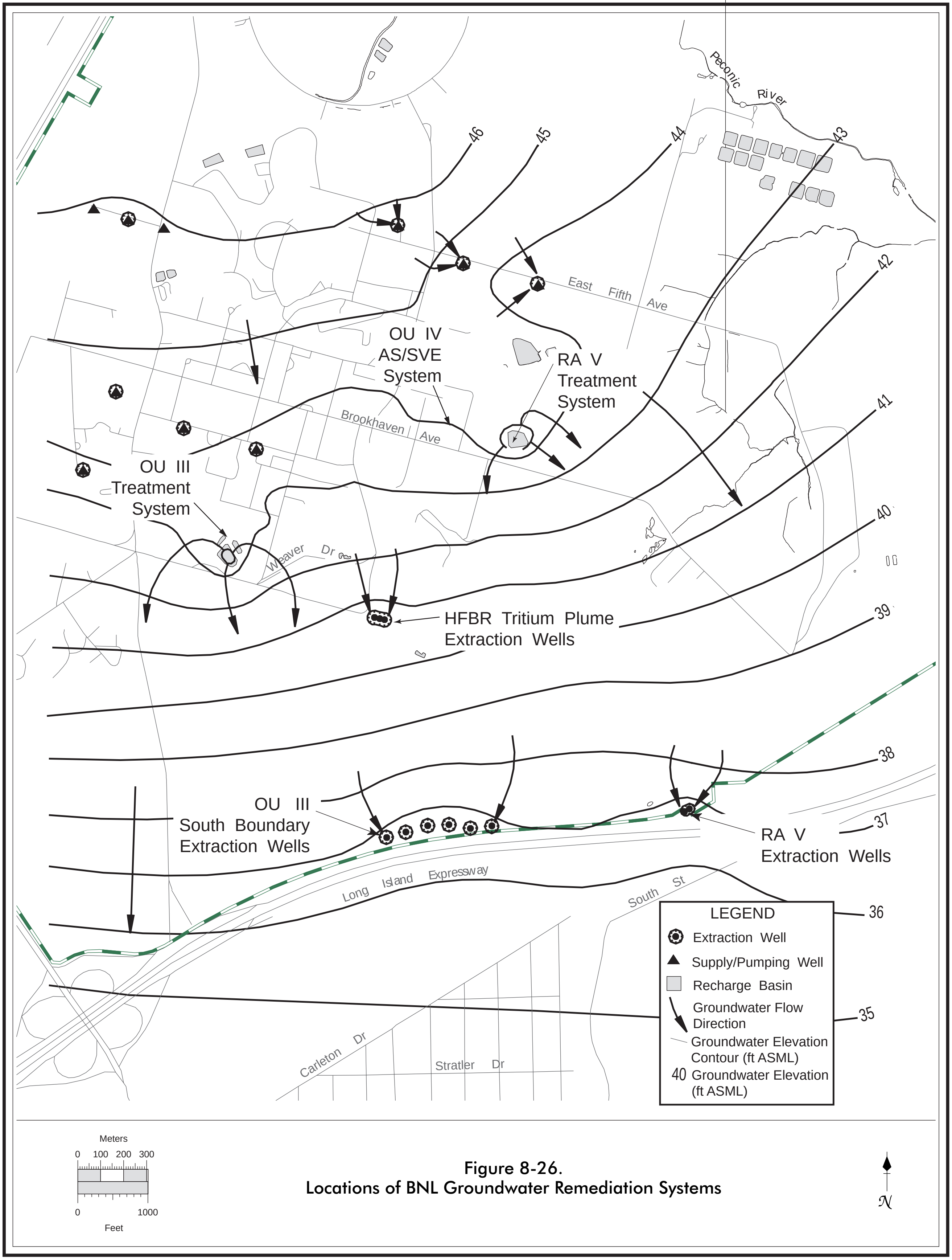

Figure 8-26.
Locations of BNL Groundwater Remediation Systems

Table 8-4. OU III South Boundary Groundwater Remediation System Comparison of Monthly Average Influent and Effluent VOC Concentrations [a]

Month (# Samples)	VOC Removal (lbs.)		Carbon Tetrachloride (µg/L)	1,1 - Dichloroethylene (µg/L)	Tetrachloroethylene (µg/L)	Trichloroethylene (µg/L)	1,1,1 -Trichloroethane (µg/L)
January	39	Influent	8	33	43	6	86
(2)		Effluent	<0.5	<0.5	<0.5	<0.5	<0.5
February	34	Influent	7	36	42	7	87
(2)		Effluent	<0.5	<0.5	<0.5	<0.5	<0.5
March	45	Influent	7	35	45	7	85
(2)		Effluent	<0.5	<0.5	<0.5	<0.5	<0.5
April	45	Influent	8	38	46	7	90
(2)		Effluent	<0.5	<0.5	<0.5	<0.5	<0.5
May	28	Influent	6	19	36	4	58
(2)		Effluent	<0.5	<0.5	<0.5	<0.5	<0.5
June	28	Influent	5	22	33	<5	60
(2)		Effluent	<0.5	<0.5	<0.5	<0.5	<0.5
July	33	Influent	6	25	35	5	63
(2)		Effluent	<0.5	<0.5	<0.5	<0.5	<0.5
August	22	Influent	3	18	19	4	45
(2)		Effluent	<0.5	<0.5	<0.5	<0.5	<0.5
September	29	Influent	5	21	31	4	61
(2)		Effluent	<0.5	<0.5	<0.5	<0.5	<0.5
October	32	Influent	3	25	44	2	61
(2)		Effluent	<0.5	<0.5	<0.5	<0.5	<0.5
November	22	Influent	6	15	41	4	42
(2)		Effluent	<0.5	<0.5	<0.5	<0.5	<0.5
December	46	Influent	7	33	58	5	75
(2)		Effluent	<0.5	<0.5	<0.5	<0.5	<0.5

Notes:
1. NYSAWQS: New York State Ambient Water Standard
2. MDL: Minimum Detection Limit
a. Other compounds detected (typically <3 µg/L).

Table 8-5. Removal Action V Groundwater Remediation System
Comparison of Monthly Average Influent and Effluent VOC Concentrations (a)

Month (# Samples)	VOC Removal (lbs)		Chloroethane	1,1 - Dichloroethane	Chloroform	1,1,1 Trichloroethane
			µg/L			
January (1)	4	Influent Effluent	3 <0.5	10 <0.5	<1 <0.5	3 <0.5
February (1)	3	Influent Effluent	3 <0.5	9 <0.5	<1 <0.5	<0.5 <0.5
March (1)	4	Influent Effluent	4 <0.5	8 <0.5	<1 <0.5	3 <0.5
April (1)	3	Influent Effluent	5 <0.5	11 <0.5	1 <0.5	4 <0.5
May (1)	7	Influent Effluent	3 <0.5	7 <0.5	<1 <0.5	3 <0.5
June (1)	3	Influent Effluent	2 <0.5	8 <0.5	1 <0.5	3 <0.5
July (1)	3	Influent Effluent	2 <0.5	7 <0.5	<1 <0.5	3 <0.5
August (1)	4	Influent Effluent	2 <0.5	7 <0.5	<1 <0.5	2 <0.5
September (1)	4	Influent Effluent	2 <0.5	6 <0.5	<1 <0.5	2 <0.5
October (1)	4	Influent Effluent	1 <0.5	7 <0.5	1 <0.5	2 <0.5
November (1)	3	Influent Effluent	2 <0.5	7 <0.5	<1 <0.5	2 <0.5
December (1)	4	Influent Effluent	3 <0.5	11 <0.5	2 <0.5	3 <0.5
NYSAWQS			5	5	7	5
MDL			0.5	0.5	0.5	0.5

Notes:
MDL = Minimum detection limit.
a. Trace amounts of several other compounds were occasionally detected (typically <3 µg/L).

nated from another source(s), the water is treated by passing it through a granular carbon filter to remove the VOCs before discharging the water to the RA V recharge basin. No VOCs were detected above the MDL treated water samples, and tritium concentrations in samples collected at the influent to the treatment system were <900 pCi/L (<33 Bq/L) (see Table 8-6). This interim remediation system is designed to prevent the further southward migration of the HFBR tritium plume while long-term remediation options are evaluated as part of the OU III FS.

During 1998, the granular activated carbon filters removed approximately 20 pounds of VOCs, and 238,000,000 liters (63,000,000 gallons) of treated water were recharged to the aquifer system.

Air Sparging/Soil Vapor Extraction System for OU IV: This remediation system, which has operated since November 1997, combines two technologies to remove VOC and semi-VOC contaminants from soil and groundwater located near the BNL CSF (Figure 8-26). The system uses air sparging and soil vapor extraction which forces pressurized air into the groundwater to "bubble" or strip these volatile compounds out of the water and soil and into a vapor phase. Powerful vacuum pumps then recover the resulting vapors and pipe them to a nearby treatment facility where the VOC vapors are removed by a granular carbon filter

Table 8-6. HFBR Tritium Plume and Recharge System
Monthly Average Influent Tritium Concentrations and a
Comparison of Monthly Average Influent and Effluent VOC Concentrations (a)

Month (# Samples)	**VOC Removal** (lbs)		**Tritium** (pCi/L)	**Tetrachloroethylene** (μg/L)	**1,1,1 - TCA** (μg/L)
January	2	Influent	<700	27	10
(3)		Effluent	-	<0.5	<0.5
February	2	Influent	<900	26	9
(1)		Effluent	-	<0.5	<0.5
March	2	Influent	<800	30	10
(2)		Effluent	-	<0.5	<0.5
April	2	Influent	<800	29	11
(2)		Effluent	-	<0.5	<0.5
May	2	Influent	<600	21	9
(2)		Effluent	-	<0.5	<0.5
June	2	Influent	<500	35	10
(2)		Effluent	-	<0.5	<0.5
July	1	Influent	<500	21	6
(3)		Effluent	-	<0.5	<0.5
August	1	Influent	<500	13	5
(2)		Effluent	-	<0.5	<0.5
September	1	Influent	<500	17	7
(2)		Effluent	-	<0.5	<0.5
October	1.5	Influent	<500	23	8
(2)		Effluent	-	<0.5	<0.5
November	2(a)	Influent	NS	NS	NS
(0)		Effluent	-	-	-
December	2	Influent	<500	30	11
(1)		Effluent	-	<0.5	<0.5
SDWA/NYSAWQS		20,000	5	5	
Typical MDL			700	0.5	0.5

Notes:
1. MDL = Minimum detection limit.
a. Other compounds detected (typically <3 μg/L).
b. Estimated.

system before the air is released into the atmosphere.

During 1998, approximately 18.5 pounds of contaminants were removed from the soil and groundwater through the treatment of 6.88 x 10^8 cubic feet of air collected in the soil vapor extraction system.

Offsite Groundwater Treatment System for OU III: A fifth groundwater remediation system is expected to be operational in the summer of 1999. The system will be constructed south of the BNL site to remove VOC contamination that has migrated to an industrial area located between the Long Island Expressway and the residential areas of North Shirley. This remediation system will consists of a series of innovative "in-well stripping" wells that use the same air stripping treatment concept as the OU III south boundary systems, but all treatment and recharge will occur within the well. Within each well, contaminated water will be pumped from a deep well screen to a treatment system located near the top of the well, where VOCs will be stripped from the water. The treated water will then be routed to a shallower screened section of the same well where it will re-enter the aquifer, and the VOC vapors will be captured by a granular carbon filter.

8.1.3 ENVIRONMENTAL MONITORING PROGRAM (NON-CERCLA)

As noted above, BNL's Environmental Monitoring Program includes monitoring at active waste processing and temporary storage facilities to comply with RCRA, waste-treatment facilities, operational monitoring around accelerators, and in other areas of known or suspected soil and groundwater contamination. In September 1998, BNL finalized a Groundwater Monitoring Improvements Plan (Paquette, 1998) which identified active research and support facilities requiring improved groundwater monitoring programs. As a result of this evaluation, over 80 new groundwater monitoring wells will be installed on a prioritized basis in 1999. During 1998, a total of 63 groundwater surveillance wells were monitored during approximately 235 individual sampling events. All wells sampled during 1998 are listed in Appendix D.

8.1.3.1 RESEARCH FACILITIES

8.1.3.1.1 ALTERNATING GRADIENT SYNCHROTRON AND BROOKHAVEN LINAC ISOTOPE PRODUCER (BLIP) AREAS

Activated soils have been created at the AGS and BLIP facilities as the result of secondary particles (primarily neutrons) produced at beam targets and beam stops. Radionuclides, such as tritium and sodium-22, have been produced by the interaction of these secondary particles and soils that surround these experimental areas. Furthermore, historical surface spills and discharges of solvents to cesspools and recharge basins near the AGS have contaminated soils and groundwater with VOCs. Groundwater quality in the AGS/Linac and BLIP areas is monitored using 19 shallow to deep Upper Glacial aquifer wells that are sampled on a quarterly basis.

Volatile Organic Compounds: Groundwater samples collected from two AGS area wells had TCA at concentrations that exceeded NYS AWQS. Wells 54-07 and 64-03 showed maximum TCA concentrations of 114 µg/L and 7.7 µg/L, respectively. The TCA in Well 64-03 may have originated from cesspools associated with Buildings 914 and 919, whereas the TCA in Well 54-07 may have originated from the Bubble Chamber spill areas. The contents of the Building 914/919 cesspools were characterized as part of the ER Program (Cesspools Removal Project EE/CA), and were found to contain VOCs at levels above NYS Soil Cleanup Guidelines (BNL, 1994). No VOCs were detected in Linac or BLIP area wells.

Radionuclides: In February 1998, above normal levels of tritium (14,100 pCi/L; 522 Bq/L) and sodium-22 (44 pCi/L; 2 Bq/L) were detected in Well 64-02, which located downgradient of the BLIP and AGS Booster facilities (Table 8-7). Although the initial tritium and sodium-22 values were below the DWS of 20,000 pCi/L and 400 pCi/L, respectively, BNL conducted a groundwater investigation and inspection of the facilities located upgradient of Well 64-02. As a result of this investigation, activated soils surrounding the BLIP facility's beam target vessel were identified as the source of the contamination. Tritium and sodium-22 concentrations (52,400 pCi/L [1,939 Bq/L] and 151 pCi/L [6 Bq/L], respectively) were observed in a temporary well installed approximately 6 meters (20 feet) south of the BLIP building. Tritium concentrations diminished to less than the 20,000 pCi/L DWS in wells installed approximately 30 meters (100 feet) downgradient of BLIP. Details on the characterization effort are contained in the Monitoring Well 064-02 Tritium Investigation Report (BNL, 1998b). Corrective actions were taken (e.g., connecting roof drains, sealing paved areas, and construction of a cement cap) to prevent rainwater from infiltrating the activated soils, and thereby "washing out" the tritium and sodium-22 from the soils and into the groundwater. Six new groundwater monitoring wells will be installed in 1999 to verify that these corrective measures are working.

8.1.3.1.2 BROOKHAVEN MEDICAL RESEARCH REACTOR

During a 1997 investigation to evaluate groundwater quality near the BMRR, a tritium plume with a maximum concentration of approximately one-half the DWS was identified. The maximum tritium concentration was 11,800 pCi/L (437 Bq/L) in wells installed directly downgradient (within 10 meters) of the facility. The tritium is believed to have originated from the historical discharge of small amounts of BMRR primary cooling water to a basement floor drain and sump system that may have leaked. The last discharge of primary water to the floor drain system occurred in 1987. However, the floor drains continued to be used for secondary (non-radioactive) cooling water until 1997, which may have promoted the movement of residual tritium from the soils surrounding the floor drain piping system to the groundwater. The floor drains were permanently sealed in 1998 to prevent any future releases to the underlying soils.

During 1998, four rounds of groundwater

Table 8-7. Radiological Data for Groundwater Wells Near AGS, BLIP, and LINAC Areas

Well		Gross Alpha (pCi/L)	Gross Beta (pCi/L)	Tritium (pCi/L)	Na-22 (pCi/L)
44-02	#	4	4	4	4
	Max.	3.0±0.7	< 4.0	< 317	ND
	Avg.	0.9±1.2	0.5±1.2	-17±198	
53-01	#	4	4	4	4
	Max.	1.9±0.7	3.2±1.5	< 373	ND
	Avg.	0.6±0.8	0.0±2.4	-163±72	
54-01	#	4	4	4	4
	Max.	7.1±1.0	4.7±2.6	463 211	ND
	Avg.	2.3±2.8	2.1±1.8	49±274	
54-02	#	3	3	3	4
	Max.	< 1.3	< 3.9	606±248	ND
	Avg.	0.1±0.8	0.5±0.8	357±203	
54-03	#	4	4	4	4
	Max.	4.7±1.3	6.8±2.6	< 367	ND
	Avg.	2.0±1.9	4.2±2.3	-52±51	
54-05	#	3	3	3	3
	Max.	< 1.1	< 3.7	< 317	ND
	Avg.	0.2±0.7	0.0±1.1	-6±154	
54-06	#	3	3	3	3
	Max.	< 0.9	< 4.0	< 317	ND
	Avg.	0.1±0.1	1.1±1.6	-51±181	
54-07	#	4	4	4	4
	Max.	< 0.7	8.4±2.7	585±242	1.8±1.1
	Avg.	-0.2±0.2	6.5±1.4	321±204	0.4±0.7
54-08	#	3	3	5	5
	Max.	2.4±1.1	6.6±1.5	< 372	ND
	Avg.	1.4±0.6	2.5±3.0	73±72	
54-10	#	5	5	5	5
	Max.	6.8±0.9	< 8.3	419±214	ND
	Avg.	2.5±2.6	4.0±2.2	-12±196	
64-01	#	4	4	4	4
	Max.	2.2±0.6	3.8±1.4	< 373	ND
	Avg.	0.5±1.1	1.0±2.3	-34±123	
64-02	#	6	6	10	9
	Max.	0.9±0.8	40.7±3.7	14,100±601	43.6±7.2
Avg.	0.5±0.4	19.1±12.1	3,609±3149	15.3±9.7	
64-03	#	5	5	5	5
	Max.	< 0.7	5.7±2.3	594±219	5.5±1.9
	Avg.	0.0±0.4	3.2±1.1	292±200	3.4±1.1
SDWA Limit		15	50	20,000	400

Notes:
# = Number of samples collected.
ND = Not Detected.
1. All values shown with 95% confidence interval.
2. Out of three analyses, Well 54-05 showed one detection of Be-7 at 17.1 ± 13.3 pCi/L.

samples were collected from three shallow Upper Glacial aquifer wells located downgradient of the BMRR (Table 8-8). Compared to 1997 results, tritium concentrations decreased in wells directly downgradient of the facility, with a maximum observed value in Well 84-12 of 6,200 pCi/L (229 Bq/L).

8.1.3.2 SUPPORT FACILITIES

8.1.3.2.1 SEWAGE TREATMENT PLANT / PECONIC RIVER AREA

As described in Chapter 2, STP processes sanitary sewage for BNL facilities. Approximately 15 percent of the water released to the

Table 8-8. Radiological Analysis Results for Wells Downgradient of the BMRR.

Well (# Samples)	Gross Alpha (pCi/L)	Gross Beta (pCi/L)	Tritium (pCi/L)
84-12	1.9±0.7	7.2±1.6	6,200±428
(4)	0.6±1.1	3.2±2.3	4,720±1,440
84-13	1.3±0.7	6.0±1.6	3,120±337
(4)	0.3±0.7	2.8±2.6	2,400±669
94-01	1.6±0.7	< 3.9	< 357
(4)	0.1±0.9	-18.9±35.0	4±118
SDWA Limit	15	50	20,000

Notes:
1. All values shown with 95% confidence interval.
2. No anthropogenic gamma-emitting radionuclides were detected in these wells in 1998.

STP's filter beds is lost either to evaporation or to direct groundwater recharge; the remaining water is discharged to the Peconic River. Past radiological and chemical releases to the sanitary system contaminated soils, sediments and groundwater in the STP and Peconic River areas. The STP groundwater monitoring program used 13 shallow Upper Glacial aquifer wells to evaluate groundwater quality near the plant's filter beds and along the Peconic River from the STP discharge point to the site boundary. These wells are typically monitored on a quarterly basis.

Volatile Organic Compounds, Metals and Water Quality Parameters: As noted earlier, groundwater quality impacts resulting from historical STP discharges are currently being monitored as part of the OU V monitoring program using wells that are located at the site boundary and offsite areas (see Section 8.1.2.5.1). The STP facility monitoring program, on the other hand, is designed to evaluate whether current operations are impacting groundwater quality. The 13 wells used under this program are situated close to the STP's sand filter beds and along the Peconic River. Samples are routinely analyzed for water quality, VOCs, and metals. In all groundwater samples, water quality parameters were within the applicable NYS AWQS. Iron levels exceeded NYS AWQS of 0.3 mg/L in five wells, with maximum concentrations ranging from 0.3 mg/L to 1 mg/L. Two wells had sodium concentrations above the NYS AWQS of 20 mg/L, with maximum concentrations ranging from 21.6 mg/L to 31.5 mg/L. Whereas the elevated iron concentrations may be due to naturally occurring sediments surrounding the wells, the sodium levels are likely due to Laboratory operations. Although trace amounts of chloroform were detected (maximum concentration of 1.6 µg/L), no VOCs were detected above NYS AWQS in any of the STP area wells.

Radionuclides: For groundwater in the area surrounding the STP, gross alpha and gross beta activity values were below DWS, and were typical of ambient groundwater values. However, gross beta activities were slightly elevated in Well 38-02 (a background well) and Well 38-03 (located near the filter beds) with maximum recorded values of 16 pCi/L (0.6 Bq/L) and 25.5 pCi/L (0.9 Bq/L), respectively (see Table 8-9). Because these wells are screened near shallow clay deposits, the slightly elevated gross beta values are likely due to naturally occurring potassium-40 from clay minerals introduced into the samples during collection. Tritium was present at up to 1,020 pCi/L (38 Bq/L) in wells located near the filter bed. Tritium concentrations in these wells have decreased over the past five years (Figure 8-27). Although cesium-137 has been detected in groundwater in this area in the past, no significant concentrations were observed in samples collected in 1998. No other man-made radionuclides were detected in groundwater in this area.

8.1.3.2.2 BNL SHOTGUN RANGE

In the north central portion of the site (north of the new WMF), BNL maintains a recreational shotgun range. Although impacts to groundwater quality from the deposition of lead shot used at the range are not expected, verification sampling is conducted because the range lies within the zone of contribution for BNL potable supply Wells 11 and 12, which are located to the south of the range. Routine sampling of the potable wells has not revealed detectable levels of lead. Groundwater quality in the shotgun range area is currently evaluated using four shallow Upper Glacial aquifer wells that are located in the general vicinity of the range. During 1998, two rounds of groundwater samples from these four wells were collected and analyzed for metals and water quality. All water quality parameters and metals concentrations, including lead, were below applicable NYS AWQS. BNL plans to

Table 8-9. Radiological Analysis Results for Wells in the STP and On-Site Peconic River Area

Well (# Samples)		Gross Alpha (pCi/L)	Gross Beta (pCi/L)	Tritium (pCi/L)
38-01	Max.	< 1.2	< 3.6	< 322
(4)	Avg.	0.2 ±0.4	-0.9±3.5	-61±129
38-02	Max.	3.5±0.7	16±1.7	520±218
(4)	Avg.	1.5±1.4	6.7±5.5	375±190
38-03	Max.	1.4±0.7	25.5±3	< 197
(4)	Avg.	1±0.4	15.2±7.5	-57±126
38-05	Max.	1.4±0.8	< 3.6	670±243
(4)	Avg.	0.9±0.6	-0.8±3.1	298±288
38-06	Max.	< 1.1	3.9±1.5	< 335
(4)	Avg.	0.2±0.6	0.9±2.1	21±128
39-05	Max.	< 1.2	6±1.8	475±211
(4)	Avg.	0.2±0.4	2.8±2.1	336±133
39-06	Max.	2.6±1	4.7±2.3	< 322
(4)	Avg.	0.5±1.4	2.2±3.3	166±59
39-07	Max.	< 1.2	< 3.6	435±203
(4)	Avg.	0.2±0.6	1.8±1.1	158±198
39-08	Max.	1.4±0.7	6.7±2.4	1020±259
(4)	Avg.	0.6±0.5	4.2±1.5	398±361
39-09	Max.	< 1.2	< 3.6	< 335
(4)	Avg.	-0.1±0.7	-0.3±3.4	-27±68
39-01	Max.	< 1.2	< 3.6	< 362
(2)	Avg.	-0.3±1	0±3	-88±40
60-01	Max.	8.4±1.5	13.5±2.6	405±233
(3)	Avg.	2.8±4.5	3±9	82±258
61-03	Max.	< 1.0	< 3.6	< 322
(5)	Avg.	-0.1±0.2	-0.7±2.7	-67±33
SDWA Limit		15	50	20,000

Notes:
1. All values shown with 95% confidence interval.

install two additional wells during 1999 to allow for improved monitoring of this area.

8.1.3.2.3 WATER TREATMENT PLANT (WTP) AREA

At the direction of the NYSDEC, five shallow Upper Glacial aquifer surveillance wells were installed at the WTP in 1993 to assess potential leaching of iron from the plant's recharge basins into the groundwater. Naturally high levels of iron in groundwater are removed at the WTP, and the precipitated iron is discharged to the recharge basins.

During 1998, two rounds of groundwater samples were collected from these five wells, and analyzed for water quality and metals. As in previous years, all water quality parameters and metals concentrations, including iron, were below the applicable NYS AWQS.

8.1.3.2.4 BUILDING 423 (MOTOR POOL) AREA

Building 423 serves as the site motor pool, where BNL's fleet vehicles are repaired and refueled. Gasoline is stored in two 30,280 liter (8,000 gallon) capacity underground storage tanks (USTs), and waste oil is stored in one 1,892 liter (500 gallon) capacity UST. Although the USTs and associated distribution lines meet Suffolk County Article 12 requirements for secondary containment, leak detection, and high level alarms, BNL initiated a groundwater monitoring program in 1996 to ensure that potential leakage would be detected if a tank alarm system were to fail.

During 1998, four rounds of groundwater samples were collected from the two shallow Upper Glacial aquifer surveillance wells and analyzed for VOCs and checked for floating petroleum product. TCA was detected at concentrations slightly exceeding NYS AWQS (of 5 µg/L) in Well 102-06, with a maximum observed concentration of 8.3 µg/L. The fuel additive methyl tertiary butyl ether (MTBE) was also detected in Well 102-06 at a maximum concentration of 8.4 µg/L, which is well below the NYS DWS of 50 µg/L. It is believed that the MTBE is related to gasoline spillage that occurred prior to the 1985 upgrade of the USTs. No floating product was observed.

8.1.3.2.5 ONSITE SERVICE STATION

Building 630 is a commercial automobile repair and gasoline station for the BNL site. Gasoline is stored in two 30,280 liter (8,000 gallon) capacity and one 22,710 liter (6,000 gallon) capacity underground storage tanks (USTs), and waste oil is stored in one 1,892 liter (500 gallon) capacity UST. Although the USTs and associated distribution lines meet Suffolk County Article 12 requirements for secondary containment, leak detection, and high level alarms, BNL initiated a groundwater monitoring program in 1996 to ensure that potential leakage would be detected if a tank alarm system were to fail.

During 1998, four rounds of groundwater samples were collected from the two shallow Upper Glacial aquifer surveillance wells and analyzed for VOCs and checked for floating petroleum product. PCE and carbon tetrachloride were detected at concentrations exceeding

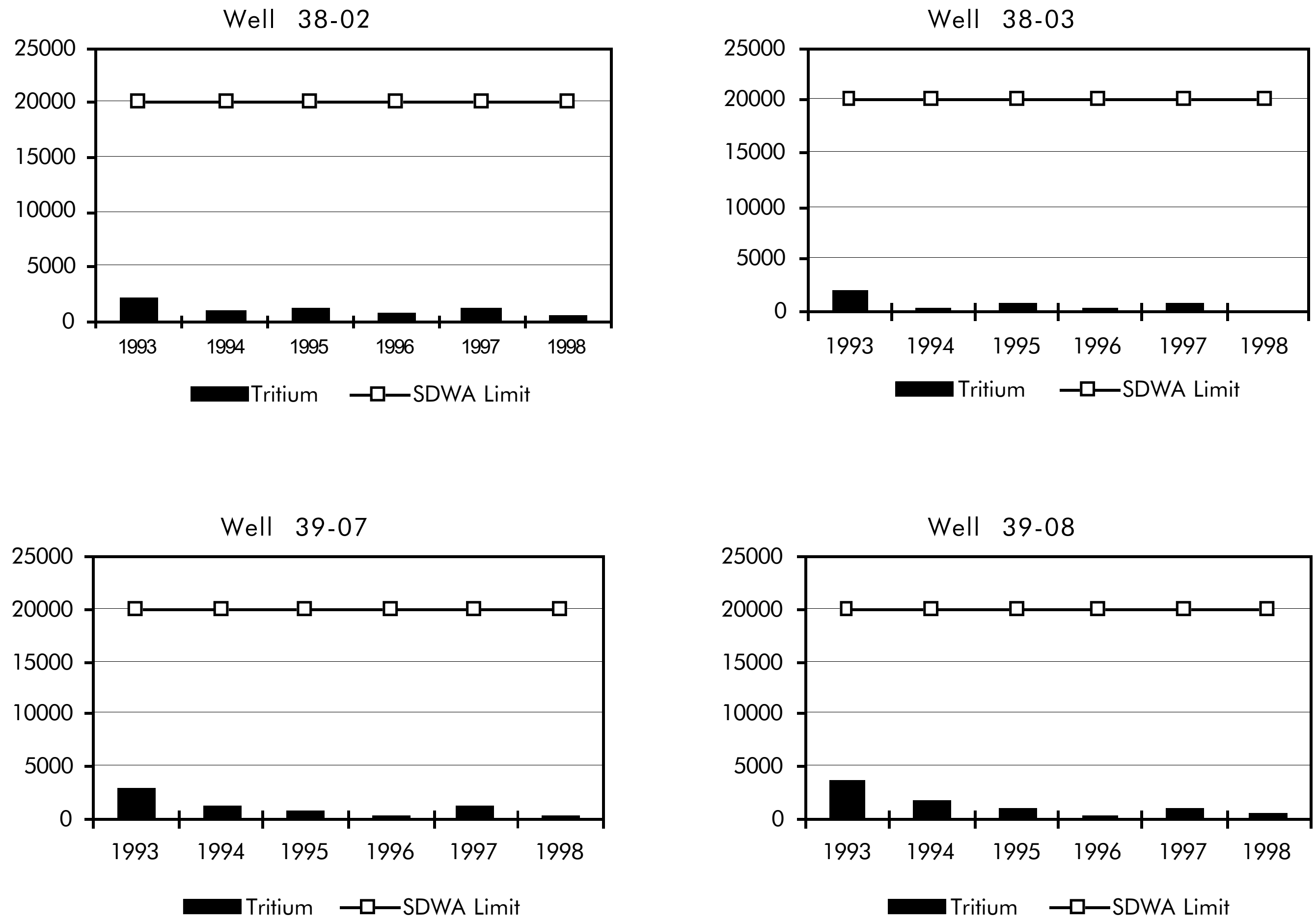

Figure 8-27.
Time-vs.-Tritium concentration trend plots for key wells in the Sewage Treatment Plantís filter bed area

NYS AWQS in Well 85-17. Carbon tetrachloride was observed at a maximum concentration of 13.3 µg/L, whereas PCE was detected at a maximum concentration 12.1µg/L. The fuel additive MTBE was not detected in either of the wells. No floating product was observed. The PCE and carbon tetrachloride are likely due to historical use of cleaning solutions at the station.

8.1.3.2.6 MAJOR PETROLEUM FACILITY (MPF) AREA

The CSF supplies steam for heating to all major facilities of the Laboratory through an underground distribution system. The MPF is the holding area for most fuels used at the CSF. Five shallow Upper Glacial aquifer wells monitoring the MPF were installed as part of the licensing requirements for this facility, and are screened across the water table so that free product (i.e., oil floating on top of the groundwater) could be detected. The surveillance wells at the CSF were installed primarily to monitor groundwater contamination resulting from a 1977 leak of approximately 23,000 gallons of Alternative Liquid Fuel (a fuel oil/ spent solvent mixture). The CSF/MPF area has been the subject of an RI/FS (OU IV), and has been undergoing active soil and groundwater remediation since the winter of 1997.

The surveillance well network at the MPF area consists of five shallow Upper Glacial aquifer wells. During 1998, five wells were monitored for water quality, metals, and VOCs. The five MPF wells were also sampled monthly for floating petroleum products, and twice per year for polynuclear aromatics and base-neutral extractable compounds (EPA Method 625), in accordance with the NYSDEC license (see Chapter 2). All water quality parameters and metals concentrations were

Table 8-10. Radiological Analysis Resuts for Wells near the New Waste Management Facility

Well (# Samples)		Gross Alpha (pCi/L)	Gross Beta (pCi/L)	Tritium (pCi/L)	Co-60 (pCi/L)
55-03	Max.	2.7±1	< 4.1	< 320	ND
(3)	Avg.	1.1±1.3	0.2±2.2	92±115	
55-10	Max.	12.6±1.9	16.3±3	414±213	ND
(5)	Avg.	4.7±3.9	7.2±4.9	-1±199	
56-21[(a)]	Max.	3±0.8	4±1.4	< 320	8.1±1.2
(4)	Avg.	1.2±1.2	2.5±1	-51±112	2.9±3.8
56-22	Max.	1.9±0.9	< 3.6	444±211	ND
(4)	Avg.	0.2±1	0.7±1.5	57±224	
56-23	Max.	1.3±0.5	< 3.6	< 320	ND
(3)	Avg.	0.7±0.6	0.9±	1.988±184	
66-07	Max.	1.7±0.8	< 4.1	470±213	ND
(4)	Avg.	0.1±0.9	0.7±1.4	69±231	
66-83	Max.	2±0.6	< 4.1	< 320	ND
(4)	Avg.	0.7±1.1	0.7±0.7	33±52	
SDWA Limit		15	50	20,000	200

Notes:
ND= Not detected.
1. All values shown with 95% confidence interval.
(a) = Co-60 was detected in two of the four samples collected from this well in 1998.

below the applicable NYS AWQS. VOC concentrations were above NYS AWQS in upgradient Well 76-25 with TCA at a maximum concentration of 5.1 µg/L, and PCE was detected in downgradient Well 76-19 at a maximum concentration of 24.7 µg/L. The TCA detected in Well 76-25 is likely to have originated from releases in the Building 650 area, whereas the PCE in Well 76-19 is likely to have originated from historical spills at the MPF. No benzene/ethylbenzene/toluene/xylene (BETX) or other hydrocarbon-related compounds were detected in the MPF wells. As in previous years, no floating petroleum products were observed during 1998.

8.1.3.2.7 NEW WASTE MANAGEMENT FACILITY (WMF)

In 1997, BNL began operating a new WMF. The new WMF is designed and operated in a manner that meets all applicable federal, state and local environmental protection requirements; nevertheless, BNL established a groundwater monitoring program as a secondary means of verifying the effectiveness of the facility's administrative and engineered controls. The new WMF is monitored by eight shallow Upper Glacial aquifer wells. During 1998, four rounds of groundwater samples were collected and analyzed for VOCs, radioactivity, metals and water quality.

Volatile Organic Compounds, Metals and Water Quality Parameters: All water quality and metals concentrations were below the applicable NYS AWQS. Although low levels of chloroform (up to 2.1 µg/L) were detected in a number of the wells, all VOC concentrations were below applicable NYS AWQS.

Radionuclides: With one exception, gross activity levels in these samples were typical of ambient (background) levels (Table 8-10). Slightly elevated gross alpha and gross beta concentrations were observed in upgradient Well 55-10, at maximum concentrations of 12.6 pCi/L and 16.3 pCi/L, respectively. As in previous years, low levels of cobalt-60 were detected in samples collected from Well 56-21. The maximum concentration of cobalt-60 observed was 8.1 pCi/L (0.3 Bq/L). The DWS for this radionuclide is 200 pCi/L (7 Bq/L). This material is not related to operations of the WMF. The likely sources of the cobalt are (1) past leakage from nearby underground sanitary lines (which at one time transported liquid wastes containing this nuclide from Building 811 to the STP) or (2) an underground storage tank leak which occurred at Building 830 in 1988. While the monitoring results indicated maximum tritium concentrations above the MDL at wells 55-10, 56-20 and 66-07, these values were extremely close to the typical MDL of 320 pCi/L (12 Bq/L). When the 95 percent confidence intervals are considered, these two values are not statistically different from the MDL and do not, therefore, represent clear detections. The annual average value for each well, which includes all three of the sample results, was less than the typical MDL for this analysis.

REFERENCES

Brookhaven National Laboratory. 1994. *Cesspools Removal Project: Engineering Evaluation/Cost Analysis.* BNL, Upton, New York.

Brookhaven National Laboratory. 1998a. *OU III Pump and Treat System Annual Report.* BNL, Upton, New York.

Brookhaven National Laboratory. 1998b. *Monitoring Well 064-02 Tritium Investigation*. Brookhaven National Laboratory, Upton, New York.

Brookhaven National Laboratory. 1999a. *1998 Environmental Monitoring Report, Current and Former Landfill Areas*. Brookhaven National Laboratory, Upton, New York.

Brookhaven National Laboratory. 1999b. *Summary Report for the Carbon Tetrachloride Investigation*. Brookhaven National Laboratory, Upton, New York.

Brookhaven National Laboratory. 1999c. *Final Draft RA V Groundwater Treatment Annual Operations Report 1998*. Brookhaven National Laboratory, Upton, New York.

Dorsch, W.R. and S. Wachino. 1999. *Final Draft, 1998 ERD Sitewide Groundwater Monitoring Report*. Brookhaven National Laboratory, Upton, New York.

Paquette, D.E. 1998. *Groundwater Monitoring Improvements Plan for FY 1998 and 1999*. Brookhaven National Laboratory, Upton, New York.

Paquette, D.E., Naymik, T.G., and E.A. Flores. 1998. *Groundwater Protection Management Program Description*. Brookhaven National Laboratory, Upton, New York.