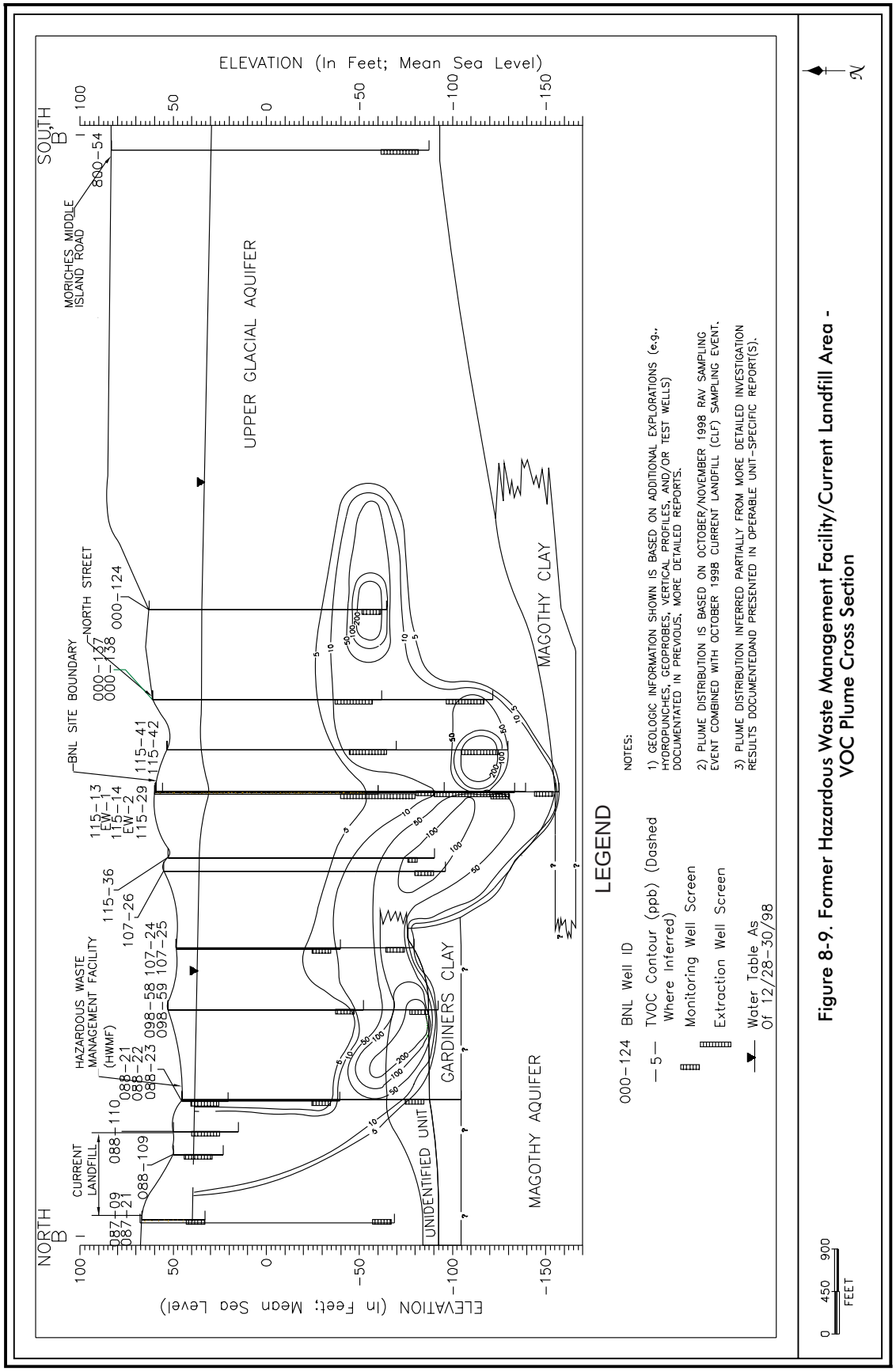

Figure 8-9. Former Hazardous Waste Management Facility/Current Landfill Area - VOC Plume Cross Section

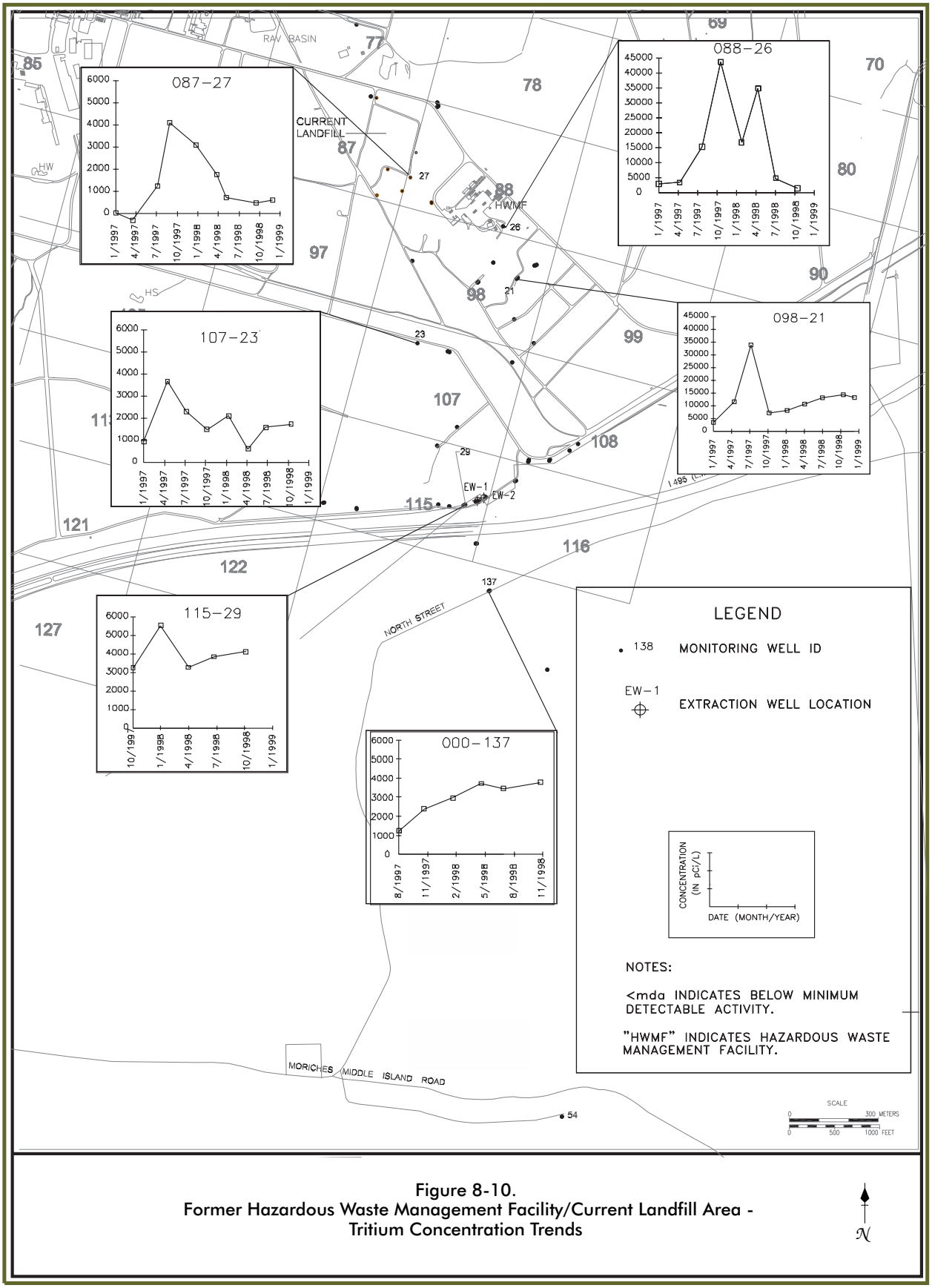

Figure 8-10.
Former Hazardous Waste Management Facility/Current Landfill Area -
Tritium Concentration Trends

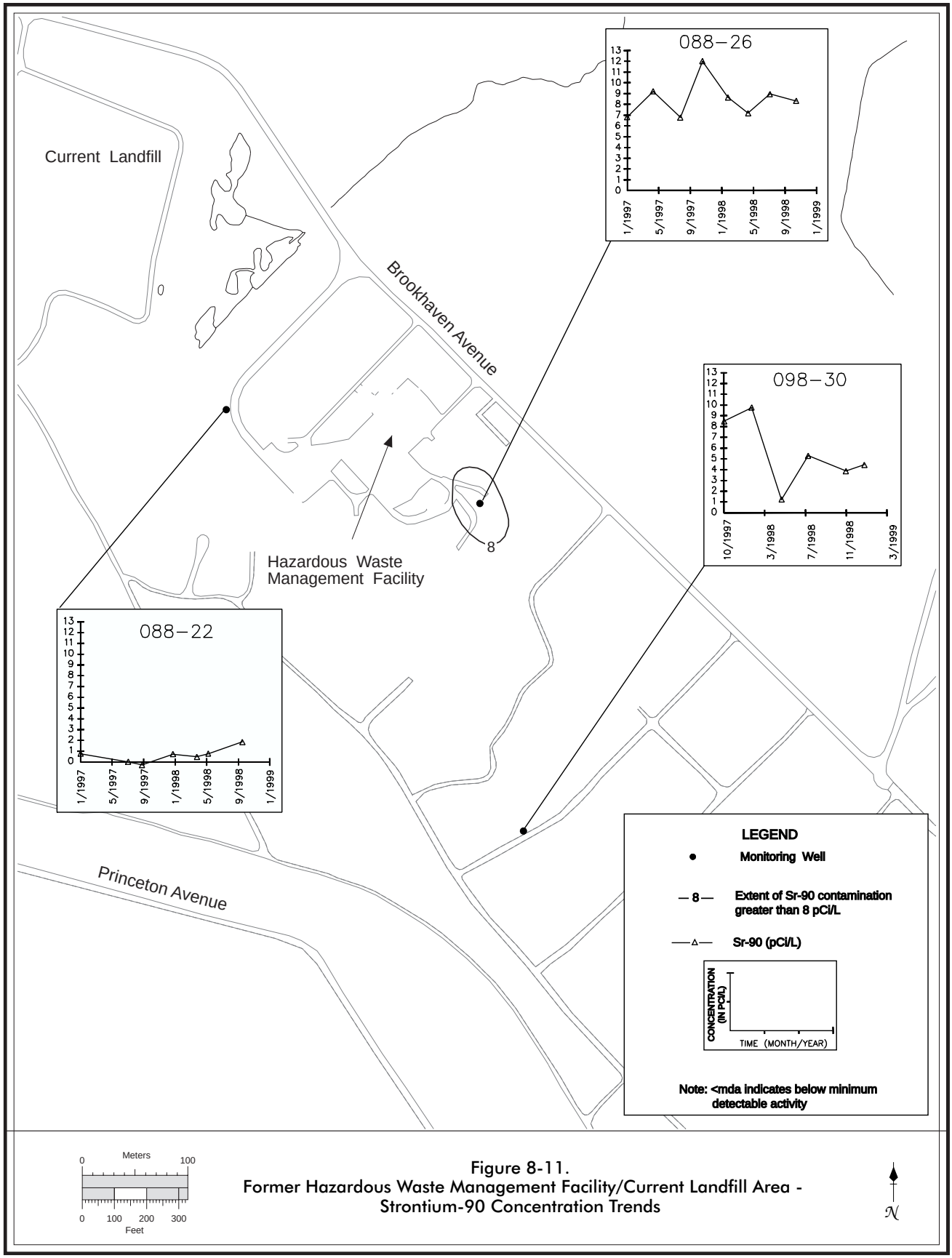

Figure 8-11.
Former Hazardous Waste Management Facility/Current Landfill Area - Strontium-90 Concentration Trends

system initiated in June 1997 (extraction wells EW-3 through EW-8). This monitoring program characterizes the effects of this pumping on the contaminant plume, and will provide data that are necessary for making decisions on the future operations of the extraction wells.

- Monitor the offsite segment of the plume and "outpost" wells located to the south (downgradient) of the defined extent of the offsite VOC plume to provide data on any possible future downgradient migration of the plume. Outpost wells are also situated in the southwestern portion of BNL, directly upgradient of the Suffolk County Water Authority (SCWA) Parr Village Well Field on William Floyd Parkway. These wells are used to verify groundwater quality south of the BNL apartment areas, and they would also provide an early warning if contaminants from BNL were to migrate toward the SCWA well field.

Volatile Organic Compounds: The OU III VOC "plume" is composed of multiple commingled plumes, some of which can be traced directly to their source areas. This commingling is partially due to the significant periodic changes in groundwater flow patterns created by historical and ongoing groundwater pumping and recharge effects. Some identified sources that were evaluated during the OU III RI/FS include spill areas within the AGS Complex, former Building 96 area (a former vehicle maintenance and drum storage area) and Building 208, located within the Supply and Materiel area. Figure 8-12 depicts the OU III VOC contamination plume. (Please note that the OU IV plume is also depicted on Figure 8-12.) The primary OU III VOCs detected in onsite monitoring wells include carbon tetrachloride, TCA, and PCE; carbon tetrachloride is the primary VOC detected in offsite wells. The OU III plume extends from the AGS Complex in the north-central part of the site southward approximately 5,180 meters (17,000 feet) to the vicinity of Flower Hill Drive in North Shirley. The plume is about 1,525 meters (5,000 feet) wide at its maximum, as defined by the 5 µg/L isoconcentration contour on Figure 8-12. The width of the high concentration portion of the plume (portions >50 µg/L) is approximately 550 meters (1,800 feet) at the site boundary. The area defined by the 5 µg/L isoconcentration line should not be interpreted to mean that there is continuous VOC contamination from the western 5 µg/L line eastward to the central core of the OU III plume. In actuality, the plume includes many areas with <5 µg/L concentrations.

Portions of the plume displaying the highest VOC concentrations include the vicinity of Building 96 (primarily PCE with lower concentrations of TCA), with TVOC concentrations ranging from 1,000 to >18,000 µg/L) and continuing south to Carleton Drive with TVOC concentrations of >500 µg/L. In the vicinity of Well 000-130, located offsite on Carleton Drive, TVOC concentrations are greater than 7,000 µg/L (consisting primarily of carbon tetrachloride). As shown in Figure 8-13, this high level carbon tetrachloride contamination is located in the upper portion of the Magothy aquifer. Groundwater characterization to define the extent of carbon tetrachloride contamination in the Magothy aquifer and the installation of additional monitoring wells is planned for 2000.

An underground storage tank (UST), located in the vicinity of the corner of Rowland Street and Rochester Street was excavated and removed in April 1998. The UST had been used at the former Chemistry Department Complex in the 1950s, and contained carbon tetrachloride. Monitoring Well 85-06 was destroyed as a result of this effort, and replaced by new well 85-98. Historically, samples collected from Well 85-06 have shown low level concentrations of carbon tetrachloride (<20 µg/L). However, sampling of the new well in June 1998 revealed carbon tetrachloride contamination approaching 100,000 µg/L. It now appears that the contamination was caused by the inadvertent release of residual carbon tetrachloride from the tank during the removal process. Subsequent groundwater characterization efforts during the summer and fall of 1998 successfully characterized the extent of the carbon tetrachloride plume, and remediation of this area is planned for in 1999. A summary of the data from this groundwater characterization project can be found in Summary Report for the Carbon Tetrachloride Investigation (BNL, 1999b).

Trend plots showing changes in VOC concentrations over time are depicted for key OU III monitoring wells in Figure 8-14 and 8-15. Wells located in the vicinity of known source areas in the central onsite portion of OU III have

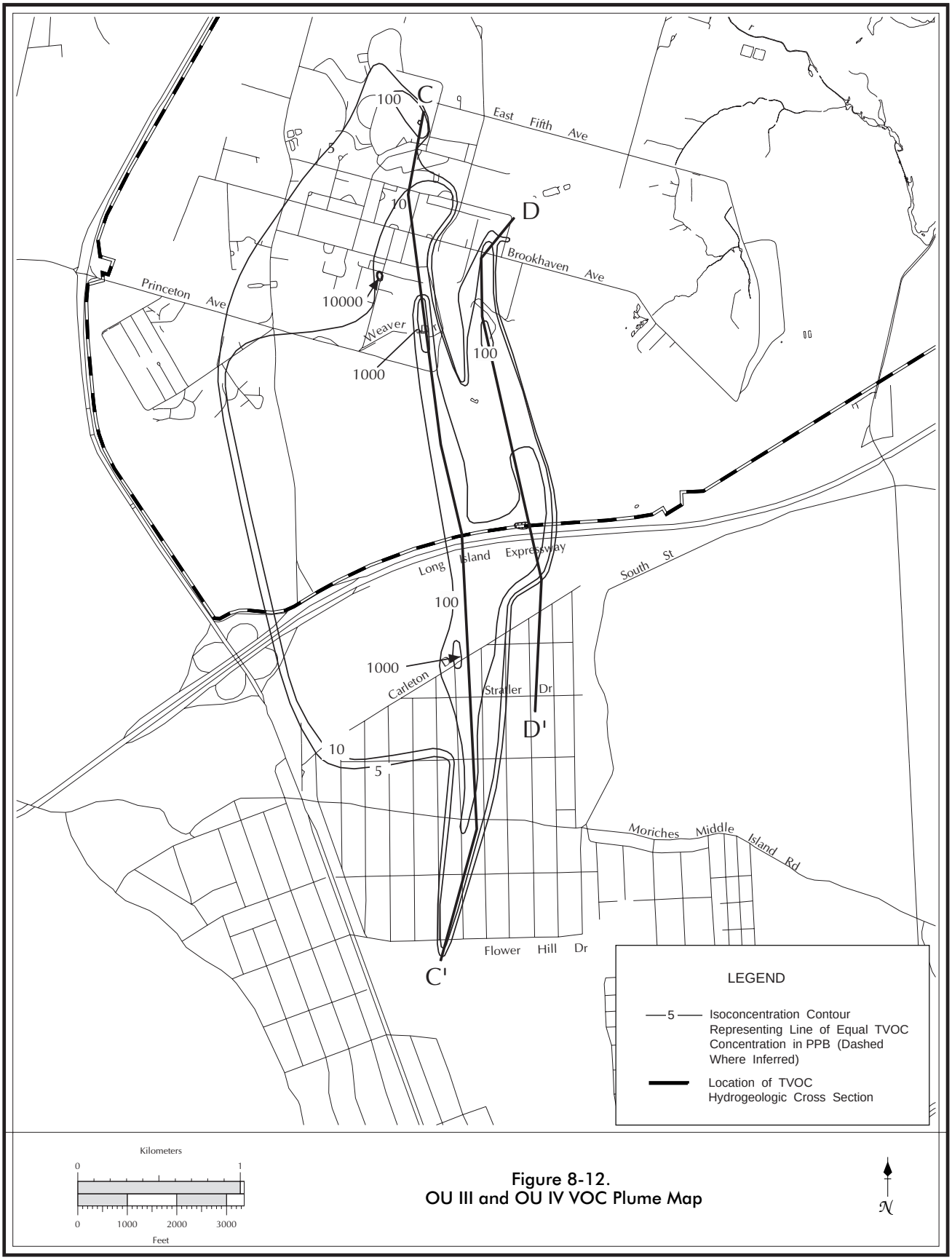

Figure 8-12.
OU III and OU IV VOC Plume Map

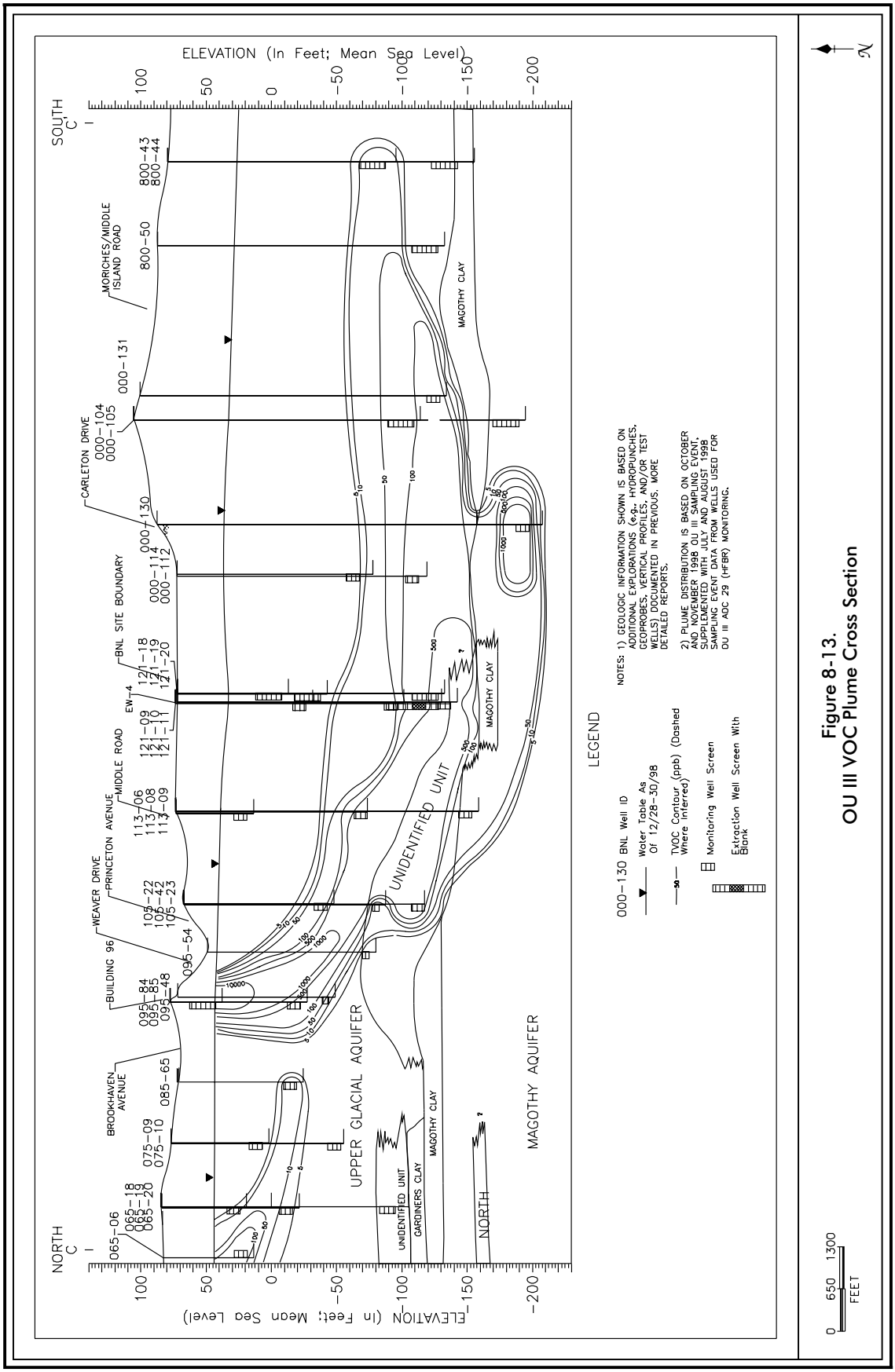

Figure 8-13.
OU III VOC Plume Cross Section

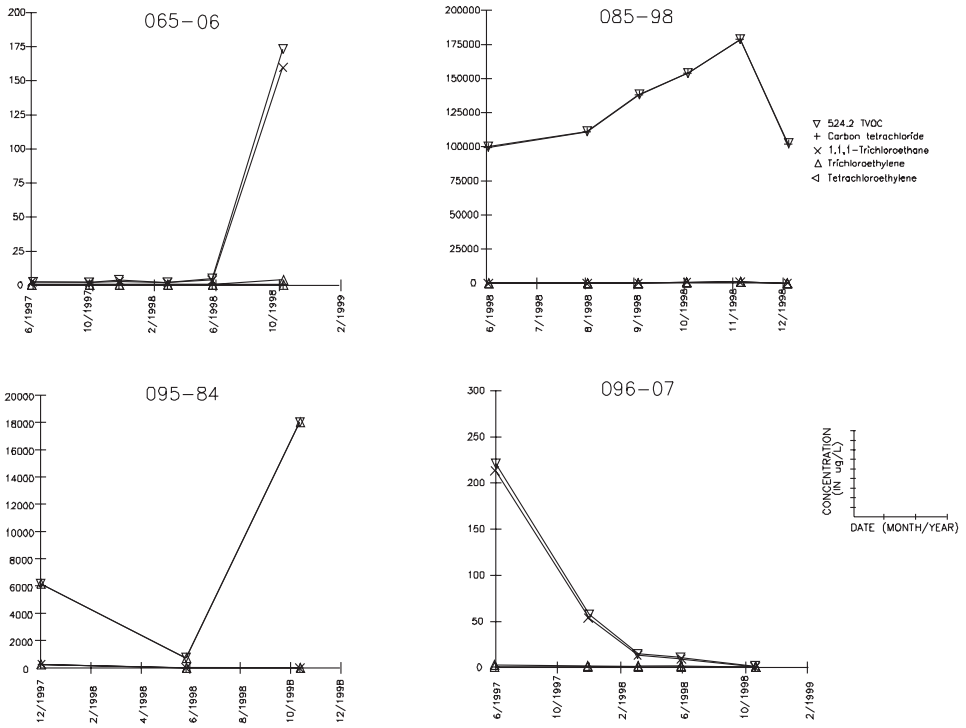

Figure 8-14. Time-vs.-VOC concentration trend plots for key wells in the OU III VOC Plume (central area): Well 65-06 located downgradient of the AGS area; Well 85-98 located downgradient of a carbon tetrachloride spill area; Well 95-84 located in the former Building 96 area; and Well 96-07 located downgradient of the Supply and Materiel Building 208.

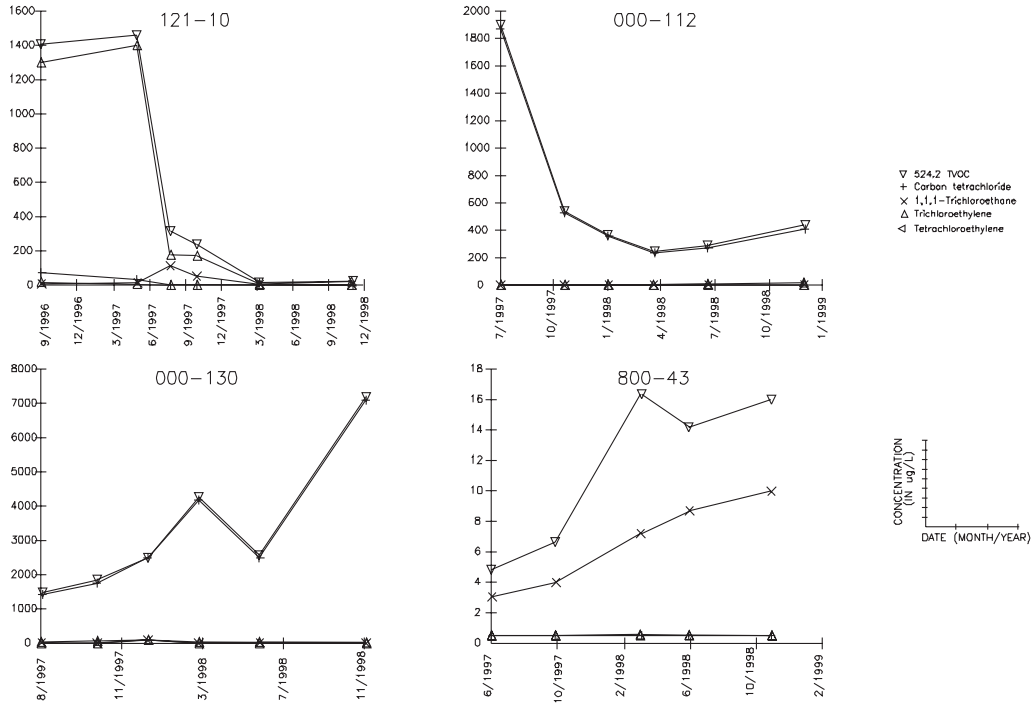

Figure 8-15. Time-vs.-VOC concentration trend plots for key wells in the OU VOC Plume (southern boundary and off-site areas): Well 121-10 located at the BNL southern boundary; Well 000-112 located off-site near the Brookhaven Industrial Park; Well 000-130 located on Carleton Drive; and Well 800-43 located near Flower Hill Drive near the leading edge of the OU III plume.

shown significant increases in concentrations during 1998. For example, VOC concentrations in Well 65-06 (primarily TCA), which is located downgradient of the AGS research complex, increased from typical concentrations ranging from 5 to 20 µg/L in 1997 and the first three-quarters of 1998 to >170 µg/L during the last quarter of 1998. (Characterization of the extent of VOC contamination in the AGS area will be augmented with data obtained from new Facility Monitoring Program wells to be installed in 1999.) Additionally, TCA concentrations decreased in Supply and Materiel area monitoring Well 96-07. Historically, TCA concentrations have exceeded 100 µg/L. However, during 1998 concentrations dropped to <5 µg/L. Wells located near the southern boundary extraction system are displaying significantly decreasing concentration trends (in Wells 121-10, 122-19 and 122-22), which can be attributed to the effect of the remediation system. The 1998 OU III Pump and Treat System Annual Report (BNL 1998a) provides detailed evaluations of VOC concentration trends and recommendations for changes to the system operations.

8.1.2.3.1 HFBR TRITIUM PLUME

Following the January 1997 discovery of tritium in wells south of the HFBR, it was determined that the HFBR's spent fuel pool was leaking tritiated water at a rate of approximately six to nine gallons per day. (Note: To prevent additional leakage, the HFBR's spent-fuel pool was completely emptied by December 1997.) As the result of an extensive groundwater investigation, it was determined that the tritium plume remains completely onsite . The extent of the tritium plume (as defined by the 1,000-pCi/L contour) was found to extend from the HFBR to a location immediately north of Weaver Drive on the BNL site, a distance of approximately 1,220 meters (4,000 feet) (see Figure 8-16). The plume is approximately 305 meters (1,000 feet) at its maximum width. However, the portion of the plume with concentrations exceeding the DWS of 20,000 pCi/L is approximately 60 meters (200 feet) wide. The area of the plume containing the highest concentrations extends in a narrow band from the HFBR south to the vicinity of Rowland Street. Tritium is detected in the shallow Upper Glacial aquifer in the vicinity of the HFBR and in the deep Upper Glacial aquifer just to the north of Weaver Drive.

During 1998, the HFBR tritium plume was monitored using 88 monitoring wells that were sampled on a quarterly basis. The highest tritium concentrations continue to be found in wells located directly downgradient of the HFBR. For example, Well 75-43, located approximately 100 feet downgradient of the HFBR, displayed a tritium concentration of 1,920,000 pCi/L (71,040 Bq/L) in December of 1998 (see trend plots for key HFBR tritium plume wells on Figure 8-16). Although several wells located south of Brookhaven Avenue (e.g., Wells 85-67 and 095-48) showed increasing tritium concentrations throughout the year, the majority of the HFBR tritium plume wells displayed decreasing or fluctuating tritium concentration trends. The fluctuation in tritium concentrations for these wells is likely due to the effects of lateral movement of the plume resulting from periodic changes in groundwater flow directions caused by onsite pumping and recharge effects. Additional groundwater characterization work, including the enhancement of the HFBR tritium-plume monitoring well network, is planned for 1999.

8.1.2.3.2 WASTE CONCENTRATION FACILITY AND BROOKHAVEN GRAPHITE RESEARCH REACTOR (BGRR)/PILE FAN SUMP AREAS

Groundwater quality in the areas surrounding the WCF, former BGRR and its associated Pile Fan Sump has been affected by strontium-90 contamination. A groundwater characterization effort utilizing temporary wells was undertaken in 1997 to better define the extent of strontium-90 contamination in the areas of the WCF, the BGRR, and the Pile Fan Sump. As a result of this investigation, strontium-90 was found to occur at concentrations up to 432 pCi/L (16 Bq/L) in the Pile Fan Sump area, and up to 53 pCi/L (2 Bq/L) in wells located downgradient of the BGRR. Strontium-90 concentrations up to 146 pCi/L (5 Bq/L) have been detected in wells located downgradient of the WCF. The distribution of strontium-90 contamination using the 1997 characterization data is shown on Figure 8-17. Current plans call for the installation of new monitoring wells in the spring of 1999 to allow for better long-term monitoring of the strontium-90 plumes.

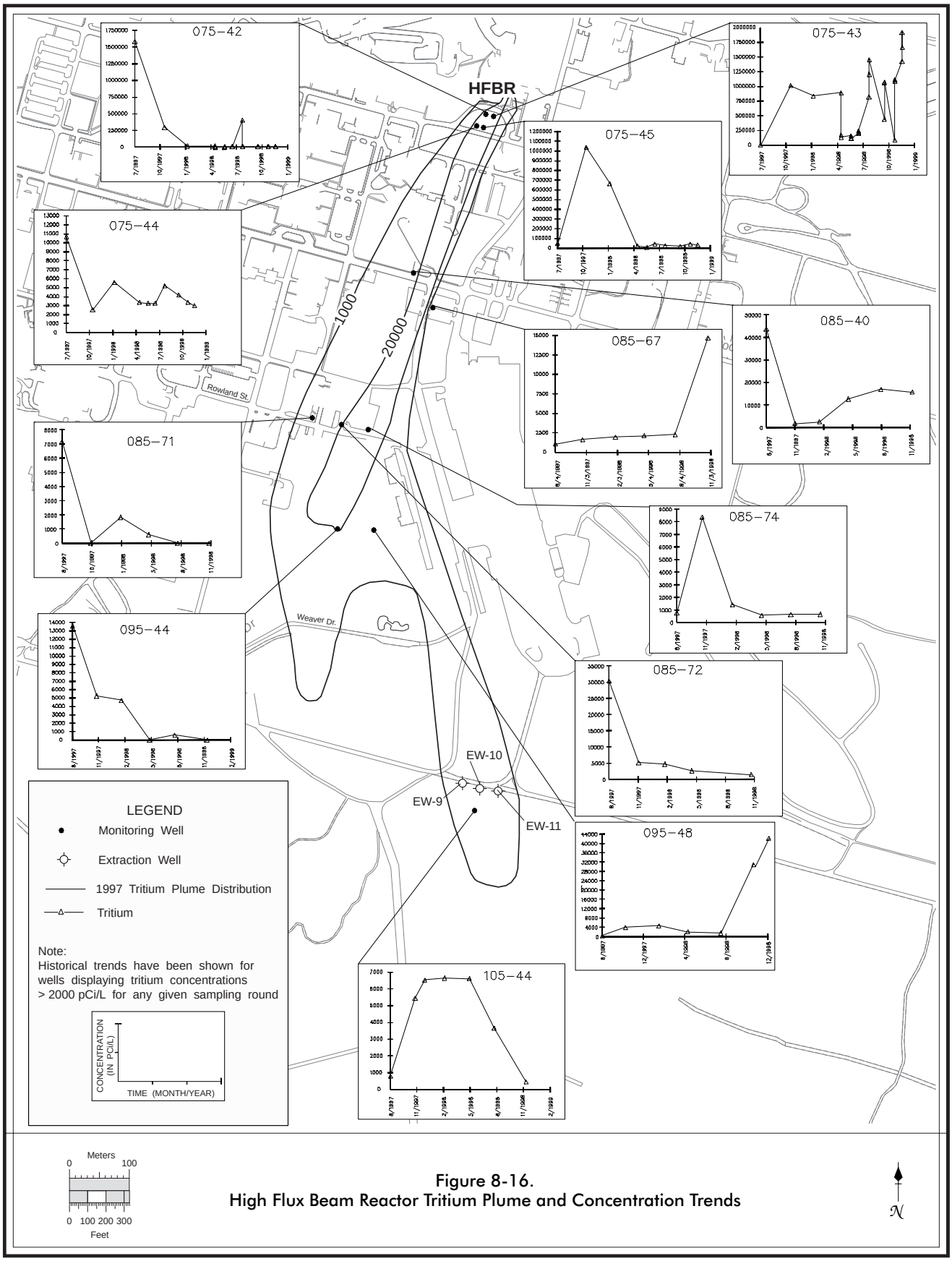

Figure 8-16.
High Flux Beam Reactor Tritium Plume and Concentration Trends

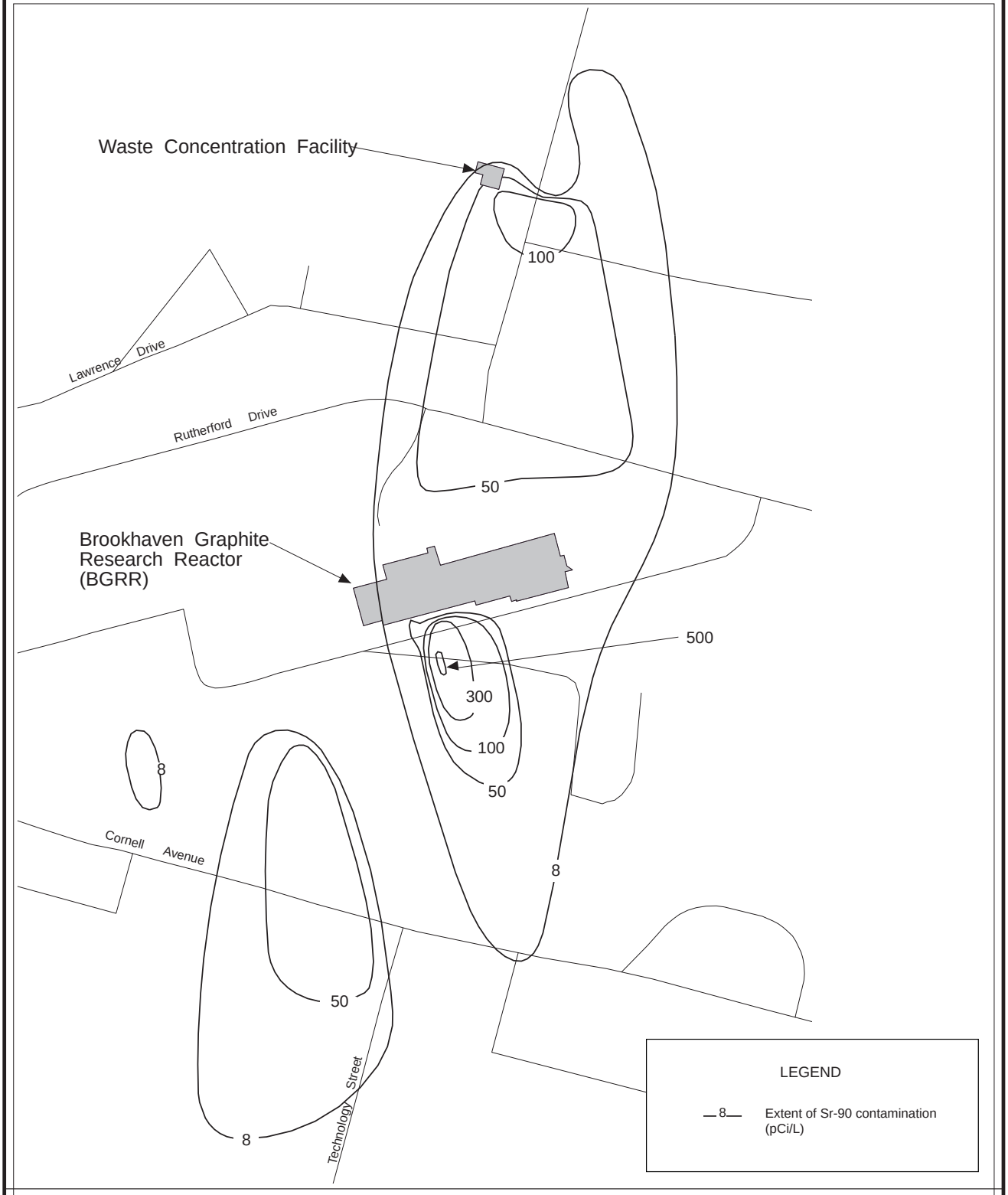

Figure 8-17.
Waste Concentration Facility and Brookhaven Graphite Research Reactor areas - Strontium-90 Plumes