New York State Department of Health
Center for Environmental Health

Public Health Assessment

LIBERTY INDUSTRIAL FINISHING CORPORATION

FARMINGDALE, NASSAU COUNTY, NEW YORK

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SUMMARY

The Liberty Industrial Finishing site, which is on the National Priorities List, is situated in a suburban residential area in the Town of Oyster Bay, South Farmingdale, Nassau County, New York. Since the late 1930s, industrial operations at the site included aircraft parts manufacturing, trailer manufacturing, and metal plating and finishing. Untreated industrial wastes were placed in leach fields and unlined groundwater recharge basins on site.

This site posed an indeterminate public health hazard in the past. Surface soils contaminated with polychlorinated biphenyls (PCBs) existed on-site and may have presented a source of exposure to workers and trespassers.

Low concentrations of volatile organic compounds (VOCs) were present in a sidegradient drinking water supply well from 1976 to 1978. This well operated for about 24 years before closure in 1978; however, the presence and extent of contamination in the well before 1976 cannot be determined because monitoring data specific to VOCs were not mandated for collection before 1980, and therefore are unavailable. Persons receiving their drinking water from this well were exposed to levels of VOCs that could result in a low increased risk of developing cancer if the exposure was long-term; however, the source of contamination has not been determined for this past completed exposure pathway. Other potential sources of this contamination existed in the area. On-site and downgradient groundwater monitoring wells in the upper aquifer are contaminated with organic compounds, including VOCs, and metals at concentrations that exceed drinking water standards. Downgradient public drinking water supply wells, which pump water from the deeper Magothy Aquifer, are not contaminated. The water from the public drinking water supply wells is monitored quarterly for organic contamination.

The site poses no apparent public health hazard. The limited surface soil data for the western portion of the site do not represent a public health concern provided site use remains industrial/commercial. Low levels of trichloroethene and tetrachloroethene were found in on-site soil gas; however, the data are inadequate to determine whether these compounds have migrated to off-site dwellings. The findings from a proposed off-site soil gas investigation will be evaluated to determine the existence of contaminants from the site and likelihood of human exposure.

Edible fish species, particularly white perch, collected from Massapequa Reservoir are contaminated with chlordane and PCBs. A New York State Department of Health (NYS DOH) sportfish consumption advisory is in effect for the Upper Massapequa Reservoir. The source of these fish contaminants has not been determined and is probably is not attributable to the site because chlordane was detected infrequently at exceedingly low concentrations in subsurface soils at the site and has not been detected in groundwater samples. Furthermore, although PCBs were present in soils at the site, these compounds tend to bind to the soil; therefore, they are unlikely to migrate off the site.

Residents in the community have three primary concerns-direct contact with contamination at the site, potential for the site to serve as a source of groundwater contamination, and potential exposures to contaminated groundwater. During the past several years, representatives of the NYS DOH, U.S. Environmental Protection Agency (US EPA), Agency for Toxic Substances and Disease Registry (ATSDR), New York State Department of Environmental Conservation (NYS DEC) and Nassau County Department of Health (NC DOH) participated in public meetings to present findings of remedial investigations, to address public and community health concerns, and to present possible measures for remediation of the site.

The NYS DOH has recommended measures to reduce and prevent exposure to contaminants and to determine the extent of contamination at and migrating from the site.

Public health actions taken include the following: (1) public drinking water supply wells have been and continue to be tested for site-related contaminants; (2) PCB contaminated soils have been excavated and removed from areas where transformers are or were situated; and (3) the NYS DOH, ATSDR, NYS DEC, US EPA, and NC DOH have been involved with the site and continue to provide education and information pertaining to residents' health concerns.

BACKGROUND

In cooperation with the Agency for Toxic Substances and Disease Registry (ATSDR), the New York State Department of Health (NYS DOH) will evaluate the public health significance of the Liberty Industrial Finishing site. Specifically, ATSDR and NYS DOH will determine whether health effects are possible and will recommend actions to reduce or prevent possible health effects. ATSDR, located in Atlanta, Georgia, is a federal agency within the U.S. Department of Health and Human Services and is authorized by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) to conduct public health assessments (PHAs) at hazardous waste sites.

All figures and tables in this PHA are in appendices A and B, respectively. The use of the words "on-site" and "off-site" throughout the document depict the area within and around the site boundary shown on Figure 1 and are not intended to convey the meanings defined under CERCLA.

A. Site Description and History

The Liberty Industrial Finishing site (i.e. Liberty Site) is a former aircraft part manufacturing and metal plating facility about 1 mile south of Bethpage State Park in the Town of Oyster Bay, South Farmingdale, Nassau County, New York (Figure 2). The 30-acre site is bordered by Long Island Railroad tracks to the north, Motor Avenue to the south, Main Street to the east, and a small park (the Ellsworth-Allen Park) to the west. Kirkham Engineering and Manufacturing Corporation began manufacturing aircraft-related equipment at the site in 1934. During the 1940s, the Defense Plant Corporation (DPC) purchased a portion of the site and built additional plant facilities for the manufacture of aircraft parts. The DPC leased the facilities and parcel to Liberty Aircraft Products Corporation (formerly Kirkham Engineering and Manufacturing Corporation). Liberty Aircraft Products Corporation discharged untreated chromic-rich anodizing waste solutions to a common recharge basin every 2 weeks during the war and about every 2 months after the war. Operation of a chromium-treatment plant began at the Liberty site in November 1949 to remove chromium from the discharged solutions.

Ownership of the Liberty site changed several times from the early 1940s to the late 1950s. By the 1950s, the Liberty Plant was equipped to conduct acid and alkaline metal cleaning; chrome-plating; cadmium, nickel, copper, and zinc plating; and various rinsing operations. In 1957, the Liberty Aircraft Products Corporation ceased operating at the site. In 1958, the Liberty Industrial Finishing Corporation (Liberty Finishing I) began operating at the site. In 1959, the Nassau County Department of Health (NC DOH) reported that liquid wastes dripped through floor grates in the process areas and were carried to a sump, which discharged the untreated wastes to the on-site recharge basins. NC DOH records also indicate inadequacies and improper operation of Liberty Finishing I's wastewater treatment system. By 1965, another company named Liberty Industrial Finishing Corporation (Liberty Finishing II) began operating at the site. When Liberty Finishing I stopped operating at the site is not known. The Liberty Finishing II operations included painting and plating with continued discharges of treated and untreated wastewater to on-site recharge basins. In addition to the use of the recharge basins, Liberty Finishing II constructed a separate-sludge drying bed to receive metal sludge from the chromium-treatment plant. In August 1978, Liberty Finishing II moved its operations to Brentwood, Suffolk County, New York. Ten buildings remain at the site. These buildings are used for a variety of operations including trucking, warehousing, auto parts salvaging, product distributing, and pallet recycling.

In September 1978, Liberty Finishing entered into an agreement with the New York State Department of Environmental Conservation (NYS DEC) to clean up the Nassau County site. Limited cleanup activities consisted of the partial removal of soils from two recharge basins.

In December 1980, the Four J's Company (a real estate partnership) leased a portion of the site to build condominium units on the parcel. In April 1985, the Four J's Company entered into an agreement with the NYS DEC to conduct a remedial investigation (RI) / feasibility study (FS) at the site. RIs follow preliminary site investigations conducted by town, county, state and/or federal agencies to verify whether hazardous wastes are present and to determine whether wastes pose a significant threat to public health and the environment. An RI is carried out to determine the nature and extent of contamination. The FS uses RI information to develop alternative cleanup plans that will eliminate the threat to public health or the environment posed by the site. A final RI report, prepared by the environmental consulting firm, Lockwood, Kessler and Bartlett (LKB) for the Four J's Company, was submitted to the NYS DEC in November 1985. The investigation undertaken by LKB included soil borings in the recharge basins and sludge-drying bed, installation of monitoring wells on-site, and collection/analysis of on-site and off-site groundwater samples and surface water sampling of Massapequa Creek, south of the site (Figure 3). In July and August 1987, limited portions of the sludge drying bed and recharge basins were excavated, and material identified as hazardous was disposed off-site.

In May 1986, the Liberty Industrial Finishing site was placed on the U.S. Environmental Protection Agency's (US EPA's) National Priorities List (NPL). In June 1989, NYS DOH prepared a Preliminary PHA for the site under a cooperative agreement with ATSDR.

In September 1990, US EPA contracted Roy F. Weston, Inc., to conduct a federally funded RI/FS at the Liberty site. Field work, conducted from November 1991 to July 1992, included various contaminant source and migration investigations and an ecologic investigation. The ecologic assessment was conducted to develop a general description of the existing ecology and natural resources associated with the site. A final RI report and a draft FS report were completed in January 1994 and April 1994, respectively.

B. Actions Implemented During the Public Health Assessment Process

1. Active downgradient public drinking water supply wells have been and continue to be tested by NC DOH at the specified intervals as mandated by NYS DOH. Public drinking water supply wells in Nassau County are tested quarterly for volatile organic compounds (VOCs) and annually for metals. This action should significantly reduce the potential for exposure to site-related groundwater contaminants from the public drinking water supplies because it verifies continued compliance with state and federal drinking water standards.

2. On December 7, 1993, and April 20, 1994, US EPA conducted a public meeting to present findings of the RI/FS, to discuss future land-use alternatives, and to inform the community about future activities at the site. About 50 persons attended the December 1993 meeting; the April meeting was attended by about 200 persons, many of whom voiced concern about the site. John Olm (NYS DOH), a representative of NC DOH, Arthur Block and Steve Jones (ATSDR), and US EPA representatives addressed health-related concerns and questions at the meetings.

3. On August 11, 1997; August 9, 2001; and January 9, 2002, US EPA conducted public meetings to discuss the Proposed Remedial Action Plan (PRAP) for remediating on-site and off-site soil and groundwater contamination. Close to 200 residents attended all three meetings. Health-related concerns and questions were addressed by Mr. John Olm at the August 11, 1997, meeting and by Mrs. Jacquelyn Nealon (NYS DOH) and Mr. Michael Sivak, the US EPA Risk Assessor, at the meetings on August 9, 2001, and January 9, 2002.

C. Site Visit

Mr. John Olm and Ms. Nina Knapp with NYS DOH; a representative of the NC DOH; and Mr. Arthur Block and Mr. Steve Jones, ATSDR regional representatives, visited the site area on December 7, 1993. During the site inspection, they made the following observations:

> During the day, numerous vehicles entered and exited the property through two unsecured entrances along Motor Avenue. Vehicles that entered the site through the westernmost entrance way were driven to several active businesses on the property. The easternmost entrance way appeared to be used solely by an active recycling business. A return site visit at about 11 p.m. revealed that the easternmost entrance was obstructed by a locked gate.
>
> About 14 acres of vacant land exists at the western portion of the site. This parcel is separated from the active portion of the site by a 3½ foot high chain-link fence. Two US EPA placards were attached to the fence that identified the parcel as a hazardous waste disposal area and warned against trespassing.
>
> Trespassers probably enter the site at the northwest disposal area through an opening in the fence bordering the railroad tracks. A path has been worn through from the fence line to an open area where a barrel used for burning was present. The ground was littered with debris, including construction and demolition materials and beer bottles.
>
> A man who later identified himself as an employee at an on-site business, was observed crossing over the fence that separates the former disposal basins and northwestern disposal area from the active industrial complex. The man walked down into the disposal basins, where he remained for several minutes. He then exited the basins and crossed over the fence to return to his place of business. The man stated he had entered the basins in search of scrap material for use at his business.

> Several adults and children were using the playground area adjacent to the office building at the Ellsworth-Allen Park. A chain-link fence about six feet high separates the park from the site property. One "No Trespassing" sign was posted on the fence and indicated the adjacent property is a hazardous waste disposal site. A section of the fence at the northern end was down, and a worn path indicates trespassing onto the Liberty site at this location. Numerous softballs and baseballs were observed on the Liberty site property near the fence and probably were hit or thrown out of the softball field at the park.

The nearest dwellings to the site were on the south side of Motor Avenue. These dwellings were mainly small businesses and single-family residences.

Mrs. Jacquelyn Nealon, Ms. Wendy Kuehner, and Ms. Rebecca Mitchell of the NYS DOH conducted an additional site visit on July 26, 2001. The following observations were made:

> The site is now accessible through one sliding chain-link fence at the southeastern end of the property off Motor Avenue.
>
> The 14-acre parcel of vacant land at the western portion of the site separated from the active portion by the chain-link fence was difficult to identify because underbrush had taken over the area. Whether site-related trash or debris was in the area was unclear.
>
> A part of the northern portion of the site was filled with several trailers from tractor trailer trucks. Whether the trailers were full or empty was unclear.
>
> An Interim Remedial Measure groundwater treatment system for metals and VOCs was in a gated section on the southwestern end of the property. This area appeared to be in use and clean.
>
> A man who identified himself as an on-site business employee approached the NYS DOH representatives and questioned their presence on the site. The NYS DOH representative informed the man that they were conducting a site visit in conjunction with the upcoming PRAP meeting and for the PHA.

D. Demographics, Land Use, and Natural Resource Use

Demographics

The Liberty site is in a suburban residential area in the Town of Oyster Bay, South Farmingdale, Nassau County, New York. The 30-acre facility is bordered on the north by railroad tracks, on the east by Main Street, on the west by a small park (the Ellsworth-Allen Park), and on the south by Motor Avenue.

NYS DOH determined from the 1990 census that 22,590 people live within one mile of the Liberty Finishing site. The population within 1 mile of the site is 97% white, less than 1% black, and 2.5 % other races. The site is within census tract 5205.01 in which 6.2% of the population is under 5 years of age, 16.1% is 5 - 19 years of age, 64.2% is 20 - 64 years of age, and 13.5% is 65 years or older. The median household income in 1989 for this census tract was $55,640 with 3.5 % of the families having income below the poverty level.

Land Use

The Liberty site is zoned light industrial, and the surrounding land use is predominantly residential with general neighborhood businesses located at main road intersections. The residential area south of the Liberty site comprises mostly small homes built during 1946 - 1962. A small tributary to Massapequa Creek originates to the south within ½ mile downslope of the site. The Village of Farmingdale maintains the creek and the associated Massapequa Creek Preserve for open space and recreation. The preserve extends from the headwaters of the east and west branches of Massapequa Creek downstream to its mouth at South Oyster Bay (Figure 3). Institutional use of the surrounding area includes 10 public schools within 1.5 miles of the site and Republic Airport about 1 mile to the east. The Howitt Middle School, at the intersection of Van Cott Avenue and Grant Avenue, is the nearest public school, which is about ½ mile northeast of the Liberty site. Approximately 837 children attend grades 7 and 8 at this school. The site is about 1 mile south of the Bethpage State Park and is adjacent to Ellsworth-Allen Park.

Natural Resource Use

Twenty public drinking water supply wells, irrigation wells, and commercial supply wells are within a 1- mile radius upgradient and within 2 miles downgradient of the site (Figure 3). Many residents in the Oyster Bay receive their drinking water from these public drinking water supply wells.

NYS DEC stocks Massapequa Creek with trout. Fishing for pan fish is common, and people eat fish from the ponds and lakes within the Massapequa Creek Preserve. A NYS DOH sportfish consumption advisory (http://www.health.state.ny.us/nysdoh/fish/fish.pdf) is in effect for the Upper Massapequa Reservoir. The NYS DOH advises that women of childbearing age, infants, and children under age of 15 years should not eat any fish from the Upper Massapequa Reservoir and upstream in Massapequa Creek to the first barrier impassable by fish. Other people are advised to eat no more than one meal per month of white perch from these waters. The Upper Massapequa Reservoir is in the Massapequa Preserve and is just north of Sunrise Highway (Route 27), about 2.5 miles downstream of the headwaters to Massapequa Creek. The Liberty site is unlikely to be the source of the chlordane and polychlorinated biphenyl (PCB) contamination in the fish. Chlordane was infrequently detected in on-site soils and the levels were low. Although PCBs were present in on-site soils, multiple sources probably contribute to their presence in the fish. The main chemical of concern associated with the advisory is chlordane, but PCBs also were detected.

COMMUNITY HEALTH CONCERNS

Citizens were concerned about the Liberty site. Residents joined with the community group, Citizens for Pure Water, and collaborate to address various environmental and health issues in the community around the Liberty site. NYS DOH learned of community health concerns during public information meetings conducted by US EPA. Residents were concerned about an apparent excess of Hodgkin disease in the Farmingdale area of Nassau County; about possible contamination at or near the Ellsworth-Allen Park that could result in exposure and adverse health effects; and about health risks posed by exposure to contaminants at the site and the site's role as a continuing source of aquifer (groundwater) contamination. The Public Health Implications section addresses these concerns.

ENVIRONMENTAL CONTAMINATION AND OTHER HAZARDS

To evaluate whether a site poses an existing or potential hazard to the exposed or potentially exposed population(s), the site conditions are characterized. This site characterization involves a review of sampling data for environmental media (e.g., soil, surface water, groundwater, air) both on- and off-site, and an evaluation of the physical conditions of the contaminant sources or physical hazards near the site that may pose an additional health risk to the community.

Contaminants selected for further evaluation are identified on the basis of consideration of the following factors:

1. Concentrations of contaminant(s) in environmental media both on- and off-site;

2. Field data quality, laboratory data quality, and sample design;

3. Comparison of on-site and off-site contaminant concentrations in environmental media with typical background levels;

4. Comparison of contaminant concentrations in environmental media, both on- and off-site, with public health assessment comparison values for (1) noncarcinogenic endpoints and (2) carcinogenic endpoints. These comparison values include Environmental Media Evaluation Guides (EMEGs), Cancer Risk Evaluation Guides (CREGs), drinking water standards, and other relevant guidelines. Contaminant concentrations that exceed a comparison value do not necessarily pose a health threat;

5. Community health concerns.

The selected contaminant(s) are evaluated further in the PHA to determine whether exposure to these chemicals is occurring and whether the exposure is of public health significance.

The On-Site Contamination and Off-Site Contamination subsections discuss sampling data for environmental media; summary tables of sampling data are presented in Appendix B. If a chemical is selected for further evaluation in one medium (e.g., soil, sediment, surface water, groundwater, air), the contaminant also will be reported in all other media, if detected. The listing of a contaminant does not necessarily mean exposure to that contaminant will cause adverse health effects.

A. On-Site Contamination

Most on-site environmental data for the Liberty site were collected by the environmental consulting firm, Roy F. Weston, Inc. (Weston) of Edison, New Jersey, under contract with the US EPA. These data are presented in the RI report and are used to describe the nature and extent of contamination at the site on a media-specific basis at the time of sampling. The on-site media sampled during the RI were ambient air, soil gas, soil, and groundwater.

Ambient Air and Soil Gas

Two rounds of ambient air sampling were conducted on-site during the RI (Figure 4). The first round conducted on September 18, 1991, consisted of baseline air sampling to determine ambient airborne contaminant levels before actual field activities began. The second round of ambient air sampling, conducted during the test pit excavation on January 17, 1992, determined the amount of contaminants in the soil that were released to the air and assessed potential health risks to workers and nearby residents during cleanup activities that disturbed contaminants in soil. Both rounds included sample collection from four monitoring stations set up on the site property. The data were collected during a 24-hour period. One sample station was situated about 100 feet upwind of the pits to determine background levels. The remaining three stations were placed downwind of the pits in a 180° arc about 20 - 50 feet away from the pits to determine if airborne contaminants were leaving the site. Air samples collected during both rounds were to be tested for VOCs and metals.

Air samples collected during the first round were tested for 31 VOCs, none of which were reported above detection limits. The testing results for the metals (cadmium, chromium, and mercury only) were considered suspect because of levels of inorganic contamination detected in the field blanks. Because of laboratory error, the samples for hexavalent chromium were not analyzed.

Air samples collected during the second round were tested for 41 VOCs. Low concentrations of dichlorodifluoromethane (freon 12) were detected at all four sample locations. These levels ranged from 1.4 parts per billion (ppb) at location AR-8 to 2.0 ppb at the upwind location, AR-5. The presence of this compound in the air samples is not considered to be site-related, because the highest concentration was detected in the upwind or background sample. No other VOCs were detected. Metal samples collected during the second round were not tested because of scheduling problems.

A soil gas investigation was conducted at the Liberty site in November 1991 as a field screening method to locate areas of subsurface VOC contamination on the site and at the adjacent Ellsworth-Allen Park. Samples were obtained from a total of 114 locations (Figure 5). The soil gas samples were tested for trichloroethene, tetrachloroethene, *trans*-1,2-dichloroethene, and benzene. Trichloroethene and tetrachloroethene, the only two compounds detected, were detected up to 2.5 and 0.75 parts per million by volume (ppmv), respectively.

Trichloroethene was detected at 107 of 114 sample locations but was not found along the western boundary of the sampled area (Ellsworth-Allen Park). The highest concentrations of trichloroethene were detected in the basin area of the site.

Tetrachloroethene was found at 82 of the 114 sample locations and was highest in samples from the Basin 1 area and the Building B and Building D areas. An evaluation of the July 27 and August 17, 2000, Dames & Moore groundwater test results from MW-20, 22A, 22B, 33B and 34B (draft RI report, Dames & Moore, 1999) indicated that detection of tetrachloroethene in soil gas appears to be from the shallow portion of the tetrachloroethene plume referred to as "Plume B." The tetrachloroethene that is off-gassing from Plume B is believed to be from an off-site upgradient source. For example, many dry cleaners are along Main Street north of the site (see Figure 10).

Surface Soil (0 - 3 Inches)

In October 1993, seven surface soil samples (0 - 3 inches) were collected from the eastern and western parcels of the site and tested for VOCs, semivolatile organic compounds (SVOCs), pesticides, PCBs, and metals (Figure 6). According to the US EPA, these locations were thought to pose the greatest likelihood of surficial contamination on the basis of site, visual observations during the site reconnaissance, and RI data. Therefore, these surface soil sampling data should not be considered representative of conditions at the site as a whole. Sampling results for the surface soil samples are summarized in Table 1. With the exception of sample SS-1, the surface soil samples were collected from the western portion of the site. Soil sample SS-1, taken outside a one-room cinder block building immediately west of Building F, was stained. Sample SS-2 was taken from the northern area of the site, close to the Long Island Railroad tracks. No vegetation was growing at this sampling location. Sample SS-3 was taken along side of what appeared to be a path from a patch of ground not supporting vegetation. Soil samples SS-4, SS-5, and SS-6 were taken from basins 3, 1, and 2, respectively. These soil samples appeared to be stained. Soil sample SS-7 was taken from the former Building B location. Two other soil samples were collected from two transformer locations and tested for PCBs (Figure 6, PCB-1 and PCB-2). Soil sample PCB-1 was taken from the pad of an active transformer located north and adjacent to Building B. The surface soil immediately adjacent to an inactive transformer pad located west of Building F also was sampled and is identified as PCB-2. The PCB mixture, Aroclor 1260, was detected in both samples at concentrations of 87 milligrams per kilogram (mg/kg) and 18,000 mg/kg, respectively.

In October and November 1994, additional soil sampling was conducted at the transformer areas PCB-1 and PCB-2 to further characterize the extent of PCB contamination. Soil samples also were collected at two other transformer areas (Figure 6, PCB-3 and PCB-4). Sampling results confirmed previous findings at transformer areas PCB-1 and PCB-2. Elevated concentrations of Aroclor 1254 also were detected at transformer area PCB-4. The PCB-4 location is a fenced area near the railroad tracks in the northeastern corner of the site that reportedly was used to store transformer units. No VOCs were detected in any of the surface soil samples.

Subsurface Soil: Test Pits (0 - 13 Feet)

A total of 90 test pits were excavated on-site, and 61 test pit soil samples were collected (Figure 6). Test pit samples were collected at depths ranging from 0 to 13 feet and tested for VOCs, metals, and cyanide. A portion of the samples also were tested for SVOCs, pesticides, and PCBs. Sampling results for the test pit soil samples are summarized in Table 2 and comparison values for soil contaminants are listed in Table 3.

The only organic compounds selected for further evaluation were several PCB mixtures (Aroclors). Aroclor 1242 was detected in only one soil sample (TP-38-1-4) collected at a depth of 1 - 4 feet from a leaching chamber at the east side of a former shed pad just east of disposal basin #1. Each of the three remaining Aroclors (1248, 1254, and 1260) was detected at the highest concentration in a soil sample collected from a leaching chamber at the western leaching field.

Metals detected in test pit samples at concentrations that exceed comparison levels and/or typical background levels include aluminum, arsenic, chromium, iron, lead, and zinc.

Subsurface Soil: Soil Borings (0 - 18 Feet)

Forty soil borings were drilled on-site, and 67 soil samples were collected at depths of 0 - 18 feet. One to three samples per soil boring were collected for testing. Soil boring locations include three former disposal basins and a sludge-drying bed at or near previously excavated test pits. One soil boring was located near the northern boundary of the site to determine site background conditions (SB-1). The samples were tested for VOCs, metals, and cyanide. Ten samples also were tested for SVOCs, pesticides, and PCBs. The laboratory analyses found elevated levels of organic compounds and several metals (Tables 2 and 7). Organic compounds exceeding comparison values include trichloroethene, styrene, several PCB mixtures, and polycyclic aromatic hydrocarbons (PAHs). The highest concentration of trichloroethene and styrene were found in a soil boring sample (SB-30) obtained at a depth of 1.5 - 4.5 feet from a floor drain in Building G. The highest levels of PAHs were obtained at a depth of 0 - 0.5 feet. The PCB mixture, Aroclor 1260, was detected at three soil boring locations at depths of 0 - 12 feet, and its comparison value was significantly exceeded in sample SB-23 (depth 0 - 0.5 feet). Aroclor 1248 and Aroclor 1254 also were detected in several soil boring samples. The highest concentrations of these two PCB mixtures were found in a sample (SB-17), collected at a depth of 1.5 - 3 feet, from the floor of disposal basin #3. The cancer comparison value for arsenic was exceeded in 10 samples. However, no concentrations exceeded the typical background value for this metal. Although a comparison value is unavailable for lead, this metal exceeded its typical background concentration in about three of the 71 samples in which it was detected and was found at the highest concentration in sample SB-35.

The soil boring sample (SB-1) collected at the site background location was free of organic contamination, with the exception of acetone, which may be attributed to field equipment decontamination procedures. The concentration of acetone did not exceed its comparison value. Metals detected in this background sample did not exceed comparison values.

Groundwater: Monitoring Wells

A total of 11 groundwater monitoring wells on the Liberty site were used to investigate the hydrogeology of the site and to determine groundwater quality (Figure 7). Monitoring well MW-4, located on the northern property line, was installed to determine background groundwater levels. Except for two monitoring wells (MW-6B, MW-7B), the on-site monitoring wells were installed to about 25 feet below grade in the shallow (Upper Glacial) aquifer. Monitoring wells MW-6B and MW-7B were also installed in the shallow aquifer at a depth of about 60 feet below grade. Groundwater samples were tested for VOCs, SVOCs, pesticides/PCBs, metals, cyanide, and hexavalent chromium. The well data and comparison values are presented in Tables 3 and 8, respectively. The on-site groundwater contains VOCs (primarily solvents), the SVOCs, bis(2-ethylhexyl)-phthalate, 4-nitroaniline, and pentachlorophenol; and the pesticide, dieldrin, at concentrations that exceed drinking water standards and guidelines and/or their comparison values. The VOCs are 1,1-dichloroethane, 1,2-dichloroethene (total), 1,1,1-trichloroethane, trichloroethene, 1,2-dichloropropane, 1,1,2-trichloroethane, tetrachloroethene, and benzene. These compounds will be further evaluated in this public health assessment. Except for two phthalate compounds, butylbenzyl phthalate (1 microgram per liter (mcg/L)) and di-n-butylphthalate (1 mcg/L), at concentrations below their comparison values, no organic contamination was found in monitoring wells MW-4, MW-5, and MW-7B.

Numerous metals were detected in groundwater samples from the on-site monitoring wells at concentrations above their respective comparison values and include: arsenic, cadmium, chromium, manganese, nickel, and hexavalent chromium. These compounds will be further evaluated. Aluminum and iron are the only metals detected in the upgradient monitoring well (MW-4) at concentrations above their respective comparison values. The metals data summarized and presented in this assessment are for unfiltered groundwater samples.

B. Off-site Contamination

Air and Soil Gas

Off-site ambient air and soil gas analyses were not conducted during the RI.

Surface Water and Sediments

In the area of the Liberty site, some portion of groundwater discharges into the Massapequa Creek streambed, and the remainder continues to move to the south as underflow beneath the stream toward downgradient areas. Surface water elevation measurements, taken during the RI, indicate that the east branch of the Massapequa Creek receives discharge of groundwater from the upper part of the water-table aquifer.

During the RI, 10 surface water and sediment samples were collected from the headwaters of the Massapequa Creek to determine whether contaminated groundwater from the site discharges to the creek (Figure 7, Tables 4 and 5). Samples were tested for VOCs, metals, and cyanide.

US EPA considers the samples collected from the western branch of the creek to be background for the area.

No VOCs were detected in the surface water samples collected from the western branch of Massapequa Creek (samples SW-8 through SW-10). The metals detected in these three surface water samples did not exceed public health comparison values. Cyanide was not detected in any of the creek water samples.

Trichloroethene and tetrachloroethene were detected below drinking water standards in three surface water samples (SW-5, 6, and 7) collected from the eastern branch of the creek.

Sediment sample SD-7 is the only sediment sample that had a detectable VOC. Toluene was detected at SD-7 at a concentration below the comparison value for this compound. No metals were detected above public health assessment comparison values.

Soil

Note: Contaminants detected in off-site soil samples are not evaluated for their potential adverse health effects given the low concentrations detected and the detection of these contaminants at soil depths that would make exposure unlikely.

Subsurface Soil (1 - 3.6 Feet)

ATSDR defines subsurface soil as soil more than 3 inches deep. Figure 6 presents the locations of shallow, hand augered soil samples collected in Ellsworth-Allen Park (Tables 2 and 7). The hand auger investigation was designed to evaluate alleged mercury dumping in Ellsworth-Allen Park. Ten soil samples were collected at depths of 1 - 3.6 feet and tested for VOCs, metals, and cyanide. Two of the 10 samples also were tested for SVOCs, pesticides, and PCBs. No organic compounds were detected in any of the samples. Arsenic was detected in two samples above its comparison value. However, the highest concentration (6 mg/kg) of arsenic detected is within the typical background range for this compound in soils.

Groundwater (Monitoring Wells)

A total of 15 off-site monitoring wells, ranging in depth from 12 to 120 feet, were installed downgradient of the site during the RI (Figure 7). Except for one downgradient monitoring well (MW-11C), all off-site monitoring wells are screened in the Upper Glacial Aquifer at 12 - 75 feet below grade. Monitoring well MW-11C is screened in the Magothy Aquifer at 120 feet below grade. Off-site groundwater samples were tested for VOCs, SVOCs, pesticides/PCBs, metals, cyanide, and hexavalent chromium (Tables 6 and 8).

The off-site downgradient groundwater contained nine VOCs (primarily solvents); the SVOC, bis(2-ethylhexyl)phthalate; and the pesticides, heptachlor-epoxide, chlordane, and dieldrin, at concentrations exceeding their drinking water standards/guidelines and/or comparison values. Metals, including arsenic, cadmium, chromium, and manganese, were detected at concentrations above their drinking water standards/guidelines and/or comparison values. These organic and inorganic compounds will be further evaluated. The metals data are for unfiltered groundwater samples. Before public release of the draft PHA, two rounds of groundwater sampling had been conducted from the monitoring well (MW-11C) screened in the Magothy Aquifer. In the first round of sampling in March 1992, the only site-related contaminants detected above comparison values were 1,2-dichloroethene at 69 mcg/L and trichloroethene at 760 mcg/L. In the second round of sampling in June 1992, these compounds again were the only site-related contaminants detected above comparison values at estimated concentrations of 120 mcg/L and 1300 mcg/L, respectively.

Groundwater (Private Supply Wells)

Information gathered as part of the RI identified only one active private supply well within a 1-mile radius upgradient and within 2 miles downgradient of the Liberty site (Figure 3). This well, identified by the NYS DEC as Well N-8136, is used at the Farmingdale High School for lawn irrigation only. The well is screened at 55 - 70 feet below grade. The NC DOH sampled this well in 1979, 1982, and 1986. VOCs (1,1,1-trichloroethane, 1,1-dichloroethane, 1,1-dichloroethene, 1,2-dichloroethane, chloroform, tetrachloroethene, and trichloroethene) were detected with total VOC concentrations of 41, 97, and 29 mcg/L in 1979, 1982, and 1986, respectively. Except for chloroform, these compounds exceeded their drinking water standards/guidelines and/or comparison values.

Groundwater (Public Supply Wells)

Potable water in the area surrounding the Liberty site is supplied through public water supplies derived entirely from groundwater wells in the Magothy Aquifer. Although the RI did not provide for sampling public supply wells, NYC DOH conducts mandated testing of public drinking water supply wells. The closest public supply wells (N-7515 and N-7516) are adjacent to the western property line of the Liberty site and just north of Ellsworth-Allen Park (Figure 3). Well N-7515 is 347 feet deep, and well N-7516 is 584 feet deep. These wells are sidegradient to the site. Since 1976, when VOC testing began, no VOC contamination has been detected in well N-7516. The VOCs, 1,2,3-trichlorobenzene, 1,2,4-trichlorobenzene, and hexachlorobutadiene, each were found at 8 mcg/L in a groundwater sample collected from N-7515 in May 1985. The presence of these three compounds is suspect because they never were detected in subsequent samples. Metals data compiled for these two wells since 1965 indicate that no metals were detected at concentrations exceeding applicable drinking water standards.

A South Farmingdale Water District (SFWD) wellfield is about 4000 feet southwest of the site and comprises wells N-4042, N-4043, N-5148, and N-7377. This wellfield is sidegradient to the Liberty site and is not likely to be impacted by site-related contamination. Well N-4042, completed at a depth of 154 feet and placed into service in 1954, was taken out of service in 1978 and abandoned in 1982. Sampling data for N-4042 from 1976 to 1978 indicate the presence of 1,1,1-trichloroethane up to 14 mcg/L, 1,1-dichloroethane at 10 mcg/L, 1,2-dichloroethane at 8 mcg/L, and trichloroethene up to 16 mcg/L. Benzene also was reported at 30 mcg/L in a sample collected in May 1978. No metals contamination was detected before closure of this well.

Well N-4043, completed at 374 feet below grade, is active. In January 1977, trichloroethene was reported in this well at 6 mcg/L. The presence of this compound is suspect because it has not been detected since 1977. An elevated concentration of lead (320 mcg/L) was detected in an untreated groundwater sample collected from this well in June 1989. The presence of lead in the groundwater at this concentration is suspect because this metal has not been found in any other sample above the applicable drinking water standard. The water supply from N-4043 is treated for corrosivity.

Well N-5148, completed at a depth of 369 feet, is active. No VOCs or metals have been detected above applicable drinking water standards in groundwater samples collected at the wellhead. The water supply from this well is treated for hardness and corrosivity.

Well N-7377, completed at a depth of 758 feet, is active. No VOCs or metals have been detected above applicable drinking water standards in groundwater samples collected from this well. The water supply from this well is treated for hardness and corrosivity.

Well N-6148, completed at a depth of 561 feet, is about 7500 feet southwest of the Liberty site. In January 1977, trichloroethene was reported in this well at 11 mcg/L. The presence of this compound is suspect because it has not been found above detection limits in any other samples. Elevated concentrations of iron (up to 860 mcg/L) have, on occasion, been detected in the groundwater from this well. The water supply from N-6148 is treated for corrosivity.

Wells N-5147 and N-6149, completed at depths of 219 feet and 640 feet, respectively, are about 8000 feet south-southeast of the site. No VOCs have been detected above applicable drinking water standards in groundwater samples collected from these wells. Elevated concentrations of iron (up to 8000 mcg/L) have been detected in these wells. The water supply from this wellfield is treated for corrosivity, hardness, and iron.

A Massapequa Water District wellfield is about 2 miles south-southeast of the site and comprises wells N-4602, N-5703, N-8214, and N-9173. These wells are treated for corrosivity, hardness, and taste and odor. These active wells are completed at depths of 444 feet, 459 feet, 686 feet and 850 feet, respectively. No VOCs or metals have been detected above applicable drinking water standards in groundwater samples collected from these wells.

Biota (Edible Fish)

In 1991, the NYS DEC collected several fish species from the upper Massapequa Reservoir for pesticides and PCB analyses. The upper Massapequa Reservoir, part of the Massapequa Creek Preserve, is between Clark Boulevard and Sunrise Highway. Results of the fish tissue analysis (of the edible portions, skin on) showed elevated concentrations of chlordane and PCBs, particularly in the white perch specimens (Table 9). Chlordane is not considered a site-related contaminant. The source of these contaminants has not been determined; however, the source probably is not the Liberty site.

C. Quality Assurance and Quality Control

In preparing this public health assessment, NYS DOH relied on the information provided in the referenced documents and assumed that adequate quality control measures were followed with regard to chain of custody, laboratory procedures, and data reporting. Specific quality assurance and quality control information is included in Appendix C.

D. Physical and Other Hazards

Portions of the site are littered with rubble and refuse, particularly at the northwest disposal area. Persons accessing these areas are faced with an increased risk for injury from trips, slips, and falls.

PATHWAYS ANALYSES

This section of the public health assessment identifies potential and completed exposure pathways that may or may not be associated with past, present, and future use of the site. An exposure pathway is the process by which a person may be exposed to contaminants. An exposure pathway comprises five elements: (1) a contaminant source; (2) environmental media and transport mechanisms; (3) a point of exposure; (4) a route of exposure; and (5) a receptor population.

The source of contamination is the source of contaminant release to the environment (any waste disposal area or point of discharge); if the original source is unknown, it is the environmental media (soil, air, biota, water) that are contaminated at the point of exposure. Environmental media and transport mechanisms "carry" contaminants from the source to points where human exposure can occur. The exposure point is a location where actual or potential human contact with a contaminated medium can occur. The route of exposure is the manner in which a contaminant actually enters or contacts the body (i.e., ingestion, inhalation, dermal adsorption). The receptor population is the person or people who are exposed or may be exposed to contaminants at a point of exposure.

Two types of exposure pathways are evaluated in the public health assessment; a completed exposure pathway exists when the criteria for all five elements of an exposure pathway are documented; a potential exposure pathway exists when the criteria for any one of the five elements comprising an exposure pathway are not met. A suspected exposure pathway is considered to be eliminated when any one of the five elements constituting an exposure pathway has not existed, does not exist, and will never exist.

A. Completed Exposure Pathways

Groundwater Exposure Pathway

Groundwater is contained in two water-producing aquifers at the site. The aquifers are hydraulically connected. The shallow aquifer (the Upper Glacial Aquifer) extends from the surface to a depth of about 85 feet and consists of sands and gravel. The depth to groundwater in this aquifer is about 10 feet below grade at the site and decreases to about 2 feet below grade near Massapequa Creek. Locally, groundwater in the Upper Glacial Aquifer moves predominantly south-southwest. In the Liberty site area, a portion of groundwater from the Upper Glacial Aquifer discharges into the Massapequa Creek stream bed, and the remainder flows beneath the creek toward downgradient areas. Groundwater contamination in this aquifer has been detected on-site, particularly in the area directly downgradient of the former disposal basins and wastewater treatment/process area where elevated concentrations of VOCs and metals have been detected to a depth of about 26 feet. Many of the organic and inorganic contaminants detected in this shallow aquifer on-site also were reported at elevated concentrations in the same aquifer downgradient from the site. An organic groundwater contaminant plume is estimated to have migrated from the Liberty site about 8000 feet south with a width of about 700 feet (see notes on Figure 7). The deeper water-producing aquifer beneath the site is known as the Magothy Aquifer. At the site area, the Magothy Aquifer extends from about 85 feet to a depth of about 785 feet and consists of fine sand with thin beds and lenses of silt and clay. In the site area, groundwater in the Magothy Aquifer moves south and discharges into the south shore bays and the Atlantic Ocean. The Magothy formation is the main aquifer of use for public drinking water supply in Nassau County. The aquifer system underlying all of Long Island has been designated as a sole source aquifer because no other source of drinking water is available. The NYS DOH mandated monitoring of the county's public drinking water supply wells ensure continued compliance with all federal and state drinking water regulations.

A number of public drinking water supply wells have been identified within 2 miles downgradient/sidegradient of the Liberty site. The Magothy Aquifer is the source of groundwater for all of these active and/or inactive supply wells. During 1976 - 1978, low concentrations of several VOCs were detected in a public drinking water supply well (N-4042), about 4000 feet southwest (sidegradient) of the site. The concentrations of the VOCs detected were below the NYS and federal public drinking water guidelines/standards in effect at the time of this monitoring. Therefore, water quality data indicate water distributed from SFWD well No. N-4042 was of acceptable drinking water quality during monitoring. Contamination in this well probably is not related to the Liberty site. This well was placed into service in 1954; however, the full extent of contamination cannot be determined because of the limited water quality information generated before this well was taken out of service in 1978. The analytical testing for VOCs in drinking water did not become common until the late 1970s. Therefore, exposure may have resulted from the use of this well during 1954 - 1976, although data are not available to confirm that conclusion. An estimated 22,000 people may have been exposed to VOCs in the public drinking water supply well.

VOC concentrations detected at the wellhead would be expected to be further reduced during storage and after entering the distribution system, although point-of-use data are not available to confirm this.

Biota (Fish) Exposure Pathway

Ingestion of fish from the upper Massapequa Reservoir is a completed human exposure pathway. Fishing in the upper Massapequa Reservoir is common, and people eat fish from this body of water. In 1991, NYS DEC collected several fish species (edible fish) from the upper

Massapequa Reservoir for pesticides and PCB analyses. Results of the fish tissue analysis showed elevated concentrations of chlordane and PCBs, particularly in the white perch specimens. A NYS DOH fish consumption advisory is in effect for the Upper Massapequa Reservoir. The main chemical of concern associated with the advisory is chlordane. Signs posted along the reservoir advise that women of childbearing age, infants, and children under age 15 years should not eat any fish from this body of water. Other people are advised to eat no more than one meal per month of white perch from the reservoir. Contaminants that bioaccumulate in fish or bioaccumulate through the food chain could result in exposure to people who eat fish caught in the upper Massapequa Reservoir. How many people may have been eating contaminated fish is unknown . The source(s) of PCBs and chlordane have not been determined; however, chlordane has not been identified as a chemical of concern at the Liberty site. Although PCBs were present in on-site soils, multiple sources probably contributed to their presence in the fish.

B. Potential Exposure Pathways

Groundwater Exposure Pathway

Groundwater contamination has been detected on-site in the Upper Glacial Aquifer and downgradient of the site in the Upper Glacial Aquifer and shallow portion of the Magothy Aquifer. Contaminants that have entered the groundwater beneath the site could be transported with the groundwater flow to on-site industrial wells and toward downgradient public or private supply wells. Three inactive industrial wells are located in the Liberty Industrial Park; two are completed in the Magothy Aquifer and one in the Upper Glacial Aquifer. Humans would not be expected to be exposed to contaminated groundwater supplied in the past by these wells because these wells were used for industrial purposes (i.e., cooling water) and not to supply drinking water. These wells were not sampled during the RI.

Because information is limited about the extent of contamination in the Magothy Aquifer downgradient of the site, the possibility cannot be dismissed that downgradient supply wells could be affected by site-related contamination. In the absence of monitoring and detection, this could expose 22,000 people. However, since 1988, all public supply wells have been and are tested quarterly for over 70 VOCs as required by the NC DOH. From 1977 through 1987, water from all public supply wells was tested annually for VOCs. Since the early 1970s, water from public supply wells has been tested annually for metals contamination. If contamination is detected, controls will be implemented to minimize the potential for further exposure through this pathway.

The SFWD public supply wells, which are about 7500 feet southwest (well N–6148) and 8000 feet south-southwest of the site (wells N–5147 and N–6149), and the Massepequa Water District wells, which are about 2 miles south-southwest of the site (wells N–4602, N–5703, N–8214, and N–9173) are not in the pathway of "Plume B." Plume B is the well-defined Upper Glacial unit plume, which is not site-related (Figure 8). On July 27 and August 17, 1999, Dames and Moore collected groundwater samples, with US EPA oversight, from five monitoring wells that had contained tetrachloroethene at levels above NYS DOH drinking water standards. Monitoring wells 20, 22A, 22B, 33B, and 34B were sampled in conjunction with "Plume B" in the draft RI report (Dames and Moore 3/30/99). Plume B appears to originate from one or more dry cleaning facilities along Main Street in Farmingdale north of the site. Plume B will continue to be monitored.

Soil Gas/Ambient Air Exposure Pathway

Shallow soil gas samples collected at the site indicate the presence of trichloroethene and tetrachloroethene at low concentrations. Soil gas, if released at the ground surface, could result in exposure to these VOCs; however, contaminant concentrations most likely would be further diluted by mixing with ambient air and volatilization to the atmosphere. In addition, a potential exists for these VOCs in soil gas to migrate through the subsurface and enter confined building spaces (basements) through crawl spaces, plumbing holes, other floor holes (e.g., sumps) and foundation cracks, and contaminate indoor air.

At this time, the soil gas/ambient air exposure pathway is considered a potential human exposure pathway because only limited quantitative data exist to fully evaluate this pathway. Soil gas has not been tested at off-site locations. Of particular concern is the potential for contaminated soil gas to migrate to the residential area along Motor Avenue. After the July 27 and August 17, 1999, Dames & Moore groundwater collection of MW-20, -22A and -22B, -33B and -34B, tetrachloroethene in soil gas within the footprint of the on- and off-site tetrachloroethene plume (Plume B) was determined to be related to off-gassing from the shallow portion of Plume B. The tetrachloroethene in off-gassing from Plume B is believed to be from an off-site upgradient source because of the many dry cleaners along Main Street north of the site (Figure 10).

The scope of the ambient air study conducted during the 1992 RI was limited and is not adequate to fully characterize the ambient air pathway. VOCs released to ambient air (breathing zone) are likely to disperse and be diluted at unconfined on-site and off-site areas. The extent of metals contamination in ambient air cannot be determined because the limited data collected during the 1992 RI were considered suspect.

Soil Exposure Pathway

Many contaminants related to past disposal of wastes at the site are migrating through the soils into the groundwater beneath the site. The RI identified numerous on-property source areas, including the former disposal basins, the sludge-drying bed, process areas, the Building B basement area, the northwest disposal area, the building M pad area, sanitary leaching fields, leaching chambers, transformer areas, and underground storage tanks. Past exposure pathways to an unknown number of people were possible from contamination of surface soils at the site. The full extent of surface soil contamination at the site has not been determined; however, elevated concentrations of the PCB, Aroclor 1260, were present in the shallow (0 - 6 inches) soil at two of four areas where transformers are or were situated. Elevated concentrations of Aroclor 1254 also were detected in the soil at one other transformer area. These contaminants have an affinity for soils that reduces their mobility and lessens the potential for migration into the underlying groundwater. PCB-contaminated soils from these three transformer areas have been excavated and transported to an off-site facility for treatment and disposal. Before this removal action, a fence was constructed around an unfenced transformer pad area. However, before the fence was installed, trespassers and workers at the industrial park may have traveled across the transformer pad area and could have been exposed to the PCBs by direct contact with or incidental ingestion of the soil. The limited surficial soil data collected at the western portion of the site do not indicate the existence of contamination at levels of health concern. People will not be exposed to contaminated subsurface soils and sludges unless subsequent on-site excavation of soils is conducted.

C. Eliminated Exposure Pathways

Groundwater Exposure Pathway

VOC contamination has been detected in a downgradient private well used to irrigate lawns at Farmingdale High School. Ingestion of water distributed by the well is not known to be occurring or occurs limitedly and infrequently. Drinking water at the school is supplied by the public drinking water supply system. Because VOCs readily evaporate from water, VOCs in the well water will be diluted further in the ambient air because the lawn is irrigated by sprinklers. Any regular exposures to contaminants released by the irrigation system would occur through inhalation and dermal contact, both of which would be of short duration. Therefore, this exposure pathway is eliminated from further discussion. Although no private drinking water supply wells have been identified, this pathway will be reevaluated if such wells are identified.

Surface Water/Sediment Exposure Pathway

This human exposure pathway has been eliminated from further discussion in this public health assessment because none of the contaminants detected in the surface water and sediments of Massapequa Creek were found at levels that exceed public health assessment comparison values.

Soil Exposure Pathway

In the original PRAP, soil contaminated above soil cleanup levels was to remain on-site and be covered with a soil cover or cap. Residents were concerned about exposures to contaminants in the soil if the property was developed and subsurface contamination was brought to the surface. Residents also were concerned that the subsurface soil contamination would be a continuing source of groundwater contamination. After the January 9, 2002, PRAP meeting, US EPA revised a portion of the final remedy for the on-site soil contamination in response to these concerns. The March 28, 2002, Record of Decision calls for the evacuation and off-site disposal of all contaminated soils above groundwater protection levels, estimated at 73,110 cubic yards. This will essentially remove the subsurface contamination associated with the hot spot areas on-site.

PUBLIC HEALTH IMPLICATIONS: ADULT AND CHILD HEALTH ISSUES

A. Toxicologic Evaluation

To evaluate the potential health risks from contaminants of concern that may be associated with the Liberty site, the NYS DOH assessed the risks for cancer and noncancer health effects. The health effects are related to contaminant concentration and exposure pathway, frequency, and duration. For additional information about how the NYS DOH determined and qualified health risks applicable to this health assessment, refer to Appendix C.

1. <u>Past exposure of persons eating fish from the Massapequa Reservoir and its tributaries.</u>

Ingestion of fish from Massapequa Reservoir and its tributaries is a completed human exposure pathway. Chlordane and PCBs have been detected in fish from these waters; however, the source of these contaminants in the fish is unlikely to be attributable to the Liberty site. These two chemicals cause cancer in laboratory animals exposed to high levels over their lifetimes (ATSDR, 1994, 2000). Eating one fish per week for a lifetime with the average level of PCBs in fish from the Massapequa Reservoir and its tributaries could pose a high increased risk for cancer, whereas exposure to the average level of chlordane could pose a moderate increased risk for cancer. The risks would be lower for people who eat less fish from the reservoir.

PCBs and chlordane also cause noncarcinogenic toxic effects. Human effects reported after chronic exposures to PCBs include skin, eye, and respiratory tract irritation (ATSDR, 2000). A mother's increased exposure to PCBs may be linked with slight effects on her child's birthweight and behavior (ATSDR, 2000; Rogan and Gladen, 1991, 1992). Studies of women exposed to relatively high levels of PCBs in the workplace suggested their babies might weigh less than babies born to women exposed to lower concentrations. Children born to women who ate fish contaminated with PCBs before and during pregnancy had lower scores on tests measuring gross and fine motor coordination. PCBs also have caused skin, liver, nervous system, immune system, and reproductive effects in animals (ATSDR, 2000). The primary adverse noncarcinogenic effects from exposure to elevated levels of chlordane are liver and central nervous system damage (ATSDR, 1994). Chemicals that cause adverse effects in humans and/or animals after high-level exposure also may increase the risk of adverse health effects in humans exposed to lower levels over long periods of time. Although the risks for noncarcinogenic effects from possible exposure to contaminated fish are not completely understood, data suggest that they could be high for PCBs and low for chlordane for people who eat one fish a week from the reservoir. The risks would be lower for people who eat fewer fish from the reservoir.

2. Past ingestion, dermal, and inhalation exposure to organic contaminants in a public water supply well.

For an undetermined period (fewer than 24 years) a public drinking water supply well (N-4042) near the Liberty site was contaminated with organic chemicals. Because this well is sidegradient to the site, the contamination probably is not attributable to the site. Contaminant levels in this well were reported from 1976 to 1978. Contaminant levels in drinking water before this time are not known. The highest levels of 1,1,1-trichloroethane (14 mcg/L), 1,1-dichloroethane (10 mcg/L), 1,2-dichloroethane (8 mcg/L), trichloroethene (16 mcg/L) and benzene (30 mcg/L) exceeded present NYS public drinking water standards and/or PHA comparison values for each of these chemicals (Table 8) and, therefore, these contaminants have been selected for further evaluation (see below). This public water supply well, which opened in 1954, has not been used since 1978. Chronic exposure to chemicals in drinking water is possible by ingestion, dermal contact, and inhalation from water uses such as showering, bathing, and cooking. Although exposure varies depending on an individual's lifestyle, each of these exposure routes contributes to the overall daily uptake of contaminants and increases the potential for harmful health effects.

Benzene is a known human carcinogen (ATSDR, 1993b). Chronic exposure to the highest level of benzene in public water supply well N-4042 would pose a low increased cancer risk. Trichloroethene and 1,2-dichloroethane cause cancer in laboratory animals exposed to high levels over their lifetimes (ATSDR, 1992a; 1993l). Chemicals that cause cancer in laboratory animals also may increase the risk for cancer in humans exposed to lower levels over long periods. Whether these chemicals cause cancer in humans is not known. The results of animal studies and limited sampling of this public water supply well suggest that persons exposed to drinking water contaminated with trichloroethene and 1,2-dichloroethane could have a low increased risk of developing cancer. Toxicologic data are inadequate to assess the carcinogenic potential of 1,1,1-trichloroethane and 1,1-dichloroethane (ATSDR, 1990b; 1993k), although US EPA has classified the latter chemical as a possible human carcinogen. The determination of low increased cancer risk from exposure to VOCs (i.e., benzene, trichloroethene and 1,2-dichloroethane) in drinking water is based on an exposure period of up to 24 years (from 1954, when the well was placed in service, until 1978, when its use was discontinued) and at the highest concentration each VOC was detected during the 1976-1978 monitoring.

The chlorinated contaminants 1,1,1-trichloroethane, 1,1-dichloroethane, 1,2-dichloroethane, and trichloroethene also produce noncarcinogenic toxic effects, primarily to the liver, kidneys, and nervous system. Benzene causes damage to blood-cell-forming tissues and to the immune system. All these contaminants produce their effects after exposures that are several orders of magnitude greater than estimated past exposures to these chemicals in drinking water from residential wells. Chemicals that cause health effects in humans and/or animals after high levels of exposure also may pose a risk to humans exposed to lower levels over long periods. Although the risks for noncarcinogenic effects from past exposures are not completely understood, the existing data suggest that they would be low for benzene and minimal for 1,1,1-trichloroethane, 1,1-dichloroethane, 1,2-dichloroethane, and trichloroethene.

3. Potential ingestion, dermal, and inhalation exposure to contaminants in drinking water because of future contaminant migration.

On-site and off-site groundwater is contaminated with organic chemicals and metals at concentrations that exceed NYS drinking water standards or PHA comparison values (Tables 3, 6, 8). Therefore, these chemicals have been selected for further evaluation (see below). Municipal and unidentified private drinking water supply wells could become contaminated by on-site and off-site groundwater contaminant migration. Municipal wells are tested to ensure the water distributed meets federal and state drinking water standards.

Organic Compounds:

Vinyl chloride and benzene are known human carcinogens (ATSDR, 1993b,m). Chronic exposure to the highest level of vinyl chloride detected in off-site groundwater could pose a high increased risk for cancer, whereas exposure to the highest level of benzene detected in on-site groundwater could pose a low increased risk for cancer. However, the low frequency of detection of these two contaminants (Tables 3 and 6) suggests that the levels of exposure to them should be reduced, and consequently, the cancer risks they pose also should be considerably reduced. Trichloroethene, tetrachloroethene, bis(2-ethylhexyl)phthalate, and dieldrin detected in both on-site and off-site groundwater; 1,2-dichloropropane, 1,1,2-trichloroethane, and pentachlorophenol detected in on-site groundwater; and methylene chloride, 1,1-dichloroethene, heptachlor epoxide, and chlordane detected in off-site groundwater are chemicals that cause cancer in laboratory animals exposed to high levels over their lifetimes (ATSDR, 1989a,b; 1991a,c; 1994,c,d; 1993f,j,l). Results of animal studies indicate that chronic exposure to trichloroethene, bis(2-ethylhexyl)phthalate, 1,2-dichloropropane, 1,1,2-trichloroethane, tetrachloroethene, dieldrin, and pentachlorophenol at the highest levels found in on-site groundwater, could pose a combined high increased risk for cancer. In addition, exposure to methylene chloride, trichloroethane, tetrachloroethene, bis(2-ethylhexyl)phthalate, heptachlor epoxide, dieldrin, and chlordane at the highest levels found in off-site groundwater could pose a combined high increased risk for cancer. Exposure to 1,1-dichloroethene, which also was detected in off-site groundwater, could pose a moderate increased risk for cancer. Toxicologic data are inadequate to assess the carcinogenic potential of chlorobenzene, 1,1-dichloroethane, 1,2-dichloroethene, and 1,1,1-trichloroethane (ATSDR, 1990a,b,c; 1993) (Tables 3 and 6).

Ten contaminants in on-site and/or off-site groundwater that exceed either NYS drinking water standards or noncancer public health assessment comparison values and consequently were selected for further evaluation (see below): vinyl chloride, trichloroethene, 1,2-dichloroethene, methylene chloride, chloro-benzene, 1,1-dichloroethane, 1,1,1-trichloroethane, tetrachloroethene, pentachloro-phenol, and bis(2-ethylhexyl)phthalate. These contaminants all produce noncarcinogenic toxic effects, primarily to the liver, kidneys, and central nervous system. Bis(2-ethylhexyl) phthalate can adversely affect the male reproductive system (ATSDR, 1993f). Vinyl chloride causes noncarcinogenic effects at exposure levels about five times greater than potential exposure from off-site groundwater; the other contaminants produce their noncarcinogenic effects at exposure levels several orders of magnitude greater than potential exposure to these chemicals in on-site and/or off-site groundwater. Although the risks for noncarcinogenic effects from potential exposure to contaminants in drinking water are not completely understood, the data suggest they could be high for 1,2-dichloroethene and trichloroethene, and minimal for vinyl chloride, chlorobenzene, 1,1-dichloroethane, methylene chloride, 1,1,1-trichloroethane, tetrachloroethene, pentachlorophenol, and bis(2-ethylhexyl)phthalate.

Inorganic Contaminants:

Inorganic contaminants of potential concern in on-site and/or off-site groundwater are arsenic, aluminum, cadmium, chromium, iron, manganese, nickel, sodium, thallium, and cyanide. The following summarizes the potential health effects from exposure to these inorganic chemicals which, except for cyanide, are all metals.

Arsenic is a known human carcinogen. Studies of people exposed to high levels of arsenic in drinking water in foreign countries provide evidence of an association between arsenic ingestion and skin cancer. The scientific community debates about the quantitative uncertainties in US EPA's cancer potency factor and epidemiologic studies of Taiwanese populations exposed to arsenic in drinking water (ATSDR, 1993a). The data suggest that, if drinking water were contaminated with arsenic from on-site and/or off-site groundwater, exposure to this metal could pose a low increased risk for cancer (Tables 3 and 6).

Although little is known about the chronic toxicity of aluminum in humans, some toxicity studies of animals indicate that aluminum may cause nerve and skeletal damage and may adversely affect the reproductive system (NYS DOH, 1990a). The most sensitive effect from chronic elevated exposure to cadmium is kidney damage (ATSDR, 1993c). The primary toxic effects associated with ingestion of large amounts of chromium are kidney damage, birth defects, and adverse effects on the reproductive system (ATSDR, 1993d). Although iron is an essential nutrient, ingestion of large amounts can lead to iron toxicity characterized primarily by gastrointestinal effects (Henretig and Temple, 1984). Its presence in drinking water, however, is objectionable primarily because of its affect on taste and staining of laundry and plumbing fixtures (WHO, 1984). Exposure to high manganese concentrations primarily causes nervous system effects (ATSDR, 1991b). Exposure to high levels of nickel can cause reproductive effects and allergic reactions (ATSDR, 1993h). The main health concern about sodium ingestion is its association with high blood pressure and possibly heart disease (WHO, 1984). Chronic exposure to elevated levels of thallium can adversely affect the respiratory, cardiovascular and gastrointestinal systems, liver, kidneys, and male reproductive system (ATSDR, 1992d). The primary effects associated with exposure to elevated levels of cyanide are blood cell changes and central nervous system effects (ATSDR, 1993e). Chronic exposure to drinking water contaminated with manganese and thallium at the highest concentrations found in on-site and off-site groundwater monitoring wells would pose a high risk for adverse health effects; chronic exposure to cadmium, chromium, and sodium would pose a low noncancer risk. The remaining metal contaminants, as well as cyanide, would pose a minimal increased risk for adverse health effects.

4. Potential inhalation exposure to migrating on-site soil gas.

   Contamination of soil gas by trichloroethene and tetrachloroethene was confirmed in certain areas of the site. As previously discussed, trichloroethene and tetrachloroethene are considered potential human carcinogens and can produce noncarcinogenic toxic effects, primarily to the liver, kidneys, and central nervous system. The health risks from trichloroethene and tetrachloroethene are indeterminate because of inadequate data on current potential exposure to these chemicals in migrating soil gas.

5. Past potential ingestion and dermal contact exposure to contaminants in soil at on-site transformer areas.

   Surface soil at three on-site areas where transformers are or were situated were contaminated with PCBs at elevated levels as high as 18,000 mg/kg which exceed PHA comparison values for these soil contaminants (Table 7). PCB-contaminated soils have been excavated and removed from these three areas. Before this removal and before a fence was constructed around the transformer pad area, trespassers and workers may have traveled across the area and could have been exposed to the PCBs by unintentionally eating soil or by absorbing PCBs through the skin. One important factor is that the amount of soil-bound PCBs absorbed through skin is relatively low, particularly compared with absorption after ingestion. Studies in animals and humans consistently show that about 90% or more of ingested PCBs (not bound to soil) are absorbed into the body (ATSDR, 1998). A study with rats suggests that the percentage of absorption of soil-bound PCBs when ingested is 70% - 90% (Fries et al., 1989). In contrast, an estimate of the percentage of absorption of soil-bound PCBs (as Aroclor 1242 or Aroclor 1254) applied to monkey skin is about 14% (Wester et al., 1993). Exposure to the PCB- contaminated soil could pose an increased risk for carcinogenic and noncarcinogenic effects. The PCB contamination was confined to the transformer areas and may not represent potential exposures for other areas of the site. In addition, no specific exposure information exists for trespassers at the site. Because of these uncertainties, the magnitude of the health risks cannot reliably be determined.

B. Health Outcome Data Evaluation

NYS DOH conducted three studies on cancer incidence in ZIP codes 11701, 11735, 11758, and 11762. The first study, completed in 1992, investigated the incidence of Hodgkin disease in the area and found no significant excess of the disease in either males or females for 1978 - 1987. A follow-up study of Hodgkin disease in this area covering 1980 - 1989 was completed in 1994. Overall rates of Hodgkin disease were not significantly elevated in either males or females; however, when the number of Hodgkin disease cases was examined by year, an apparent excess of cases was observed among females during the last 2 years of the study. Further testing indicated a disproportionate number of these cases were located in ZIP codes 11735 and 11758. The third study investigated all cancers in the area for 1983 - 1992, with additional follow-up of bladder cancer and Hodgkin disease incidence for 1993 - 1997. No cancers were significantly elevated among any specific cancer sites for the study area as a whole. However, a statistically significant excess of bladder cancer was found for ZIP code 11735 among both males and females for 1983 - 1992. In the follow-up, no significant excess of bladder cancer was observed in any ZIP code for 1993 - 1997. Taken together these studies suggest that before 1988 no significant excesses of Hodgkin disease existed in the area; however, during 1988 - 1992 significant excesses of Hodgkin disease and bladder cancer were noted in ZIP codes 11758 and 11735, which includes the Liberty site. The most recent study showed that, in the latest period examined (1993 - 1997) significant excesses of Hodgkin disease or bladder cancer no longer existed in the area.

Rates of cancer that occur naturally over time and space vary. Year-to-year fluctuations in cancer rates in a small community, such as an individual ZIP code, are not unusual and the significant results observed in these studies could be due simply to chance fluctuations. Variation in cancer incidence also may be due to differences in diagnosing, treatment, and reporting of cancers across the state. In addition, because of the number of individual tests conducted (one for each type of cancer, for each sex, in each ZIP code, in each time period), several tests would be expected to have statistically significant results even though the differences between the observed and expected rates were due entirely to random fluctuations in the data alone.

Proving that the cancer incidence rate in a community is associated with a specific environmental contaminant is difficult. Generally studies are limited by lack of information about individual water use and consumption, lack of control for confounding variables, and exposures to numerous contaminants. Some evidence indicates that two of the chemicals evaluated for past exposures in public water supplies may cause cancers of the hematopoietic system, which were elevated in some of the ZIP codes. Benzene is considered a human carcinogen because of increased incidence of leukemia among workers who breathed high levels of the chemical in air over long periods. Also, studies of people exposed to trichloroethene in drinking water showed a higher risk for hematopoietic cancers (e.g., leukemia, non-Hodgkin lymphoma and Hodgkin disease), but these studies have inadequate individual exposure information and did not account for several confounding variables, including exposure to other chemicals in the drinking water. The epidemiologic data, although limited, do not suggest that these public water contaminants cause human bladder cancer. The NYS DOH investigations of the four ZIP codes cannot determine whether any of the increased incidence of cancer in the ZIP codes is due to a specific environmental contaminant because, by design, NYS DOH examined only cancer incidence and did not evaluate exposures.

C. Community Health Concerns Evaluation

We have addressed each of the community concerns about health as follows:

1. Residents are concerned about an apparent excess of Hodgkin disease in the community near the Liberty site.

   NYS DOH conducted three studies on cancer incidence in ZIP codes 11701, 11735, 11758, and 11762. Taken together these studies suggest that before 1988 no significant excesses of Hodgkin disease occurred in the area; however, during 1988 - 1992, significant excesses of Hodgkin disease and bladder cancer were noted in ZIP codes

11758 and 11735, which includes the Liberty site. The most recent study showed that, during the latest period examined (1993 - 1997), significant excesses of Hodgkin disease or bladder cancer no longer were evident in the area. The NYS DOH investigations of the four ZIP codes cannot determine whether any of the increased incidence of cancer in the ZIP codes is due to a specific environmental contaminant because, by design, NYS DOH examined only cancer incidence and did not evaluate exposures. This question is discussed in more detail in of the Health Outcome Data Evaluation section.

2. Local residents have asked about possible contamination at or near the Ellsworth-Allen Park, a public recreation area.

   During the RI, a geophysical survey (to determine the presence of underground features such as drums), a soil gas survey (to determine the presence of VOCs in the soil), and sampling of shallow soil were conducted at a portion of the Ellsworth-Allen Park. The purpose of the soil sampling was to evaluate the alleged dumping of methyl mercury diisocyante in the park. The test results for the soil samples are included in Table 2 (off-site Hand Auger samples) and discussed in the Off-Site Contamination section of this assessment. The area of investigation consisted of a former disturbed area with soil piles shown on a historical aerial photograph from 1966. This area corresponds to the current location of the baseball field closest to the Liberty property boundary (Figure 1). None of the field activities conducted in this area revealed any significant evidence of organic or inorganic (including mercury) contamination. The groundwater directly downgradient of the park does not contain any contaminants at concentrations exceeding PHA comparison values. Therefore, we believe the park is not contaminated with site-related constituents.

3. Residents have been concerned for many years about health risks posed to the local community from contamination at the site.

   To evaluate the potential health risks from contaminants of concern associated with the Liberty site, the NYS DOH assessed the risks for cancer and noncancer health effects. This toxicologic evaluation is included in the Public Health Implications section of this assessment. The health risks posed to residents near the site involve potential inhalation exposure to migrating on-site soil gas and potential ingestion, dermal contact, and inhalation exposure to contaminants in on-site soil. No data exist on off-site soil gas concentrations. The potential exists for site-related contamination to migrate to downgradient drinking water supply wells. No downgradient private drinking water supply wells are known in the area. Downgradient public drinking water supply wells in operation are not contaminated. Routine monitoring of the public drinking water supply wells will detect any site-related contamination, and measures will be taken to control it and avert any ingestion exposure to the supply.

4. Residents were concerned that contaminated soils remaining on-site under US EPA proposed soil cover (cap) would continue to contaminate groundwater and act as a potential source of dermal exposure if subsurface contamination is brought to the surface during redevelopment activities on the site.

In March 2002, US EPA changed a portion of the final remedy for cleanup of the on-site soils. The initial remedy called for excavation and off-site disposal of 25,600 cubic yards (cu. yds.) of the most highly contaminated soil, followed by capping of the remaining soils that contained contaminants in excess of soil cleanup levels. The final remedy calls for excavation and off-site disposal of all contaminated soils above groundwater protection levels. This is estimated to include 73,100 cu.yds of soil, which essentially will remove the subsurface contamination that the residents had requested.

CONCLUSIONS

1. ATSDR's present public health hazard category classification (Appendix D), and potential exposures to PCBs and VOCs indicate that an indeterminate public health hazard existed in the past. Past exposure pathways were possible from contamination of the surface soils with PCBs at one or more transformer pad areas. Exposure to PCB-contaminated soils at three on-site transformer areas has been abated by the recent completion of a US EPA action involving the excavation and removal of the contaminated soil. A supplemental RI is ongoing to determine the extent of contamination at the eastern portion of the site.

   Also, people may have been exposed to levels of VOC contaminants in their drinking water that, upon long-term exposure, could result in a low increased risk for cancer. However, the source of the contamination was not determined and could be other than the Liberty site. Low levels of VOCs were detected in a sidegradient public drinking water supply well during 1976 - 1978. This well operated for about 24 years before closing in 1978; however, the presence and extent of VOC contamination in the well before 1976 cannot be determined.

   On-site and downgradient groundwater monitoring wells are contaminated with organic compounds and metals at concentrations that exceed drinking water standards. Currently operating downgradient public drinking water supply wells are not contaminated; the water supply wells are monitored routinely. A supplemental RI is being conducted to determine the extent of contamination in the deeper Magothy Aquifer downgradient from the site.

2. The information reviewed indicates the Liberty site currently poses no apparent public health hazard. The limited surface soil data for the western portion of the site do not represent a public health concern provided site use remains industrial/commercial. The site was and remains zoned for light industry. On-site soil gas contains low levels of VOCs that have the potential to migrate off-site by underground utilities. Soil gas samples have not been collected from residential areas near the site to assess the presence of VOCs from the site. An off-site soil gas investigation is proposed along the Motor Avenue residential area.

3. In 1991, NYS DEC collected fish from Massepequa Reservoir for pesticides and PCB analyses. The fish, particularly white perch, contained elevated concentrations of chlordane and PCBs. Although the source(s) of this contamination has not been

determined, it probably is not attributable to the site. This conclusion is supported by the infrequent detection of chlordane at exceedingly low concentrations in subsurface soils at the site but not in groundwater samples. Furthermore, even though PCBs were present in soils at the site, these compounds tend to bind to soil and therefore, would be unlikely to migrate off the site. A NYS DOH sportfish consumption advisory is in effect for the Upper Massapequa Reservoir.

4. Elevated concentrations of Aroclor 1260 and Aroclor 1254, PCB mixtures, were detected in the shallow (0 - 6 feet) soil at three transformer areas on-site. These soils were excavated and removed from the site.

5. Site-security measures by US EPA have not been completely successful. Additional fencing has been installed, and existing fencing has been repaired to prevent trespassers from entering the site, particularly the inactive western portion. Vandals continually destroy sections of fencing to gain access to the site.

6. Local residents are concerned about health risks posed to the community from contamination at the site. Residents also suspect an excess of Hodgkin disease in the community near the Liberty site resulting from exposure to contaminants from the site. NYS DOH conducted three studies on cancer incidence in ZIP codes 11701, 11735, 11758, and 11762. Taken together, these studies suggest that before 1988 no significant excesses of Hodgkin disease existed in the area; however, during 1988 - 1992, significant excesses of Hodgkin disease and bladder cancer were noted in ZIP codes 11758 and 11735, which includes the Liberty site. The most recent study showed that, in the latest period examined (1993 - 1997), significant excesses of Hodgkin disease or bladder cancer no longer existed in the area. The NYS DOH investigations of the four ZIP codes cannot determine whether any of the increased incidence of cancer in the ZIP codes is due to a specific environmental contaminant because, by design, they examined only cancer incidence and did not evaluate exposures.

RECOMMENDATIONS

1. Public drinking water supply wells downgradient of the site should continue to be monitored to determine whether they are being affected by site-related contaminants. This monitoring is mandated by the State of New York and the federal government. If any contamination advances to any of these wells, measures should be taken to control it.

2. Groundwater quality needs to be monitored downgradient from the site and in the general path of groundwater flow. Additional monitoring wells should be installed to determine the extent of site-related contamination in the deeper Magothy Aquifer.

3. Additional soil gas measurements should be taken near the dwellings at homes opposite the site along Motor Avenue because of the potential for site-related contaminants to impact indoor air quality. These data should determine the need to conduct indoor air sampling. US EPA has proposed an off-site soil gas investigation.

4. Additional sampling of surface soil should be done during the design phase of the remedial program, as stated in the Record of Decision, to ensure the western portion of the site is acceptable for recreational use.

5. Site security measures need to be improved to control ongoing trespassing.

6. The NYS DOH sportfish consumption advisory for the Upper Massapequa Reservoir should remain in effect until the PCBs and chlordane concentrations in the fish decrease to acceptable levels.

7. The eastern portion of the site should be restricted to industrial and appropriate commercial use.

PUBLIC HEALTH ACTION PLAN

The PHAP for the Liberty site contains a description of actions to be at and near the site, after completion of this PHA. See the Background section of this PHA for actions already taken at the site. The purpose of the PHAP is to ensure that this PHA not only identifies public health hazards but also provides a plan of action to mitigate and prevent adverse human health effects resulting from past, present, and/or future exposures to hazardous substances at or near the site. Included is a commitment by ATSDR and/or the NYS DOH to follow up on this plan to ensure its implementation. The public health actions to be implemented are as follows:

1. US EPA has begun field work for the supplemental groundwater RI. The installation of additional monitoring wells is in progress. This investigation will further characterize the downgradient groundwater quality in the Magothy Aquifer. The results of this investigation will be evaluated to determine potential source(s) of contamination in the site area. As part of the supplemental RI, a soil gas survey will be conducted at the eastern portion of the site and at selected locations along the south side of Motor Avenue.

2. ATSDR and NYS DOH will coordinate with the appropriate agencies regarding actions to be taken in response to recommendations in this PHA for which no plan has yet been developed.

3. ATSDR and NYS DOH will provide follow-up to the PHAP, outlining the actions completed and those in progress. This report will be placed in repositories that contain copies of this PHA and will be provided to persons who request it.

ATSDR will reevaluate and expand the PHAP when needed. New environmental, toxicologic, or health outcome data, or the results of implementing the above proposed actions, may determine the need for additional actions at this site.

CERTIFICATION

This Public Health Assessment was prepared by the New York State Department of Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the public health assessment was initiated.

Technical Project Officer, SPAB, DHAC

The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this public health assessment, and concurs with its findings.

for RE

Team Leader, CAT, SPAB, DHAC, ATSDR

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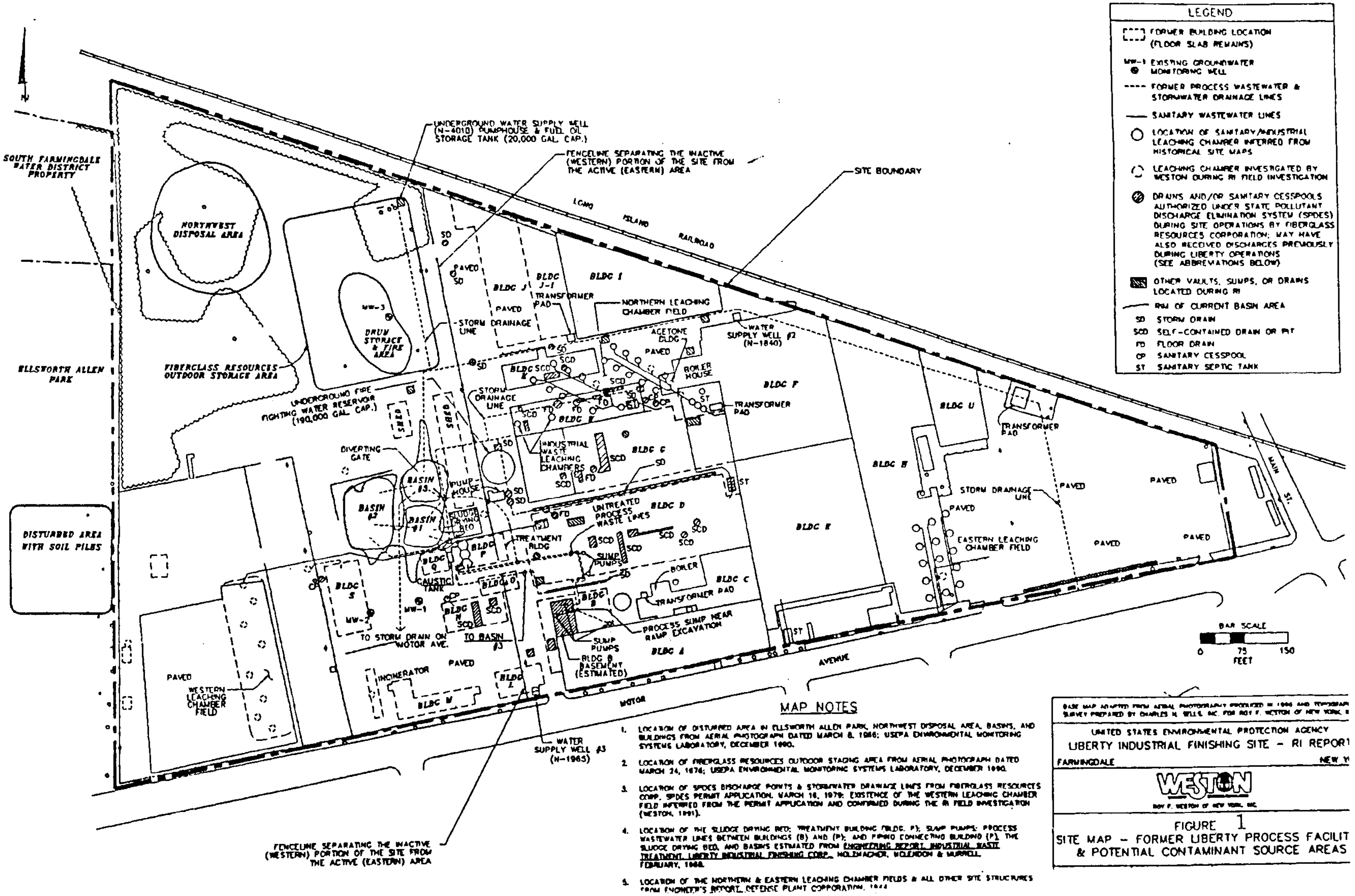
APPENDIX A

Figures

Figure 1



LEGEND

⬚	FORMER BUILDING LOCATION (FLOOR SLAB REMAINS)
MW-1 ⊕	EXISTING GROUNDWATER MONITORING WELL
----	FORMER PROCESS WASTEWATER & STORMWATER DRAINAGE LINES
——	SANITARY WASTEWATER LINES
○	LOCATION OF SANITARY/INDUSTRIAL LEACHING CHAMBER INFERRED FROM HISTORICAL SITE MAPS
◌	LEACHING CHAMBER INVESTIGATED BY WESTON DURING RI FIELD INVESTIGATION
⊘	DRAINS AND/OR SANITARY CESSPOOLS AUTHORIZED UNDER STATE POLLUTANT DISCHARGE ELIMINATION SYSTEM (SPDES) DURING SITE OPERATIONS BY FIBERGLASS RESOURCES CORPORATION; MAY HAVE ALSO RECEIVED DISCHARGES PREVIOUSLY DURING LIBERTY OPERATIONS (SEE ABBREVIATIONS BELOW)
▨	OTHER VAULTS, SUMPS, OR DRAINS LOCATED DURING RI
⌒	RIM OF CURRENT BASIN AREA
SD	STORM DRAIN
SCD	SELF-CONTAINED DRAIN OR PIT
FD	FLOOR DRAIN
CP	SANITARY CESSPOOL
ST	SANITARY SEPTIC TANK

MAP NOTES

1. LOCATION OF DISTURBED AREA IN ELLSWORTH ALLEN PARK, NORTHWEST DISPOSAL AREA, BASINS, AND BUILDINGS FROM AERIAL PHOTOGRAPH DATED MARCH 8, 1966; USEPA ENVIRONMENTAL MONITORING SYSTEMS LABORATORY, DECEMBER 1990.
2. LOCATION OF FIBERGLASS RESOURCES OUTDOOR STAGING AREA FROM AERIAL PHOTOGRAPH DATED MARCH 24, 1976; USEPA ENVIRONMENTAL MONITORING SYSTEMS LABORATORY, DECEMBER 1990.
3. LOCATION OF SPDES DISCHARGE POINTS & STORMWATER DRAINAGE LINES FROM FIBERGLASS RESOURCES CORP. SPDES PERMIT APPLICATION, MARCH 16, 1979; EXISTENCE OF THE WESTERN LEACHING CHAMBER FIELD INFERRED FROM THE PERMIT APPLICATION AND CONFIRMED DURING THE RI FIELD INVESTIGATION (WESTON, 1991).
4. LOCATION OF THE SLUDGE DRYING BED; TREATMENT BUILDING (BLDG. P); SUMP PUMPS; PROCESS WASTEWATER LINES BETWEEN BUILDINGS (B) AND (P); AND PIPING CONNECTING BUILDING (P), THE SLUDGE DRYING BED, AND BASINS ESTIMATED FROM ENGINEERING REPORT, INDUSTRIAL WASTE TREATMENT, LIBERTY INDUSTRIAL FINISHING CORP., HOLZMACHER, MCLENDON & MURRELL, FEBRUARY, 1966.
5. LOCATION OF THE NORTHERN & EASTERN LEACHING CHAMBER FIELDS & ALL OTHER SITE STRUCTURES FROM ENGINEER'S REPORT, DEFENSE PLANT CORPORATION, 1944.

BASE MAP ADAPTED FROM AERIAL PHOTOGRAPHY PRODUCED IN 1990 AND TOPOGRAPH
SURVEY PREPARED BY CHARLES H. SELLS, INC. FOR ROY F. WESTON OF NEW YORK, I

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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FARMINGDALE NEW Y

WESTON
ROY F. WESTON OF NEW YORK, INC.

FIGURE 1
SITE MAP - FORMER LIBERTY PROCESS FACILIT
& POTENTIAL CONTAMINANT SOURCE AREAS

Figure 2

LIBERTY INDUSTRIAL FINISHING SITE, FARMINGDALE, NY

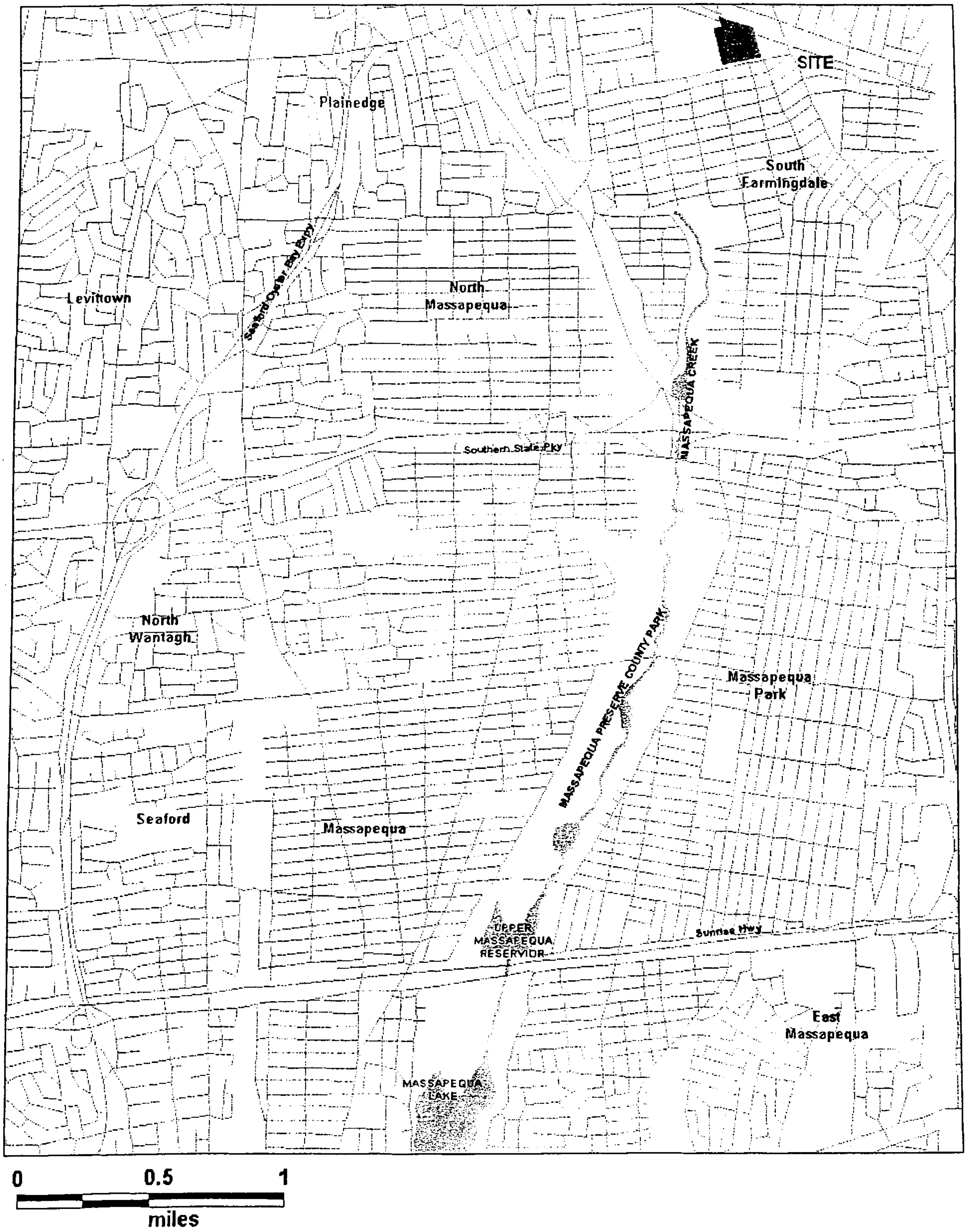
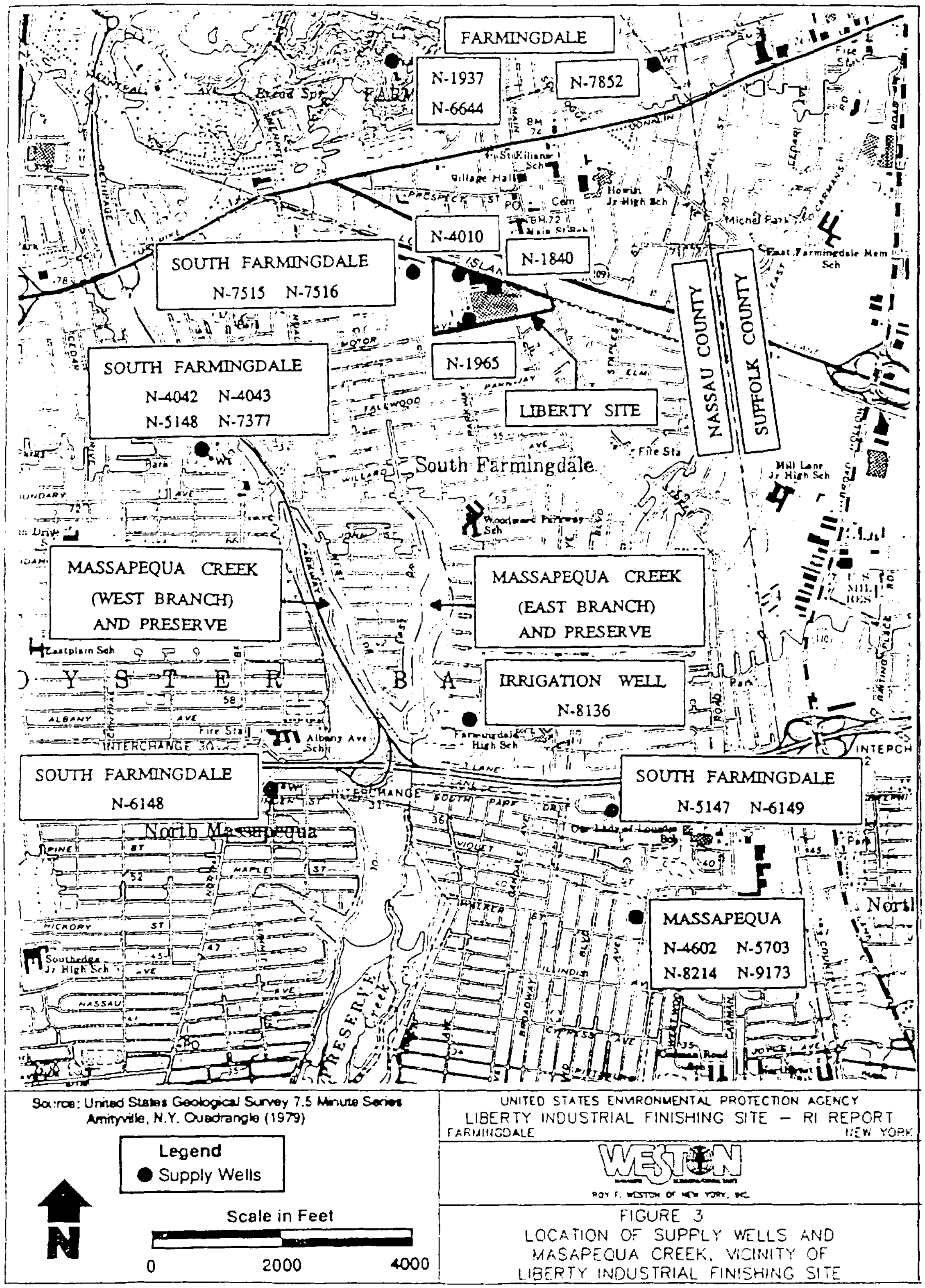


Figure 3



Source: United States Geological Survey 7.5 Minute Series Amityville, N.Y. Quadrangle (1979)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
LIBERTY INDUSTRIAL FINISHING SITE – RI REPORT
FARMINGDALE NEW YORK

FIGURE 3
LOCATION OF SUPPLY WELLS AND MASAPEQUA CREEK, VICINITY OF LIBERTY INDUSTRIAL FINISHING SITE

Figure 4

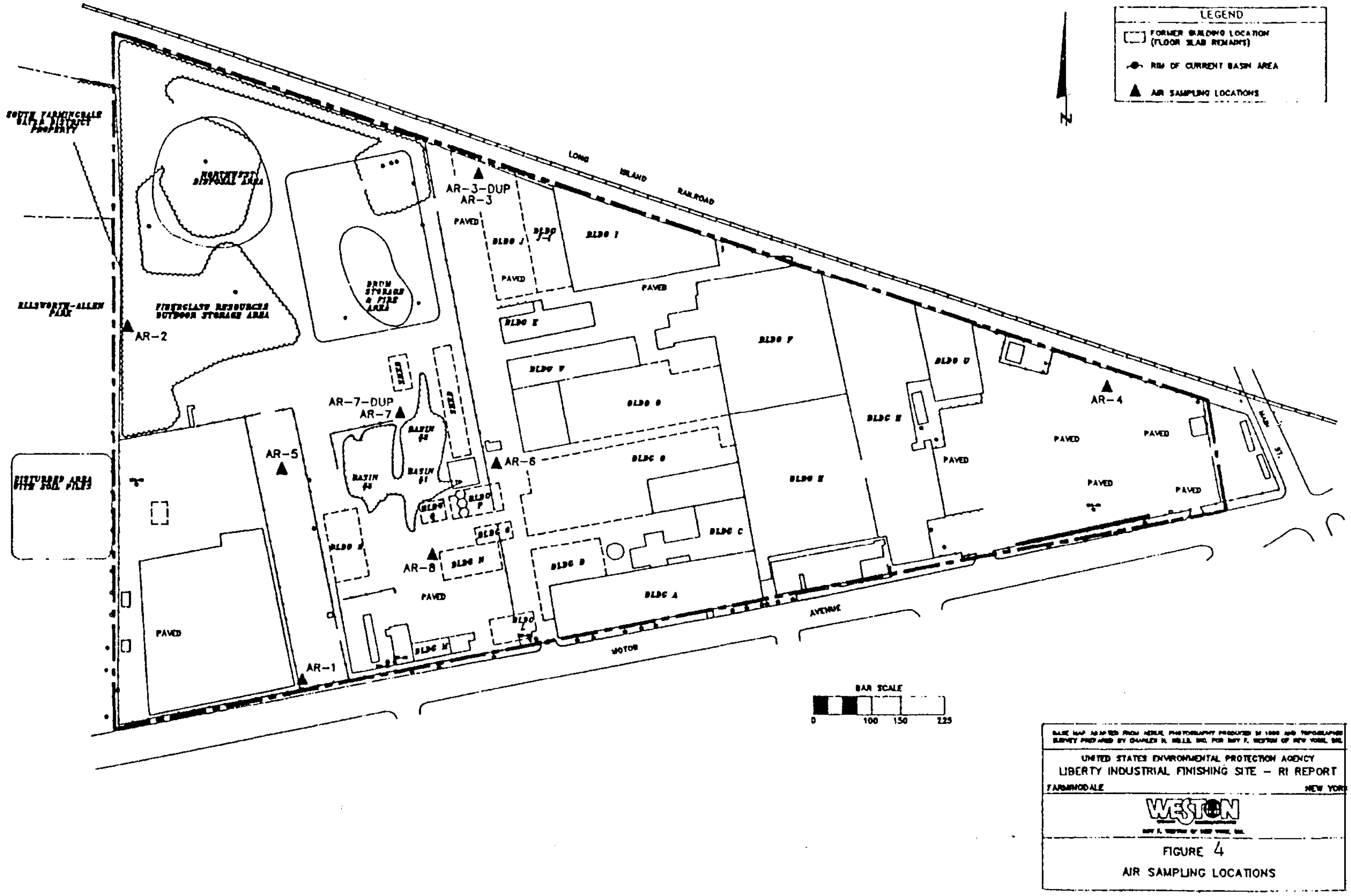

LEGEND
FORMER BUILDING LOCATION (FLOOR SLAB REMAINS)
RIM OF CURRENT BASIN AREA
AIR SAMPLING LOCATIONS
N
LONG ISLAND RAILROAD
MAIN ST.
MOTOR AVENUE
SOUTH FARMINGDALE WATER DISTRICT PROPERTY
ELLSWORTH-ALLEN PARK
DISTURBED AREA WITH SOIL PILES
NORTHWEST DISPOSAL AREA
FIBERGLASS RESOURCES OUTDOOR STORAGE AREA
DRUM STORAGE & PILE AREA
AR-1
AR-2
AR-3-DUP
AR-3
AR-4
AR-5
AR-6
AR-7-DUP
AR-7
AR-8
BASIN #1
BASIN #2
BASIN #3
BLDG A
BLDG B
BLDG C
BLDG D
BLDG E
BLDG F
BLDG G
BLDG H
BLDG I
BLDG J
BLDG K
BLDG L
BLDG M
BLDG N
BLDG O
BLDG P
BLDG Q
BLDG U
BLDG V
BLDG W
PAVED
BAR SCALE
0
100
150
225
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
LIBERTY INDUSTRIAL FINISHING SITE – RI REPORT
FARMINGDALE
NEW YORK
WESTON
FIGURE 4
AIR SAMPLING LOCATIONS

Figure 5

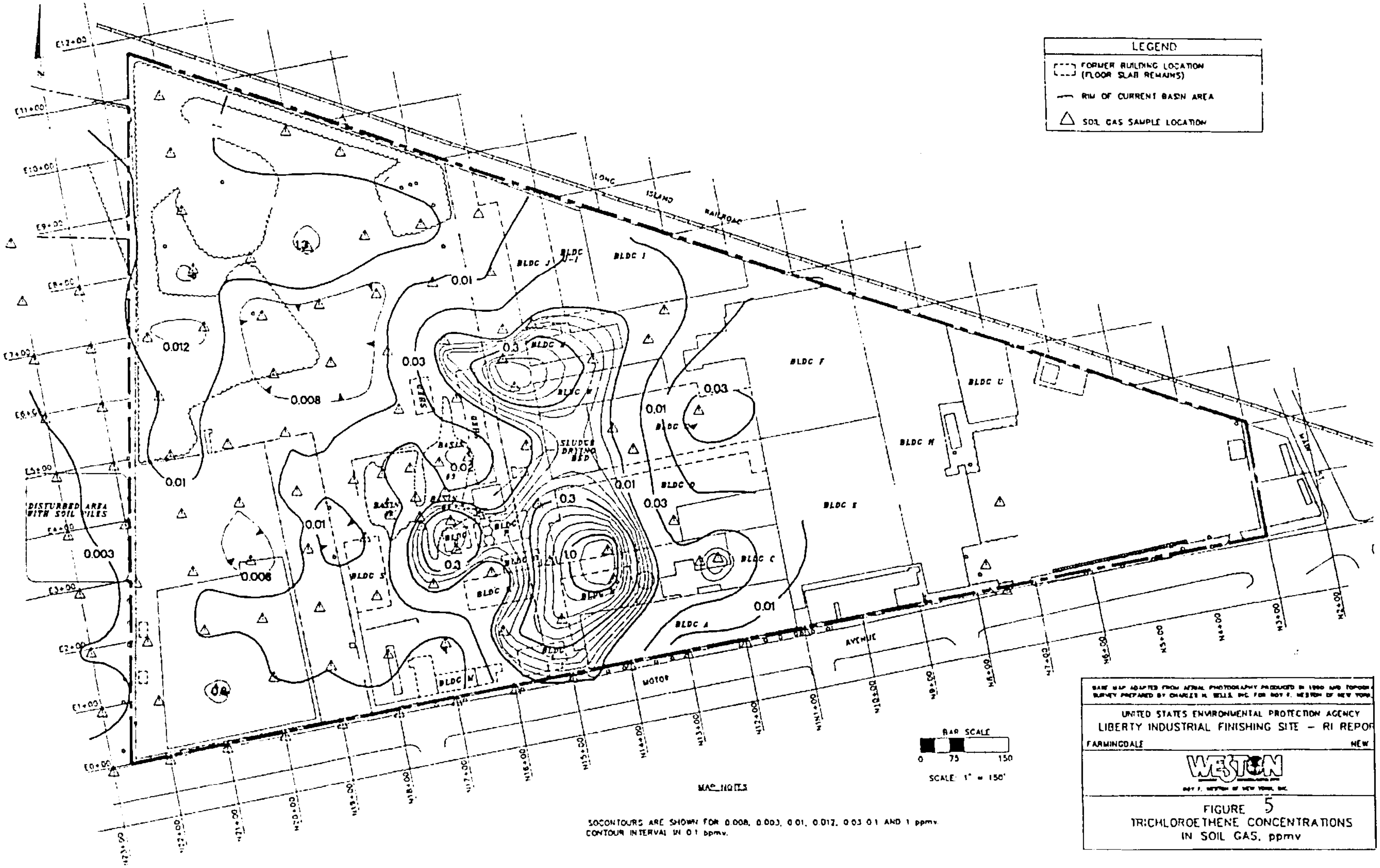

LEGEND
FORMER BUILDING LOCATION (FLOOR SLAB REMAINS)
RIM OF CURRENT BASIN AREA
△ SOIL GAS SAMPLE LOCATION
LONG ISLAND RAILROAD
MOTOR AVENUE
BLDG A
BLDG C
BLDG D
BLDG E
BLDG F
BLDG H
BLDG I
BLDG J
BLDG J-1
BLDG K
BLDG M
BLDG S
BLDG U
SLUDGE DRYING BED
SHED
BASIN
DISTURBED AREA WITH SOIL PILES
0.003
0.008
0.01
0.012
0.03
0.3
1.0
E0+00
E1+00
E2+00
E3+00
E4+00
E5+00
E6+00
E7+00
E9+00
E10+00
E11+00
E12+00
N2+00
N3+00
N4+00
N5+00
N6+00
N7+00
N8+00
N9+00
N10+00
N11+00
N12+00
N13+00
N14+00
N15+00
N16+00
N17+00
N18+00
N19+00
N20+00
N21+00
N22+00
N23+00
MAP NOTES
SOCONTOURS ARE SHOWN FOR 0.008, 0.003, 0.01, 0.012, 0.03 0.1 AND 1 ppmv.
CONTOUR INTERVAL IN 0.1 ppmv.
BAR SCALE
0
75
150
SCALE: 1" = 150'
BASE MAP ADAPTED FROM AERIAL PHOTOGRAPHY PRODUCED IN 1990 AND TOPOGR
SURVEY PREPARED BY CHARLES H. SELLS, INC. FOR ROY F. WESTON OF NEW YORK
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
LIBERTY INDUSTRIAL FINISHING SITE – RI REPOR
FARMINGDALE
NEW
WESTON
ROY F. WESTON OF NEW YORK, INC.
FIGURE 5
TRICHLOROETHENE CONCENTRATIONS
IN SOIL GAS, ppmv

Figure 6

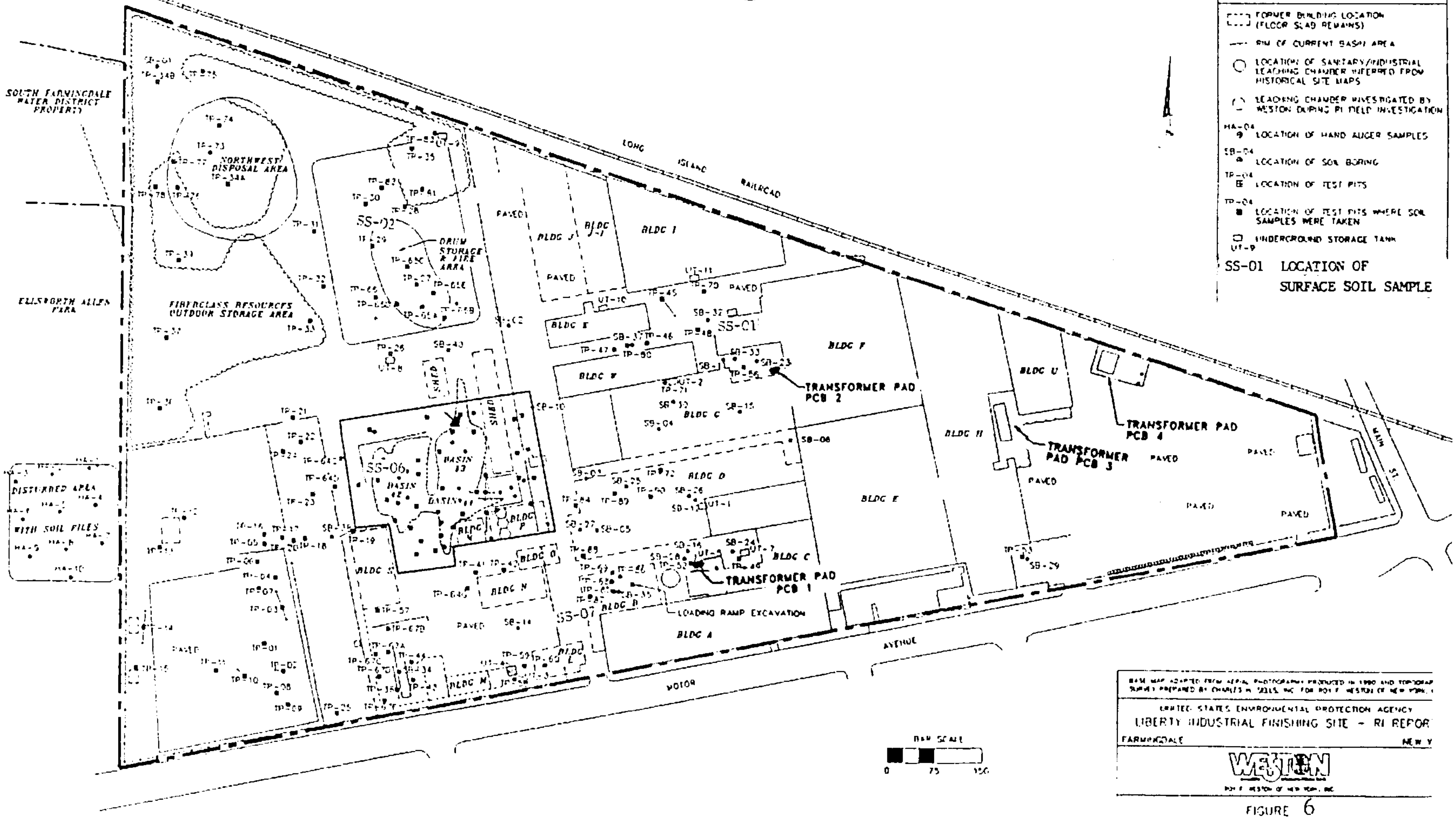
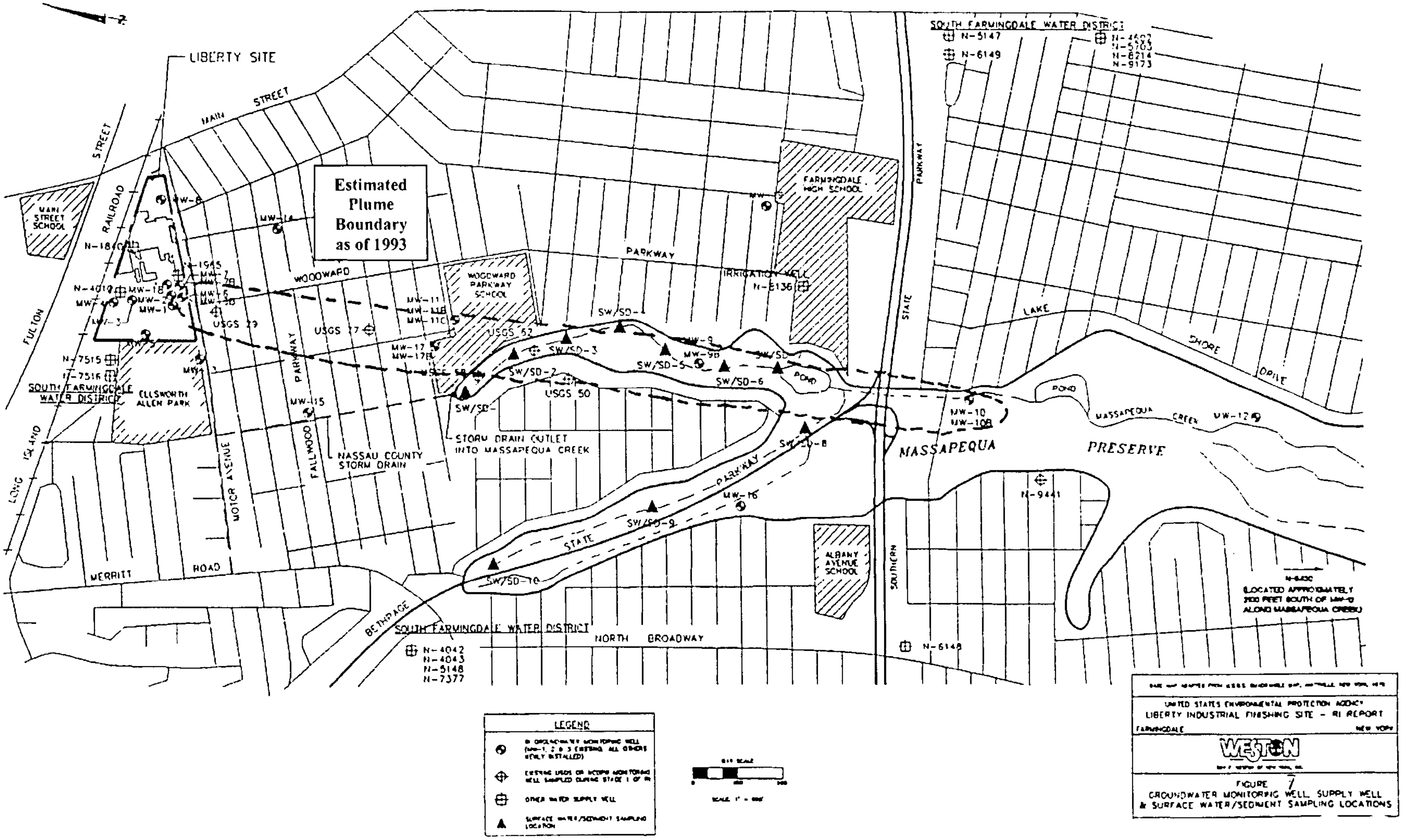


FIGURE 6
TEST PIT & SOIL
SAMPLING LOCATIONS

Figure 7


LIBERTY SITE
MAIN STREET
STREET
RAILROAD
FULTON
LONG ISLAND
MAIN STREET SCHOOL
Estimated Plume Boundary as of 1993
MW-6
MW-14
N-1840
N-1945
MW-7
MW-7B
MW-16
MW-1B
N-4019
MW-18
MW-2
MW-1
MW-4
MW-3
MW-5
USGS 29
N-7515
N-7516
SOUTH FARMINGDALE WATER DISTRICT
ELLSWORTH ALLEN PARK
MOTOR AVENUE
MERRITT ROAD
WOODWARD
PARKWAY
FALLWOOD
MW-15
NASSAU COUNTY STORM DRAIN
USGS 17
MW-11
MW-11B
MW-11C
MW-17
MW-17B
WOODWARD PARKWAY SCHOOL
USGS 52
USGS 50
SW/SD-1
SW/SD-2
SW/SD-3
SW/SD-4
SW/SD-5
SW/SD-6
SW/SD-7
SW/SD-8
SW/SD-9
SW/SD-10
SW/SD-
MW-9
MW-9B
MW-16
POND
STORM DRAIN OUTLET INTO MASSAPEQUA CREEK
STATE PARKWAY
BETHPAGE
SOUTH FARMINGDALE WATER DISTRICT
N-4042
N-4043
N-5148
N-7377
NORTH BROADWAY
FARMINGDALE HIGH SCHOOL
MW-
IRRIGATION WELL
N-8136
ALBANY AVENUE SCHOOL
SOUTHERN
STATE
PARKWAY
SOUTH FARMINGDALE WATER DISTRICT
N-5147
N-6149
N-4602
N-5703
N-8214
N-9173
LAKE
SHORE DRIVE
MW-10
MW-10B
POND
MASSAPEQUA CREEK
MW-12
MASSAPEQUA
PRESERVE
N-9441
N-6148
N-6430
LOCATED APPROXIMATELY 2100 FEET SOUTH OF MW-12 ALONG MASSAPEQUA CREEK
LEGEND
GROUNDWATER MONITORING WELL (MW-1, 2 & 3 EXISTING, ALL OTHERS NEWLY INSTALLED)
EXISTING USGS OR NCDPW MONITORING WELL SAMPLED DURING STAGE 1 OF RI
OTHER WATER SUPPLY WELL
SURFACE WATER/SEDIMENT SAMPLING LOCATION
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
LIBERTY INDUSTRIAL FINISHING SITE - RI REPORT
FARMINGDALE
NEW YORK
WESTON
FIGURE 7
GROUNDWATER MONITORING WELL, SUPPLY WELL & SURFACE WATER/SEDIMENT SAMPLING LOCATIONS

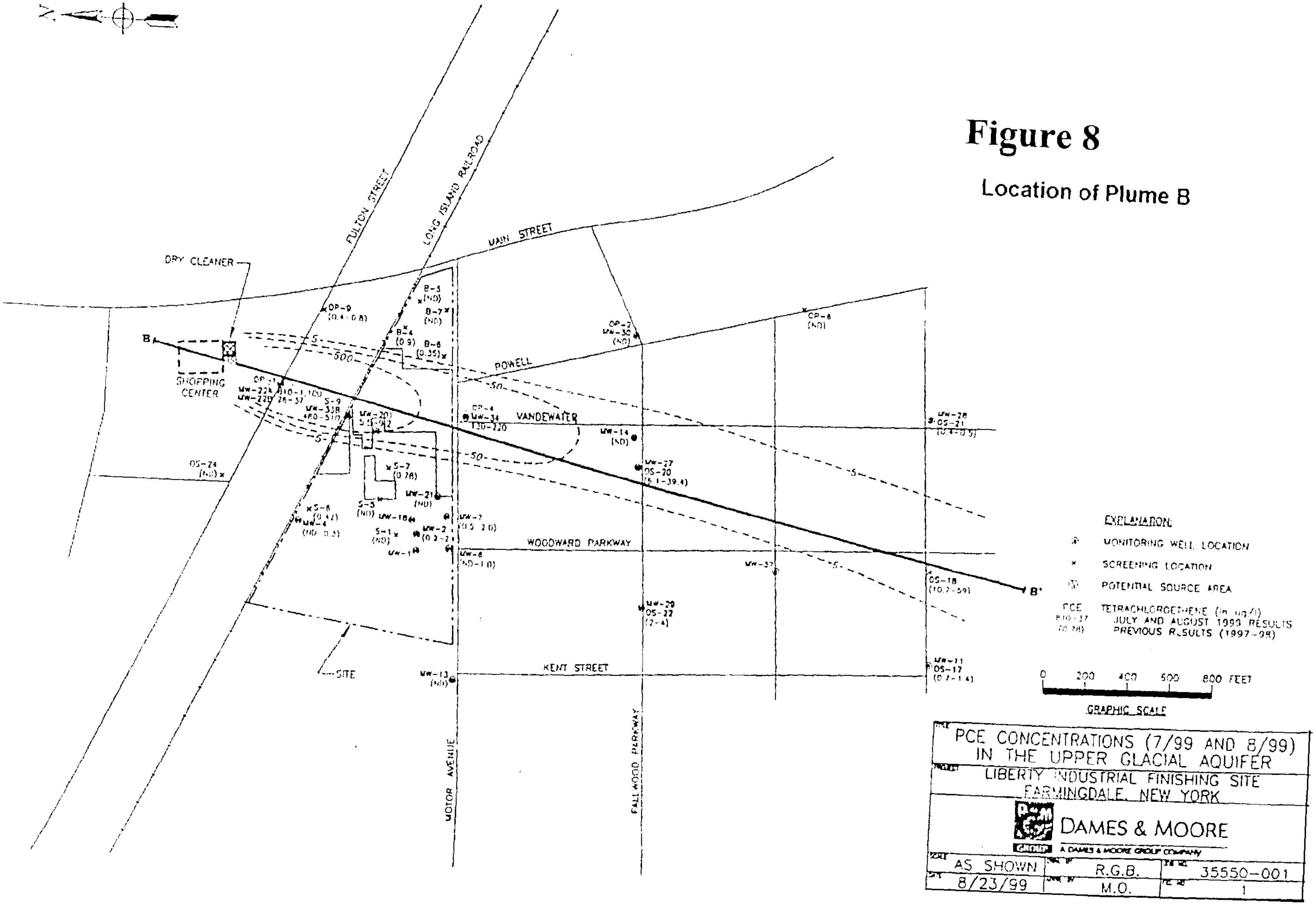


Figure 8

Location of Plume B

APPENDIX B

Tables

Table 1.
Liberty Industrial Finishing Site
On-Site Surface Soil Sampling Results
Remedial Investigation - October 1993

[All values in milligrams per kilogram]
(see Table 7 for Public Health Assessment Comparison Values)

Compound	Frequency of Detection	Range of Detection
<u>Semi-Volatile Organics</u>		
1,2-dichlorobenzene	1/7	0.54J
2-methylnaphthalene	2/7	0.22J; 0.083J
acenaphthene	1/7	0.41J
phenanthrene	4/7	0.11J-3.5
anthracene	2/7	0.098J; 1J
di-n-butylphthalate	2/7	1.1; 5.2
fluoranthrene	4/7	0.16J-4.6
pyrene	4/7	0.16J-3.7
butylbenzylphthalate	4/7	0.09J-4.2
benzo(a)anthracene	3/7	0.12J-2.3J
chrysene	4/7	0.2J-2.5
bis(2-ethylhexyl)phthalate	4/7	0.18J-2.4J
benzo(b)fluoranthene	4/7	0.21J-2.4J
benzo(k)fluoranthene	4/7	0.049J-1.4J
benzo(a)pyrene	4/7	0.097J-1.9J
indeno(1,2,3-cd)pyrene	4/7	0.12J-1.6J
dibenz(a,h)anthracene	3/7	0.046J-0.68J
benzo(g,h,i)perylene	4/7	0.11J-1.3J
<u>Pesticides/PCBs</u>		
Aroclor 1254	1/9	0.40
Aroclor 1260	5/19	0.33-0.7
<u>Inorganics</u>		
arsenic	7/7	0.68-5.3
barium	7/7	10-150
antimony	4/7	2.6-31
aluminum	7/7	1,700-11,000
zinc	7/7	23-370
vanadium	7/7	5.5-50
sodium	7/7	8.2-240
potassium	7/7	140-570
nickel	7/7	6.3-63
manganese	7/7	35-150
magnesium	7/7	200-1,400
iron	7/7	3,400-25,000
cobalt	7/7	0.74-5.0
calcium	7/7	160-11,000
beryllium	3/7	0.28-0.37
cadmium	7/7	1-71
copper	7/7	7.3-220
lead	7/7	7.5-510
silver	3/7	0.45-1.9
chromium	7/7	41-2,100
selenium	4/7	0.4-0.99
mercury	3/7	0.27-0.37

J = estimated value

Table 2.

Liberty Industrial Finishing Site
On-Site and Off-Site Subsurface Soil Sampling Results
Remedial Investigation
(All values in milligrams per kilogram)
[See Table 7 for Public Health Assessment Comparison Values]

Compound	On-Site Soil Borings			On-Site Test Pits		Off-Site Hand Auger Samples	
	Frequency	Range of Detection	Background Range (Sample SB-1)	Frequency	Range of Detection	Frequency	Range of Detection
Volatile Organics							
methylene chloride	3/76	0.011J-0.080J	ND	6/71	0.002J-0.066J	ND	ND
acetone	37/76	0.007J-16	1.1J	11/71	0.006J-0.62J	ND	ND
1,1-dichloroethane	1/76	12J	ND	2/71	0.007J-0.013	ND	ND
1,2-dichloroethene (total)	10/76	0.003J-1100J	ND	8/71	0.001J-15J	ND	ND
chloroform	1/76	0.002J	ND	1/71	0.063J	ND	ND
2-butanone	5/76	0.021J-0.99J	ND	10/71	0.002J-0.036	ND	ND
1,1,1-trichloroethane	2/76	0.039J-56J	ND	4/71	0.001J-0.023	ND	ND
*trichloroethene	23/76	0.001J-1700J	ND	31/71	0.001J-185	ND	ND
benzene	2/76	0.078, 6.1J	ND	ND	ND	ND	ND
tetrachloroethene	5/76	0.002J-7.8J	ND	15/71	0.001J-15J	ND	ND
toluene	13/76	0.001J-24J	ND	10/71	0.001J-190	ND	ND
chlorobenzene	5/76	0.001J-430J	ND	3/71	0.001J-0.26	ND	ND
ethylbenzene	10/76	0.001J-6100J	ND	6/71	0.008J-0.69J	ND	ND
*styrene	3/76	0.47J-2200J	ND	ND	ND	ND	ND
xylene (total)	9/76	0.005J-10	ND	7/81	0.008J-13J	ND	ND
vinyl chloride	ND	ND	ND	1/71	0.14J	ND	ND
1,2-dichloroethane	ND	ND	ND	1/71	0.063J	ND	ND
carbon tetrachloride	ND	ND	ND	1/71	0.063J	ND	ND
bromodichloromethane	ND	ND	ND	1/71	0.063J	ND	ND
1,2-dichloropropane	ND	ND	ND	1/71	0.063J	ND	ND
cis-1,3-dichloropropene	ND	ND	ND	1/71	0.063J	ND	ND
4-methyl-2pentanone	ND	ND	ND	2/71	0.002J-0.046J	ND	ND
2-hexanone	ND	ND	ND	2/71	0.002J-0.046J	ND	ND
Semi-Volatile Organics							
phenol	ND	ND	ND	1/13	0.30J	ND	ND
1,3-dichlorobenzene	1/14	0.016J	ND	ND	ND	ND	ND
1,4-dichlorobenzene	2/14	0.069J, 0.26J	ND	1/13	0.074J	ND	ND
1,2-dichlorobenzene	2/14	0.18j-1.08	ND	1/13	0.084J	ND	ND
naphthalene	2/14	0.024J, 0.074J	ND	4/13	0.022J-0.63J	ND	ND
2-methylphenol	ND	ND	ND	1/13	0.068J	ND	ND
2,4-dimethylphenol	ND	ND	ND	1/13	0.07J	ND	ND
2-methylnaphthalene	1/14	0.19J	ND	6.13	0.04J-2.6J	ND	ND
acenaphthene	1/14	0.071J	ND	1/13	0.38J	ND	ND
dibenzofuran	1/14	0.016J	ND	1/13	0.043J	ND	ND
fluorene	2/14	0.019J-0.12J	ND	1/13	0.50J	ND	ND
phenanthrene	3/14	0.12J-12J	ND	3/13	0.051J-1.2J	ND	ND
anthracene	2/14	0.025J, 11J	ND	3/13	0.045J-0.55J	ND	ND
di-n-butylphthalate	2/14	0.030J, 0.039J	ND	3/13	0.029J-0.15J	ND	ND
fluoranthene	2/14	0.080J, 0.36J	ND	1/13	0.12J	ND	ND
pyrene	2/14	0.103J, 0.34J	ND	2/13	0.12J, 0.50J	ND	ND
butylbenzylphthalate	4/14	0.073J-0.33J	ND	ND	ND	ND	ND

Table 2 (page 2).

Liberty Industrial Finishing Site
On-Site and Off-Site Subsurface Soil Sampling Results
Remedial Investigation
(All values in milligrams per kilogram)
[See Table 7 for Public Health Assessment Comparison Values]

Compound	On-Site Soil Borings			On-Site Test Pits		Off-Site Hand Auger Samples	
	Frequency	Range of Detection	Background Range (Sample SB-1)	Frequency	Range of Detection	Frequency	Range of Detection
Semi-Volatile Organics (continued)							
benzo(a)anthracene	1/14	0.12J	ND	ND	ND	ND	ND
chrysene	3/14	0.24J-1.3J	ND	ND	ND	ND	ND
bis(2-ethylhexyl)phthalate	7/14	0.085J-19	ND	4/13	1.1J-2.8J	ND	ND
di-n-octylphthalate	5/14	0.059J-2.2J	ND	ND	ND	ND	ND
benzo(b)fluoranthene	3/14	0.36J-0.87J	ND	ND	ND	ND	ND
benzo(k)fluoranthene	3/14	0.14J-0.49J	ND	ND	ND	ND	ND
benzo(a)pyrene	1/14	0.14J	ND	ND	ND	ND	ND
benzo(g,h,i)perylene	1/14	0.068J	ND	ND	ND	ND	ND
Pesticides/PCBs							
heptachlor	1/15	0.001J	ND	ND	ND	ND	ND
heptachlor epoxide	1/15	0.084J	ND	ND	ND	ND	ND
4,4'-DDE	1/15	0.016J	ND	2/12	0.0021J, 0.0026J	ND	ND
endrin	2/15	0.002J, 0.004	ND	2/12	0.0021J, 0.0031J	ND	ND
endosulfan II	ND	ND	ND	2/12	0.0015J	ND	ND
4,4'-DDD	1/15	0.018J	ND	ND	ND	ND	ND
endosulfan sulfate	1/15	0.002J	ND	1/12	0.0036J	ND	ND
4,4'-DDT	ND	ND	ND	1/12	0.0069J	ND	ND
methoxychlor	1/15	0.005J	ND	3/12	0.0014J-0.075	ND	ND
endrin ketone	3/15	0.0007J-0.39J	ND	2/12	0.00085J, 0.0011J	ND	ND
endrin aldehyde	ND	ND	ND	1/12	0.0029J	ND	ND
alpha-chlordane	3/15	0.0003J-0.016J	ND	ND	ND	ND	ND
gamma-chlordane	ND	ND	ND	1/12	0.014J	ND	ND
*aroclor-1242	ND	ND	ND	1/12	1.3J	ND	ND
*aroclor-1248	2/15	0.48J, 2.2	ND	1/12	2.6J	ND	ND
*aroclor-1254	3/15	0.27-1.8J	ND	6/12	0.14J-2.2J	ND	ND
*aroclor-1260	4/15	0.12J-200J	ND	1/12	9	ND	ND
Inorganics							
*aluminum	77/77	442-32,900	13,200	71/71	73.4-297,000	11/11	1,160-10,100
antimony	12/77	1.7-22.5	ND	13/71	1.7-709	ND	ND
*arsenic	65/77	0.67-17	3.20J	64/71	0.41J-42.9	11/11	0.82-6
barium	76/77	0.82-591	36.8J	68/71	1.4-500	11/11	2.7-23.3
beryllium	26/77	0.20-0.72	0.42	28/71	0.20-1.9	10/11	0.23-0.54
cadmium	47/77	0.23-197	0.27	55/71	0.20-1180	ND	ND
calcium	77/77	36.7-67,500	157	71/71	40.4-99,700	11/11	8.1-452
*chromium	77/77	2.5-2710J	15.7J	71/71	0.98-43,300	11/11	1.5-68.5
cobalt	52/77	0.62-11.1	4.5	62/71	0.62-14.4J	10/11	0.82-28.7
*copper	62/77	1-2,760	9.8	68/71	1.8-9,120	11/11	2.5-11.3
*iron	77/77	766-19,800	9,440	71/71	99.9-255,000	11/11	2,390-35,300
*lead	71/77	0.67J-1220	8.8	69/71	0.58J-2,670	11/11	0.86J-9.1J

Table 2 (page 3).

Liberty Industrial Finishing Site
On-Site and Off-Site Subsurface Soil Sampling Results
Remedial Investigation
(All values in milligrams per kilogram)
[See Table 7 for Public Health Assessment Comparison Values]

	On-Site Soil Borings			On-Site Test Pits		Off-Site Hand Auger Samples	
Compound	Frequency	Range of Detection	Background Range (Sample SB-1)	Frequency	Range of Detection	Frequency	Range of Detection
Inorganics (continued)							
magnesium	77/77	92.9-2,990	2,060	70/71	32.2-3,390	11/11	154-1,120
manganese	65/77	4.7-217	78.6	66/71	0.70-2,530	Data Rejected	
mercury	22/77	0.10-3.2	0.44	26/71	0.09-1.3	ND	ND
nickel	71/77	0.81-149J	8.3	65/71	1.6-793	1/11	4.9
potassium	77/77	60.5-836	305J	71/71	37.7-22,400	11/11	102-315
selenium	1/77	8.8J	ND	3/71	1.1J-3J	2/11	0.44, 0.48
silver	12/77	0.41-10.9	ND	22/71	0.46-48.3	ND	ND
sodium	74/77	7.5-1,870	60	70/71	10.2-1,330	6/11	40.5-54.9
thallium	ND	ND	ND	4/71	0.60-1.1	4/11	0.27-0.49
vanadium	73/77	1.1-40.8	20.5	69/71	1.2-104	11/11	1.3-19.9
*zinc	64/77	2.6-5,060	23.4	64/71	3.3J-187,000	11/11	3.4-21.2
cyanide	18/77	7.7-228	--	30/71	1.5-1,220	2/11	0.21

ND - not detected
J - estimated value

Soil Sampling Depth: Test Pits (0-13 ft.)
Soil Borings (0-18 ft.)
Hand Auger (1-3.5 ft.)

*Contaminant selected for further evaluation.

NOTE: The off-site hand auger samples were collected at the Ellsworth Allen Park

Table 3.

Liberty Industrial Finishing Site
Summary of Groundwater Data (On-Site Monitoring Wells)
Remedial Investigation
[All values in micrograms per liter (mcg/L)]
(see Table 8 for Public Health Assessment Comparison Values)

Compound	Frequency of Detection	Range of Detection
Volatile Organics		
*1,1-dichloroethane	5/34	1J-58J
*1,2-dichloroethene (total)	10/34	4J-1,800
*1,1,1-trichloroethane	6/34	6J-12
*trichloroethene	12/34	3J-1,400
acetone	1/34	8J
chloroform	1/34	1J
2-hexanone	2/34	10J
*1,2-dichloropropane	1/34	2J
*1,1,2-trichloroethane	1/34	2J
*benzene	2/34	2J
*tetrachloroethene	10/34	2J-24J
Semi-Volatile Organics		
diethylphthalate	2/23	1J-2J
*4-nitroaniline	1/23	25J
*pentachlorophenol	2/23	3J
di-n-butylphthalate	4/23	1J-3J
butylbenzylphthalate	1/23	1J
pyrene	2/23	1J, 2J
chrysene	3/23	0.8J-4J
*bis(2-ethylhexyl)phthalate	7/23	0.6J-400J
naphthalene	1/23	5J
Pesticides/PCBs		
*dieldrin	5/23	0.004J-0.064J
4,4'-DDE	1/23	0.0052J
endosulfan sulfate	2/23	0.0035J, 0.01
alpha-chlordane	2/23	0.0056J, 0.02
Inorganics		
*aluminum	19/31	29J-7,060
*arsenic	12/31	1-5.3
barium	31/31	5-80
beryllium	1/31	0.78J
*cadmium	25/34	1.3-609
calcium	31/31	277-38,200J
*chromium	29/34	2.8-888
cobalt	7/31	3-9.2
copper	16/31	4-149

Table 3 (page 2).

Liberty Industrial Finishing Site
Summary of Groundwater Data (On-Site Monitoring Wells)
Remedial Investigation
[All values in micrograms per liter (mcg/L)]
(see Table 8 for Public Health Assessment Comparison Values)

Compound	Frequency of Detection	Range of Detection
Inorganics (continued)		
*iron	31/31	59.7J-18,000
lead	21/31	1.1J-9.5J
magnesium	31/31	1,750-5,140
*manganese	29/31	2.9-2,890
mercury	1/26	0.20
*nickel	17/31	4J-141
potassium	31/31	1,340-26,000J
selenium	4/31	1J-6.2J
*sodium	30/31	3,800-40,400J
*thallium	3/31	3.6J-40.5J
vanadium	7/31	7.7-13.5
*cyanide	8/34	31.1-540
*hexavalent chromium	6/11	6.3J-130J

Note: Only detected compounds are reported.

J = estimated value
*Contaminant selected for further evaluation.

Table 4.

Liberty Industrial Finishing Site
Off-Site Surface Water Sampling Results - Massapequa Creek
Remedial Investigation

[All values in micrograms per liter (mcg/L)]

Compound	Frequency of Detection	Range of Detection
Volatile Organics		
1,2-dichloroethene (total)	1/11	1J
trichloroethene	3/11	2J-4J
dibromochloromethane	1/11	0.8J
tetrachloroethene	3/11	0.6J-2J
toluene	1/11	0.6J
Inorganics		
aluminum	11/11	103-417
barium	11/11	3.9-44.6
cadmium	3/11	4.9-10.8
calcium	11/11	15,400-20,800
chromium	5/11	8.2-44.9
cobalt	3/11	5.1-6.5
copper	1/11	13J
iron	11/11	191-1,590
lead	11/11	1.4-12
magnesium	11/11	599-4,810
manganese	11/11	13.8-587
potassium	9/11	639-8,280
sodium	11/11	7,540-52,600
zinc	9/11	7.1-110

Note: Only detected compounds are reported.

J = estimated value

Table 5.

Liberty Industrial Finishing Site
Off-Site Sediment Sampling Results - Massapequa Creek
Remedial Investigation
[All values in milligrams per kilogram (mg/kg)]

Compound	Frequency of Detection	Range of Detection
Volatile Organic		
toluene	1/11	0.062
Inorganic		
aluminum	11/11	608-2,230J
arsenic	11/11	0.17-5.4J
barium	11/11	2.1-110J
cadmium	6/11	1.1-5.3
calcium	11/11	199J-3,380J
chromium	11/11	4.30-44.10
cobalt	10/11	1.4-15.2J
copper	11/11	1.7-37.1J
iron	11/11	721-16,200J
lead	11/11	10.3-227J
magnesium	11/11	116-1,340J
manganese	11/11	17.4-3,820J
mercury	1/11	0.27J
nickel	5/11	5.6-14.4J
potassium	7/11	163-484J
selenium	2/11	0.14
silver	1/11	1.2
sodium	11/11	23.2-245J
thallium	1/11	0.32J
vanadium	10/11	1.2-14.8J
zinc	11/11	7.2J-188J

Note: Only detected compounds are reported.

J = estimated value

Table 6.

Liberty Industrial Finishing Site
Summary of Groundwater Data (Off-Site Monitoring Wells)
Remedial Investigation

[All values in micrograms per liter (mcg/L)]
(see Table 8 for Public Health Assessment Comparison Values)

Compound	Frequency of Detection	Range of Detection
Volatile Organics		
*vinyl chloride	1/34	13J
acetone	2/34	10J
*methylene chloride	1/34	10J
*1,1-dichloroethane	5/34	1J-8J
carbon disulfide	1/34	4J
*1,2-dichloroethene (total)	7/34	1J-120J
*1,1,1-trichloroethane	5/34	1J-22
chloroform	2/34	0.4J, 2J
*trichloroethene	16/34	1J-1,300J
*tetrachloroethene	10/34	1J-8J
2-hexanone	2/34	10J
*1,1-dichloroethene	3/34	3J-5J
benzene	1/34	1J
*chlorobenzene	1/34	2
Semi-Volatile Organics		
phenol	3/34	1J-3J
di-n-butylphthalate	1/34	0.9J
*bis(2-ethylhexyl)phthalate	6/34	0.5J-19J
Pesticides/PCBs		
delta-BHC	1/34	0.0019J
heptachlor	1/34	0.0055J
*heptachlor epoxide	6/34	0.0078J-0.059
*dieldrin	20/34	0.0058J-0.2J
endrin	1/34	2.5
4,4'-DDD	3/34	0.012J-0.013J
4,4'-DDT	1/34	0.0047J
endrin ketone	11/34	0.0055J-0.087
*alpha-chlordane	10/34	0.0039J-0.021
*gamma-chlordane	4/34	0.0035J-0.026
Inorganics		
*aluminum	21/41	348-4,870
*arsenic	14/41	1-3.7
barium	41/41	13.7-132
beryllium	9/41	0.79J-1.9
*cadmium	24/49	1.2-143
calcium	41/41	5,690-28,700
*chromium	28/49	3.5J-518

Table 6 (page 2).

Liberty Industrial Finishing Site
Summary of Groundwater Data (Off-Site Monitoring Wells)
Remedial Investigation
[All values in micrograms per liter (mcg/L)]
(see Table 8 for Public Health Assessment Comparison Values)

Compound	Frequency of Detection	Range of Detection
Inorganics (continued)		
cobalt	9/41	3.6J-5.9
copper	9/41	5.8-10.9
*iron	41/41	150-14,600
lead	26/41	1J-14.2
magnesium	41/41	1,250-7,610
*manganese	40/41	4.2-2,950J
mercury	1/42	0.25
nickel	6/41	4.8-12.8J
potassium	41/41	913-27,500
selenium	4/41	1.3J-3.7J
*sodium	41/41	7,930-71,500
vanadium	19/41	2.4J-11
zinc	31/41	6.2-30.7
cyanide	4/49	2.75-12.1J
*hexavalent chromium	5/17	15-380J

Note: Only detected compounds are reported.

J = estimated value
*Contaminant selected for further evaluation.

Table 7.
Public Health Assessment Comparison Values that are Exceeded by Contaminants Found in Soils at and Near the Liberty Industrial Finishing Site
[All values in milligrams per kilogram (mg/kg)]

Compound	Typical Background Range*	Comparison Values					
		Nonresidential Setting**				Industrial Setting***	
		Cancer	Basis****	Noncancer	Basis****	Cancer	Noncancer
Volatile Organics							
trichloroethene	ND	1,800	EPA CPF	4,300	NYS DOH RfG	470	22,000
styrene	ND	650	EPA HEAST	120,000	EPA RfD	170	590,000
Semi-Volatile Organics							
indeno(1,2,3-cd)pyrene	+	14^{aa}	b	17,000	a	3.0^{aa}	89,000^{a}
benzo(a)anthracene	+	14^{aa}	b	17,000	a	3.0^{aa}	89,000^{a}
chrysene	+	1,400^{aa}	b	17,000	a	300^{aa}	89,000^{a}
benzo(b)fluoranthene	+	14^{aa}	b	17,000	a	3.0^{aa}	89,000^{a}
benzo(k)fluoranthene	+	140^{aa}	b	17,000	a	30^{aa}	89,000^{a}
benzo(a)pyrene	+	1.4	NYS DOH CPF	17,000	a	0.3	89,000^{a}
dibenz(a,h)anthracene	+	1.4^{aa}	b	17,000	a	0.3^{aa}	89,000^{a}
Pesticides/PCBs							
aroclor-1242	<0.01-0.04^{c}	2.5	EPA CPF	12	ATSDR MRL	0.7	59
aroclor-1248	<0.01-0.04^{c}	2.5	EPA CPF	12	ATSDR MRL	0.7	59
aroclor-1254	<0.01-0.04^{c}	2.5	EPA CPF	12	ATSDR MRL	0.7	59
aroclor-1260	<0.01-0.04^{c}	2.5	EPA CPF	12	ATSDR MRL	0.7	59
Inorganics							
aluminum	7,000-100,000	--	--	--	--	--	--
arsenic	10-20	11	EPA CPF	175	EPA RfD	2.9	885
chromium	10-40	--	--	2,915	EPA RfD	--	14,750
copper	<1-25	--	--	22,130	EPA HEAST	--	383,500
iron	10,000-40,000	--	--	--	--	--	--
lead	300	--	--	--	--	--	--
zinc	50-100	--	--	170,000	EPA RfD	--	890,000

ND - not determined

*References: Adriano (1986); Clarke et al. (1985); Connor et al. (1957); Davis and Bennett (1983); Dragun (1988); Frank et al. (1976); McGovern (1988); Schacklette and Boerngen (1984).

**Comparison values for cancer risk are determined for a 70 kg adult trespassing on-site and who ingests 50 mg soil per day, 2 days per week for 3 months per year; comparison values for noncancer risk are determined for a 21 kg child trespassing on-site and who ingests 100 mg soil per day, 5 days per week for 6 months per year.

***Comparison values for cancer risk are determined for a 70 kg adult who ingests in the work place 50 mg soil per day, 5 days per week, 8 months per year and assuming that exposure occurs for 40 working years out of a 70 year lifetime; comparison values for noncancer risk are determined for a 70 kg adult who ingests in the workplace 50 mg soil per day, 5 days per week for 8 months per year.

****EPA CPF = US EPA Cancer Potency Factor
EPA RfD = US EPA Reference Dose
EPA HEAST = US EPA Health Effects Assessment Summary Table
ATSDR MRL = ATSDR Minimal Risk Level
NYS DOH CPF = NYS DOH Cancer Potency Factor

+Based on reported background levels for total polycyclic aromatic hydrocarbons of 1 to 13 mg in soil (ATSDR, 1993i; Edwards, 1983).

[a] Used oral EPA RfD for pyrene

[b] Used NYS DOH oral Cancer Potency Factor for benzo(a)pyrene

[c] Total Aroclors

[aa] Public health assessment comparison value adjusted according to US EPA's interim relative potency factors for polycyclic aromatic hydrocarbons.

Table 8.

Water Quality Standards/Guidelines and/or Public Health Assessment Comparison Values that are Exceeded by Contaminants Found in Sources of Drinking Water at or Near the Liberty Industrial Finishing Site

[All values in micrograms per liter (mcg/L)]

	Water Quality Standards/Guidelines				Comparison Values*			
	New York State		U.S. EPA					
Contaminant	Ground-water	Surface Water	Drinking Water	Drinking Water	Cancer	Basis**	Noncancer	Basis**
Volatile Organics								
benzene	0.7	0.7	5	5	1.2	EPA CPF	4.9	ATSDR, 1987
chlorobenzene	5	20	5	100	--	--	100	EPA LTHA
1,1-dichloroethane	5	5(g)	5	--	--	--	700	EPA HEAST
1,1-dichloroethene	5	0.07(g)	5	7	0.058	EPA CPF	7	EPA LTHA
1,2-dichloroethene (total)	5	5(g)	5	70	--	--	70	EPA LTHA
1,2-dichloropropane	5	0.5(g)	5	5	0.51	EPA HEAST	630	ATSDR, 1989
methylene chloride	5	5(g)	5	5	4.8	EPA CPF	420	EPA RfD
tetrachloroethene	5	0.7(g)	5	5	0.67	EPA CPF	70	EPA RfD
1,1,1-trichloroethane	5	5(g)	5	200	--	--	200	EPA LTHA
1,1,2-trichloroethane	5	0.6	5	5	0.61	EPA CPF	3	EPA LTHA
trichloroethene	5	3	5	5	3.3	EPA CPF	52	EPA RfD
vinyl chloride	2	0.3(g)	2	2	0.018	EPA HEAST	0.14	ATSDR MRL
Semi-Volatile Organics								
bis(2-ethylhexyl)phthalate	50	4(g)	6	6	2.5	EPA CPF	140	EPA RfD
4-nitroaniline	5	--	5	--	--	--	--	--
pentachlorophenol	1	1	1	1	0.29	EPA CPF	210	EPA RfD
Pesticides								
chlordane	0.1	0.02(g)	2	2	0.02	NYS DOH CPF	0.42	EPA RfD
dieldrin	ND'	0.0009	5	--	0.0009	NYS DOH CPF	0.35	EPA RfD
heptachlor epoxide	ND	0.009	0.2	0.2	0.004	EPA CPF	0.09	EPA RfD
Inorganics								
aluminum	--	--	--	50-200'	--	--	--	--
arsenic	25	50	50	50++	0.02	EPA CPF	1.1	EPA RfD
cadmium	10	10	5	5	--	--	5	EPA LTHA
chromium	50	50	100	100	--	--	100	EPA LTHA
iron	300	300	300	300'	--	--	--	--
manganese	300	300	300	50'	--	--	200	EPA RfD
nickel	--	--	--	--	--	--	100	EPA LTHA
sodium	20,000	--	+	--	--	--	--	--
thallium	4(g)	4(g)	2	2	--	--	0.4	EPA LTHA
cyanide	100	100	--	200(p)	--	--	200	EPA LTHA

Footnotes for Table 8.

a = ND = not detected
g = Guidance value
s = Secondary maximum contaminant level (MCL) based on aesthetic considerations
p = proposed

*Comparison value determined for a 70 kg adult who drinks 2 liters of water per day.

**EPA RfD = EPA Reference Dose
EPA LTHA = EPA Lifetime Health Advisory
EPA HEAST = EPA Health Assessment Summary Tables
ATSDR MRL = ATSDR Oral Minimal Risk Level
ATSDR, 1987 = ATSDR Toxicological Profile for Benzene, Draft, December 1987
ATSDR, 1989 = ATSDR Toxicological Profile for 1,2-Dichloropropane, ATSDR/TP-89/12

+No designated limit; water containing more than 20,000 mcg/L should not be used for drinking by people on severely restricted sodium diets; water containing more than 270,000 mcg/L should not be used for drinking by people on moderately restricted sodium diets.

++Under review

Table 9.
Liberty Industrial Finishing Site
Chlordane and PCBs Detected in Fish Collected from Massapequa Reservoir in 1991
[All values in milligrams per kilogram (mg/kg)]

Contaminant	Range of Detection	Average Level	Comparison Values			
			Cancer**	Basis***	Noncancer**	Basis***
*chlordane	0.420-0.579	0.526	0.001	NYS CPF	0.13	EPA RfD
*PCBs	0.428-0.649	0.585	0.0003	EPA CPF	0.04	ATSDR MRL

*Contaminant selected for further evaluation.

**Comparison values are determined for a 70 kilogram adult who eats 32 grams of fish (with skin-on) per day.

***EPA CPF = EPA Cancer Potency Factor
EPA RfD = EPA Reference Dose
ATSDR MRL = ATSDR Minimal Risk Level
NYS CPF = NYS Cancer Potency Factor

APPENDIX C

Quality Assurance and Quality Control

Quality Assurance and Quality Control

In preparing this PHA, NYS DOH relied on the information provided in the referenced documents and assumed that adequate quality control (QC) measures were followed with regard to chain of custody, laboratory procedures, and data reporting. Specific quality assurance (QA) / QC information presented in the RI include the following:

- The subsurface soil samples collected at the site background location (SB-1) and in Ellsworth-Allen Park were free of organic contamination, except for acetone found in sample SB-1-12-15 at an estimated concentration of 1.1 mg/kg. This detection may be attributed to the acetone used in the field decontamination procedures because elevated concentrations of acetone also were detected in the associated field blanks.

- The low concentrations for some of the VOCs (methylene chloride, acetone, chloroform, and 2-butanone) reported in the disposal basin and sludge-drying bed soil results also were present in the field rinse or laboratory blanks and can be attributed to contamination from field procedures or laboratory analysis.

- Testing results for SVOCs for a third soil boring sample collected from SB-20 in Disposal Basin 1 were rejected because of laboratory error.

- The copper test results for four of the seven sludge-drying bed soil samples were rejected during data validation.

- Subsurface soil sample TP-13-2.5-3.5 and its field duplicate sample from testpit TP-38 at the Building M pad were scheduled to be tested for SVOCs but the analysis could not be run because of matrix interferences. The manganese test results for test pit samples from the Building M area were rejected during data validation.

- Elevated concentrations of VOCs were detected in leaching chamber sediment samples SB-34 and TP-41. These results are inconsistent with the field duplicate sample results, which do not indicate the presence of VOCs. The differences may be caused by incomplete sample homogenization in the field and not laboratory errors, considering the elevated concentrations and the consistency with other leaching chamber sediment data. The arsenic test results for all leaching chamber soil samples except TP-12-11-12 and TP-12-11-12 DUP were rejected during data validation.

- VOCs were not detected in the test pit TP-52 sample from beneath underground storage tanks UT-5 and UT-6 from a depth of 8.5 - 9 feet (TP-26-8.5-9), although the analytical detection limits were abnormally high because of matrix interferences in the laboratory.

- The test results for the inorganic compounds cadmium, chromium, and mercury, detected in ambient air samples (baseline air samples), are considered suspect because of the levels of inorganic contamination detected in the field blanks. Because of laboratory error, the ambient air samples collected were not tested for hexavalent chromium.

- Because of laboratory error, the surface water samples collected from Massapequa Creek were not tested for hexavalent chromium.

- The low-level concentrations of many of the VOCs (methylene chloride, chloroform, acetone, and 2-hexanone) reported in groundwater samples from on-site and off-site monitoring wells may not indicate actual environmental contamination. These compounds also were present in the trip, rinse, and/or bailer blank water and can be attributed to contamination from field procedure or laboratory analysis.

- Low-level concentrations of SVOCs (phenol, di-n-butylphthalate, bis(2-ethyhexyl)phthalate) reported in groundwater samples from on-site and off-site monitoring wells may not indicate actual environmental contamination. These compounds also were detected in field rinse blank water and can be attributed to contamination from field procedure or laboratory analysis.

APPENDIX D

Procedure for Evaluating Potential Health Risks for Contaminants of Concern

PROCEDURE FOR EVALUATING POTENTIAL HEALTH RISKS FOR CONTAMINANTS OF CONCERN

To evaluate the potential health risks from contaminants of concern associated with the Liberty site, NYS DOH assessed the risks for cancer and noncancer health effects.

Increased cancer risks were estimated by using site-specific information about exposure levels for the contaminant of concern and interpreting them using cancer potency estimates derived for that contaminant by US EPA or, in some cases, by NYS DOH. The following qualitative ranking of cancer risk estimates, developed by NYS DOH, then was used to rank the risk from very low to very high. For example, if the qualitative descriptor was "low," then the excess lifetime cancer risk from that exposure ranges from greater than one per million to less than one per ten thousand. Other qualitative descriptors are listed below:

Excess Lifetime Cancer Risk

Risk Ratio	Qualitative Descriptor
equal to or less than 1 per million	very low
greater than 1 per million to less than 1 per 10 thousand	low
1 per 10 thousand to less than 1 per thousand	moderate
1 per thousand to less than 1 per 10	high
equal to or greater than 1 per 10	very high

An estimated increased excess lifetime cancer risk is not a specific estimate of expected cancers. Rather, it is a plausible upper bound estimate of the probability that a person may develop cancer sometime in his or her lifetime after exposure to that contaminant.

Knowledge about cancer mechanisms is insufficient to determine whether a level of exposure to a cancer-causing agent exists below which no risk exists of developing cancer, namely, a threshold level. Therefore, every exposure, no matter how low, to a cancer-causing compound is assumed to be associated with some increased risk. As the dose of a carcinogen decreases, the chance of developing cancer decreases, but each exposure is accompanied by some increased risk.

No general consensus exists within the scientific or regulatory communities about what level of estimated excess cancer risk is acceptable. Some scientists have recommended the use of the relatively conservative excess lifetime cancer risk level of one in one million because of the uncertainties in scientific knowledge about the mechanism of cancer. Others believe that risks that are lower or higher may be acceptable, depending on scientific, economic, and social factors. An increased lifetime cancer risk of one in one million or less generally is considered an insignificant increase in cancer risk.

For noncarcinogenic health risks, the contaminant intake was estimated using exposure assumptions for the site conditions. This dose was then compared with reference dose (estimated daily intake of a chemical that is likely to be without an appreciable risk for adverse health effects) developed by US EPA, ATSDR, and/or NYS DOH. The resulting ratio was then compared with the following qualitative scale of health risk:

Qualitative Descriptions for
Noncarcinogenic Health Risks

Ratio of Estimated Contaminant Intake to Reference Dose	Qualitative Descriptor
equal to or less than the reference dose	minimal
greater than 1 to 5 times the reference dose	low
greater than 5 to 10 times the reference dose	moderate
greater than 10 times the reference dose	high

Noncarcinogenic effects are believed to have a threshold, i.e., a dose below which adverse effects will not occur. As a result, the current practice is to identify, usually from animal toxicology experiments, a no-observed adverse effect level (NOAEL). This is the experimental exposure level in animals at which no adverse toxic effect is observed. The NOAEL is then divided by an uncertainty factor to yield the reference dose. The uncertainty factor reflects the degree of uncertainty that exists when experimental animal data are extrapolated to the general human population. The magnitude of the uncertainty factor takes into consideration various factors such as sensitive subpopulations (e.g., children or the elderly), extrapolation from animals to humans, and the incompleteness of data. Thus, the reference dose is not expected to cause adverse health effects because it is selected to be much lower than dosages that do not cause adverse health effects in laboratory animals.

The measure used to describe the potential for noncancer health effects in a person is expressed as a ratio of estimated contaminant intake to the reference dose. If exposure to the contaminant exceeds the reference dose, concern may exist for potential noncancer health effects because the margin of protection is less than that afforded by the reference dose. As a rule, the greater the ratio of the estimated contaminant intake to the reference dose, the greater the level of concern. A ratio equal to or less than one is generally considered an insignificant (minimal) increase in risk.

APPENDIX E

Public Health Hazard Categories

INTERIM PUBLIC HEALTH HAZARD CATEGORIES

CATEGORY / DEFINITION	DATA SUFFICIENCY	CRITERIA
A. Urgent Public Health Hazard This category is used for sites where short-term exposures (< 1 yr) to hazardous substances or conditions could result in adverse health effects that require rapid intervention.	This determination represents a professional judgement based on critical data which ATSDR has judged sufficient to support a decision. This does not necessarily imply that the available data are complete; in some cases additional data may be required to confirm or further support the decision made.	Evaluation of available relevant information* indicates that site-specific conditions or likely exposures have had, are having, or are likely to have in the future, an adverse impact on human health that requires immediate action or intervention. Such site-specific conditions or exposures may include the presence of serious physical or safety hazards.
B. Public Health Hazard This category is used for sites that pose a public health hazard due to the existence of long-term exposures (> 1 yr) to hazardous substance or conditions that could result in adverse health effects.	This determination represents a professional judgement based on critical data which ATSDR has judged sufficient to support a decision. This does not necessarily imply that the available data are complete; in some cases additional data may be required to confirm or further support the decision made.	Evaluation of available relevant information* suggests that, under site-specific conditions of exposure, long-term exposures to site-specific contaminants (including radionuclides) have had, are having, or are likely to have in the future, an adverse impact on human health that requires one or more public health interventions. Such site-specific exposures may include the presence of serious physical or safety hazards.
C. Indeterminate Public Health Hazard This category is used for sites in which "*critical*" data are *insufficient* with regard to extent of exposure and/or toxicologic properties at estimated exposure levels.	This determination represents a professional judgement that critical data are missing and ATSDR has judged the data are insufficient to support a decision. This does not necessarily imply all data are incomplete; but that some additional data are required to support a decision.	The health assessor must determine, using professional judgement, the "criticality" of such data and the likelihood that the data can be obtained and will be obtained in a timely manner. Where some data are available, even limited data, the health assessor is encouraged to the extent possible to select other hazard categories and to support their decision with clear narrative that explains the limits of the data and the rationale for the decision.
D. No Apparent Public Health Hazard This category is used for sites where human exposure to contaminated media may be occurring, may have occurred in the past, and/or may occur in the future, but the exposure is not expected to cause any adverse health effects.	This determination represents a professional judgement based on critical data which ATSDR considers sufficient to support a decision. This does not necessarily imply that the available data are complete; in some cases additional data may be required to confirm or further support the decision made.	Evaluation of available relevant information* indicates that, under site-specific conditions of exposure, exposures to site-specific contaminants in the past, present, or future are not likely to result in any adverse impact on human health.
E: No Public Health Hazard This category is used for sites that, because of the absence of exposure, do NOT pose a public health hazard.	Sufficient evidence indicates that no human exposures to contaminated media have occurred, none are now occurring, and none are likely to occur in the future	

**Such as environmental and demographic data; health outcome data; exposure data; community health concerns information; toxicologic, medical, and epidemiologic data; monitoring and management plans.*

APPENDIX F

Response to Public Comments

RESPONSE TO PUBLIC COMMENTS

Comment #1: Although the PHA provides information about historical site use, no information about current site use is provided. A brief description of current site conditions and uses should be included in the PHA. Additional background information about site use after 1978, when Liberty Finishing II ceased operation at the site, also should be included.

Response #1: A total of 10 buildings at the site were or are used for a variety of operations including trucking, warehousing, auto parts salvaging, product distribution, and pallet recycling. This information has been added to the PHA.

Comment #2: The Summary suggests that a public health hazard existed in the past, but the magnitude of the hazard cannot be identified. If sufficient information does not exist to quantify the past potential public health hazard, the sentence should be revised to read: "It is not possible to determine whether the site posed a potential public health hazard in the past."

Response #2: The summary has been revised. In accordance with ATSDR's guidance on selecting public health hazard categories, specific criteria were followed in assigning the "indeterminate public health hazard category" pursuant to previous conditions at the site. This category is used for sites with incomplete information and is based on the following criteria:

The limited data do not indicate that humans are being or have been exposed to levels of contamination that would be expected to cause adverse health effects. However, data or information are not available for all environmental media to which humans may have been exposed, and community-specific health outcome data are insufficient or absent to indicate the site has adversely impacted human health.

Comment #3: Later sections of the PHA indicate that the PCBs and chlordane detected in the fish from Massapequa Reservoir probably are not related to the Liberty Industrial Finishing site. Therefore, the Summary should be revised to include the following: "the source of these constituents in fish has not been determined and is probably not attributable to the Liberty Industrial Finishing site."

Response #3: The Summary has been revised.

Comment #4: A paragraph describing the portions of the site at which industrial operations occurred should be added to the "Site Description and History" section because it would enable the reader to better put into perspective subsequent sections of the PHA discussing locations at the site where constituents were detected in environmental media.

Response #4: Most of the process buildings used by Liberty Industrial Finishing are no longer standing, but the former building locations are identified by the remains of concrete floor slabs. Historical information is not available to identify areas of the site where specific industrial operations occurred. The results of the RI were used to develop a detailed site history and waste disposal perspective, which is presented in the 1994 final RI report prepared by Roy F. Weston, Inc., for US EPA. The reader should refer to this document for additional history of site use.

Comment #5: None of the figures identifies the location of the Massapequa Reservoir. The PHA should be revised to include a more detailed map identifying the location of the Massapequa Creek, Massepequa Reservoir, and specific region of the creek and reservoir to which the fish consumption advisory pertains to.

Response #5: Figure 2 has been revised and now includes an expanded view of Massapequa Creek and its associated waterbodies, including the Upper Massepequa Reservoir and Massapequa Lake. The text has been revised to indicate that the NYS DOH fish consumption advisory pertains only to the Upper Massepequa Reservoir, which lies between Clark Boulevard and Sunrise Highway (Route 27). This is the body of water from which fish were collected in 1991 for NYS DEC's pesticide/PCB contamination study.

Comment #6: The PHA states that constituent concentrations were compared with PHA comparison values to determine whether detected concentrations warrant further evaluation. A review of the methodology used to develop certain of these comparison values indicates they were derived using conservative exposure assumptions that correspond to frequent, long-term exposure. Comparison values for soil (assuming an industrial setting), for example, assume exposure occurs 5 days per week, 8 months per year, over 40 years. The assumed exposure duration (40 years) is greater than the upper-bound estimate of exposure duration for workers recommended by US EPA for use in the Superfund program. Assuming that a receptor is equally likely to contact soil at any location at the site on any given day, the constituent concentration to which the receptor would be exposed is best represented by the average concentration at the site, rather than the concentration at any given sampling location. The comparison values are valid only when compared with average concentrations of constituents at the site. Therefore, the PHA should be revised to compare sitewide average concentrations to the existing comparison values derived using assumptions for sitewide chronic exposures. Alternatively, individual detected concentrations could be compared with comparison values calculated assuming an exposure frequency and duration appropriate for the small portion of the site represented by each sampling location.

Response #6: We use the soil comparison values for screening and selecting contaminants for further evaluation. For these purposes, if the highest detected level of the contaminant in soil exceeds the cancer or noncancer comparison value, the contaminant is selected for further evaluation. In estimating the cancer and noncancer health risks, we agree with the comment that in some cases, depending on site-specific characteristics, long-term exposure to a soil contaminant at a specific location may be unlikely and that a sitewide average for the contaminant may be more representative of people's potential long-term exposure. For some sites, on the basis of availability and adequacy of sampling data and other site-specific considerations, we have estimated cancer and noncancer health risks using both the maximum detected sampling results and the average sampling results. For the Liberty site, we chose not to estimate the past health risks associated with exposure to on-site surface soil because of concerns about the representativeness of the sampling and inadequate exposure information.

Comment #7: The section under the heading, "Ambient Air and Soil Gas," indicates that tetrachloroethene was elevated in the basin area of the site. Because the PHA does not identify comparison concentrations for this compound in this medium, the sentence should be edited to state that concentrations of tetrachloroethene were "highest" in samples from these areas.

Response #7: The text has been revised.

Comment #8: The PHA should state that the surface soil data are from areas of the site most likely to have been affected by historical industrial operations and therefore should not be assumed to represent conditions at the site as a whole.

Response #8: The following statement has been added to the discussion of surface soil contamination in the on-site contamination section: "The sampling locations are identified on Figure 6 as SS-1 through SS-7. According to the US EPA, these locations were thought to pose the greatest likelihood of surficial contamination on the basis of site history, visual observations during the site reconnaissance and the remedial investigation data. Therefore, these surface soil sampling data should not be considered to represent conditions at the site as a whole."

Comment #9: If any of the test pit or soil boring samples were taken from depths of 0 - 3 inches, these samples should be categorized as surface soil samples, rather than as subsurface soil samples.

Response #9: No change is required because no test pit soil samples or soil boring samples were collected specifically from depths of 0 - 3 inches. The shallowest depth from which soil samples were collected from the soil borings and test pits is 0 - 6 inches and includes the following samples: TP-41, TP-46, TP-48, and SB-23.

Comment #10: Concentrations of constituents detected in subsurface soil were compared with soil comparison values calculated using exposure assumptions that are inconsistent with typical subsurface soil exposure scenarios. The PHA should be revised to include separate comparison values for surface and subsurface soil, each calculated using potential exposure assumptions that are appropriate for the depth of interest.

Response #10: Comparison values for soil contaminants are used to evaluate the level of risk for potential adverse health effects by these contaminants if the subsurface soil is made available for long-term exposure. This is not the case at the Liberty site, where long-term exposure to subsurface soil contaminants is unlikely and which therefore precluded the need for a toxicologic evaluation of these contaminants. Additional language has been added to the final PHA to clarify this issue.

Comment #11: Constituents detected at or below background concentrations probably are not present as a result of historical or current industrial activities. For this reason, the PHA should be revised to omit comparisons of background constituency concentrations to comparison values.

Response #11: By comparing levels of background constituents with comparison values and showing that these levels did not exceed these values, we have reinforced the notion that these background samples selected were representative of typical background conditions.

Comment #12: The PHA compares concentrations of constituents detected in on-site monitoring wells to comparison values calculated using assumptions for residential drinking water exposure. Given that the current site use is industrial, the PHA should be revised to compare concentrations detected in on-site monitoring wells with comparison values calculated using exposure assumptions appropriate for potential industrial groundwater use.

Response #12: The drinking water exposure pathway is based on the potential for site-related contaminants to migrate into groundwater, which is used as a sole source of drinking water in Nassau County. Therefore, we believe it is not unreasonable to use the PHA comparison values in Table 8 for contaminants that may be found in drinking water.

Comment #13: The PHA should be revised to include additional groundwater fate and transport information in the section under the heading, "Off-site Contamination-Surface Water and Sediments." This information could include estimated groundwater flow direction and speed, as well as potential locations of groundwater discharge.

Response #13: Although site hydrogeology information is presented in the Pathways Analyses section of the PHA, additional information about the groundwater and surface water relation has been added as requested.

Comment #14: The PHA should identify the depth from which groundwater samples with concentrations exceeding guidelines or standards were taken. Additionally, the PHA should identify the specific guideline, standard, or comparison value that was exceeded.

Response #14: Except for monitoring wells MW-6B and MW-7B, all on-site monitoring wells are screened in the Upper Glacial Aquifer at 25 - 29 feet below grade. Wells MW-6B and MW-7B are each about 60 feet below grade. Exception for one downgradient monitoring well (MW-11C), all off-site monitoring wells are screened in the Upper Glacial Aquifer 12 - 75 feet below grade. Monitoring well MW-11C is screened in the Magothy Aquifer at 120 feet below grade. This information has been added to the PHA. Individual well data are included in the final RI report for comparison to the PHA comparison values presented in Table 8 of the PHA.

Comment #15: The section under the heading, "Off-site Contamination-Groundwater (Private Supply Wells)," should include the depth at which the irrigation well at the Farmingdale High School is screened.

Response #15: The irrigation well at the Farmingdale High School is screened in the Upper Glacial Aquifer 55 - 70 feet below grade. This information has been added to the PHA.

Comment #16: The discussion of public supply wells N-7515 and N-7516 under the heading, "Off-site Contamination-Groundwater (Public Supply Wells)," should be revised to state that, because these wells are sidegradient to the site, constituents detected in groundwater from these wells probably are not site-related.

Response #16: The text has been revised.

Comment #17: The last sentence in the section under the heading, "Off-site Contamination - Biota (Edible Fish)," should be revised to include, "however, the source probably is not attributable to the LIF site."

Response #17: The text has been revised as suggested.

Comment #18: Because the PHA is intended to focus on the potential public health significance of the Liberty Industrial Finishing site, it is not appropriate to include a discussion of potential health impacts from constituents and/or facilities unrelated to the Liberty site. For this reason, the discussion of air emissions from the Grumman Aerospace Corporation should be omitted from the PHA.

Response #18: At the time this PHA was released for public comment, ATSDR PHA policy required a review of data from the US EPA's Toxic Chemical Release Inventory (TRI). Since then, this requirement has been dropped. Therefore, we removed the TRI section from this document.

Comment #19: According to Figure 7 and Table 6, at least 34 groundwater samples from approximately 14 offsite monitoring wells screened at various depths were collected and analyzed during investigations at the Liberty site. However, it is impossible to determine how many samples were collected from the Magothy Aquifer and whether constituents were detected in these samples.

Response #19: Before public release of the draft PHA, two rounds of groundwater sampling were conducted from the monitoring well (MW-11C) screened in the Magothy Aquifer. In the first round of sampling (March 1992), the only site-related contaminants detected above comparison values were 1,2-dichloroethene at 69 mcg/L and trichloroethene at 760 mcg/L. In the second round of sampling (July 1992), these compounds again were the only site-related contaminants detected above comparison values at estimated concentrations of 120 mcg/l and 1300 mcg/L, respectively.

Comment #20: The PHA states that downgradient public supply wells could be affected by site-related contamination; however, the report does not identify the public supply wells to which this statement refers. The section under the heading, "Potential Exposure Pathways-Groundwater Exposure Pathway," should be revised to include the following information: "The South Farmingdale Water District public supply wells approximately 7,500 feet southwest of the site (well N-6148) and approximately 8,000 feet south/southeast of the site (wells N-5147 and N-6149), and the Massepequa Water District wells approximately two miles south/southeast of the site (wells N-4602, N-5703, N-8214, and N-9173) are not located in the pathway of the well-defined Upper Glacial unit plume. The Upper Glacial unit plume is currently monitored and will continue to be monitored. Additional monitoring wells will be installed to assess current conditions and monitor groundwater quality in the Magothy Aquifer in the area of the existing Upper Glacial plume. The data to be collected from the monitoring wells installed in the Magothy Aquifer will likely demonstrate that the public supply wells identified above are not being affected by groundwater from the Magothy Aquifer in the area of the Liberty site."

Response #20: The text has been revised.

Comment #21: The section under the heading, "Potential Exposure Pathways-Soil Exposure Pathway," should state that the affinity of PCBs for soil also results in a low bioavailability.

Response #21: People can take in PCBs if they are exposed to low levels in soil. People can be exposed to PCBs in contaminated soil by incidentally eating some soil or by absorbing PCBs through the skin. The amount of soil-bound PCBs absorbed through the skin and into the body is relatively low, particularly compared with absorption after ingestion. This information has been added to the Toxicologic Evaluation section of the PHA.

Comment #22: In section A.2. (Toxicologic Evaluation-Past Exposure of Persons Ingesting Fish from the Massapequa Reservoir and Its Tributaries) of the Public Health Implications, the sentence, "Chlordane and PCBs have been detected in fish from these waters," should be revised to include the following: "however, it is unlikely the source of chlordane and PCBs in fish is attributed to the Liberty site."

Response #22: The text has been revised.

Comment #23: The title of Table 8 in Appendix B should be revised to include "Groundwater" in place of "Sources of Drinking Water."

Response #23: The table heading has been revised.

Comment #24: The discussion of estimated increased excess lifetime cancer risk (Appendix C : Procedure for Evaluating Potential Health Risks for Contaminants of Concern) should be edited to include the following: "given a specific set of assumptions about potential exposure and toxicity of the constituent."

Response #24: This statement is now included in the revised PHA (Appendix C : Procedure for Evaluating Potential Health Risks for Contaminants of Concern).

Comment #25: The third paragraph in the Summary indicates that persons exposed to levels of VOCs in their drinking water that upon long-term exposure could result in a low increased risk of developing cancer. How do you know the risk of cancer is low if for 6 years the "presence and extent of contamination in the well cannot be determined?"

Response #25: In actuality, the presence and extent of contamination in the well was not known for about 24 years. Therefore, the NYS DOH's determination of low increased cancer risk from exposure to VOCs (i.e., benzene, trichloroethene and 1,2-dichloroethane) in drinking water is based on an exposure period of up to 24 years (from 1954, when the well was placed in service, until 1978, when use of the well was discontinued). For this evaluation, these VOCs were assumed to be present during the entire 24-year period. These VOCs also were assumed to be present at the highest concentration at which each was detected during the 1976 -1978 monitoring. This information has been added to the Toxicologic Evaluation section of the PHA.

Comment #26: How can you do a health assessment without comment about the dangers associated with the plume of groundwater contaminants (in the Magothy Aquifer) and their impact upon all of us? How can you do a health assessment without investigating the extent of vertical (groundwater) contamination?

Response #26: The toxicologic properties of the contaminants detected in the Magothy Aquifer monitoring well samples are discussed in the Public Health Implications section of the PHA. The US EPA has conducted field work for a supplemental groundwater investigation. This investigation will further characterize the groundwater quality in the deeper Magothy Aquifer. These additional groundwater quality data will be evaluated by NYS DOH and if necessary, the PHA will be appropriately revised and/or updated.

Comment #27: How can you say the site currently poses no apparent public health hazard, then you say that your [surface soil] data are limited? This site has never been anything but industrial/commercial, and you have stated it posed an indeterminate public health hazard in the past; now you tell us it does not represent a public health concern provided it remains industrial/commercial?

Response #27: In selecting the appropriate health hazard category(s), the assessor must consider the total body of information available for the site when the PHA is being prepared. Therefore, the site category is determined primarily by existing conditions at the site. Existing conditions at the Liberty site relate to a number of site-specific variables, including what is known about the extent of environmental contamination and the opportunity for community exposure to the identified contamination that can vary according to land use. In accordance with ATSDR's guidance, the "no apparent public health hazard" category is used for sites where human exposure to contaminated media is occurring or has occurred, but the exposure is below a level of health hazard. The estimation of exposure involves assumptions about how long, and how frequently the community has been exposed to site contaminants given the industrial/commercial land use scenario. If data become available suggesting that human exposure to hazardous substances at levels of public health concern is occurring or has occurred, NYS DOH will reevaluate the need for any follow-up.

Comment #28: Don't you think you should wait assessing health risks [to off-site soil gas] until you have all the information to evaluate?

Response #28: See response to Comment #27.

Comment #29: Why does the state renew the stock of fish every year (in Massepequa Reservoir) if the fish are becoming contaminated with PCBs? Where is a report evaluating the contamination found in the reservoir? Does some agency constantly test these fish? Why not suggest to the state to stop restocking the reservoir? Why expose those who fish to this danger?

Response #29: Since 1928, the NYS DEC has stocked trout in the Massapequa Creek and Massapequa Reservoir. NYS DEC aims to provide the citizens of New York an opportunity for sportfishing at this sole remaining trout stream in Nassau County. Because the government does not regulate a person's decision to eat sportfish, the NYS DOH issues consumption advisories to help people plan what fish to eat. In this instance, the advisory should be used as a guide to minimize exposure to contaminants that bioaccumulate in certain species of fish. In April and May 1985, the NYS DEC conducted a Long Island chlordane study to assess the uptake of chlordane in trout. During this controlled cage study, trout specimens were collected from Massapequa Reservoir at specific intervals, and the fish tissue was analyzed for chlordane. The results of this unpublished study do not indicate the uptake of chlordane in trout for the duration of the study. By summer's end each year, the trout population in Massapequa Creek and Massapequa Reservoir is significantly depleted by angling and warm water die-off. Therefore, annual restocking of Massapequa Creek and Massapequa Reservoir is needed to reestablish a sizeable population of trout in these waterbodies. Additional information about contaminant levels in fish is available from the NYS DEC's Division of Fish, Wildlife, and Marine Resources, Bureau of Habitat, at 625 Broadway, Albany, New York 12233; (518) 457-6178. Additional information about fishing inland waters and the stocking of fish in Nassau County is available from the NYS DEC at Loop Road, Building 40- SUNY, Stony Brook, New York 11790; (516) 444-0280.

Comment #30: I believe there are more than three contaminated transformer pad areas, and the PCB contamination is not limited to the transformer areas.

Response #30: During the RI, the US EPA identified numerous potential on-site source areas that included four transformer areas, some of which included active transformer units. Results of the soil and wipe sample taken at these areas indicated three of these areas required remediation, which was undertaken in 1995. A review of historical records does not indicate the existence of additional transformer pad areas. Extensive sampling data have been compiled during the RI and do not indicate any significant PCB contamination or PCB source areas elsewhere on the site.

Comment #31: In the updated evaluation of the incidence of Hodgkin disease cases in the South Farmingdale/Massapequa area of Nassau and Suffolk counties, you state there is no clustering, but you neglect to say these 13 cases in females all occurred in ZIP codes 11735 and 11758, which border each other. Where these 13 cases actually are is not being released by the NYS DOH, but it should be as I believe this is public information.

Response #31: The updated report, released in May 1994, indicates that among females, 13 of the 30 Hodgkin disease cases were diagnosed in the last 2 years of the investigation period. The report also indicates an unusually high number of cases diagnosed in females during the same period in ZIP codes 11735 and the northern portion of ZIP code 11758. The NYSDOH considers information involving the locations of the 13 cases of Hodgkin Disease as confidential, in accordance with Public Health Law, Article 28, Section 2805-g. The Commissioner of Health has authority to adopt such regulations as necessary to give effect to the provisions of this section and to preserve the confidentiality of medical, social, personal, or financial records of patients.

Comment #32: The PHA stated that the VOC contamination was present in groundwater samples collected from SFWD Well No. N-4042 from 1976 through 1978, however no supporting data were provided in the appendices of the report. Why did the NYS DOH choose to discuss groundwater contamination in a Liberty site-related document in which it is clearly stated that the contamination in SFWD well No. N-4042 was clearly stated to not be related to the site? In regards to this well, the following points were omitted from the report:

- None of the VOCs were detected above levels of concern for that time period. The standards were 50 mcg/L for each individual VOC and not to exceed a total of 100 mcg/L for all VOCs at sampling. Therefore, when detected, the drinking water was considered safe to drink according to US EPA and NYS DOH standards at the time;

- According to SFWD records, the well was used only as a lag well through 1978 when the well was taken out of service because of a screen collapse. Therefore, the amount of water actually supplied to the public from the well was minimal.

Response #32: The monitoring well data for SFWD Well No. N-4042 were received from the NC DOH. These data are not presented in the Liberty site PHA but can be obtained by contacting the NC DOH Bureau of Public Water Supply Protection at (516) 571-3323. An essential element of the PHA is to identify potential and completed exposure pathways that might or might not be associated with past, present, and future use of the site. Information reviewed during the preparation of this PHA indicated that persons probably were exposed to VOCs in drinking water obtained from Well No. N–4042 for an undetermined period, representative of a past completed exposure pathway. The additional points made in the comment have been incorporated in the text.

APPENDIX G

ATSDR Plain Language Glossary
of Environmental Health Terms

ATSDR Glossary of Terms

The Agency for Toxic Substances and Disease Registry (ATSDR) is a federal public health agency with headquarters in Atlanta, Georgia, and 10 regional offices in the United States. ATSDR's mission is to serve the public by using the best science, taking responsive public health actions, and providing trusted health information to prevent harmful exposures and diseases related to toxic substances. ATSDR is not a regulatory agency, unlike the U.S. Environmental Protection Agency (EPA), which is the federal agency that develops and enforces environmental laws to protect the environment and human health. This glossary defines words used by ATSDR in communications with the public. It is not a complete dictionary of environmental health terms. If you have questions or comments, call ATSDR's toll-free telephone number, 1-888-42-ATSDR or (1-888-422-8737).

General Terms

Absorption
The process of taking in. For a person or an animal, absorption is the process of a substance getting into the body through the eyes, skin, stomach, intestines, or lungs.

Acute
Occurring over a short time [compare with chronic].

Acute exposure
Contact with a substance that occurs once or for only a short time (up to 14 days) [compare with intermediate duration exposure and chronic exposure].

Additive effect
A biologic response to exposure to multiple substances that equals the sum of responses of all the individual substances added together [compare with antagonistic effect and synergistic effect].

Adverse health effect
A change in body function or cell structure that might lead to disease or health problems

Aerobic
Requiring oxygen [compare with anaerobic].

Ambient
Surrounding (for example, ambient air).

Anaerobic
Requiring the absence of oxygen [compare with aerobic].

Analyte
A substance measured in the laboratory. A chemical for which a sample (such as water, air, or blood) is tested in a laboratory. For example, if the analyte is mercury, the laboratory test will determine the amount of mercury in the sample.

Analytic epidemiologic study
A study that evaluates the association between exposure to hazardous substances and disease by testing scientific hypotheses.

Antagonistic effect
A biologic response to exposure to multiple substances that is less than would be expected if the known effects of the individual substances were added together [compare with additive effect and synergistic effect].

Background level
An average or expected amount of a substance or radioactive material in a specific environment, or typical amounts of substances that occur naturally in an environment.

Biodegradation
Decomposition or breakdown of a substance through the action of microorganisms (such as bacteria or fungi) or other natural physical processes (such as sunlight).

Biologic indicators of exposure study
A study that uses (a) biomedical testing or (b) the measurement of a substance [an analyte], its metabolite, or another marker of exposure in human body fluids or tissues to confirm human exposure to a hazardous substance [also see exposure investigation].

Biologic monitoring
Measuring hazardous substances in biologic materials (such as blood, hair, urine, or breath) to determine whether exposure has occurred. A blood test for lead is an example of biologic monitoring.

Biologic uptake
The transfer of substances from the environment to plants, animals, and humans.

Biomedical testing
Testing of persons to find out whether a change in a body function might have occurred because of exposure to a hazardous substance.

Biota
Plants and animals in an environment. Some of these plants and animals might be sources of food, clothing, or medicines for people.

Body burden
The total amount of a substance in the body. Some substances build up in the body because they are stored in fat or bone or because they leave the body very slowly.

CAP [see Community Assistance Panel.]

Cancer
Any one of a group of diseases that occur when cells in the body become abnormal and grow or multiply out of control.

Cancer risk
A theoretical risk for getting cancer if exposed to a substance every day for 70 years (a lifetime exposure). The true risk might be lower.

Carcinogen
A substance that causes cancer.

Case study
A medical or epidemiologic evaluation of one person or a small group of people to gather information about specific health conditions and past exposures.

Case-control study
A study that compares exposures of people who have a disease or condition (cases) with people who do not have the disease or condition (controls). Exposures that are more common among the cases may be considered as possible risk factors for the disease.

CAS registry number
A unique number assigned to a substance or mixture by the American Chemical Society Abstracts Service.
Central nervous system
The part of the nervous system that consists of the brain and the spinal cord.

CERCLA [see Comprehensive Environmental Response, Compensation, and Liability Act of 1980]

Chronic
Occurring over a long time [compare with acute].

Chronic exposure
Contact with a substance that occurs over a long time (more than 1 year) [compare with acute exposure and intermediate duration exposure]

Cluster investigation
A review of an unusual number, real or perceived, of health events (for example, reports of cancer) grouped together in time and location. Cluster investigations are designed to confirm case reports; determine whether they represent an unusual disease occurrence; and, if possible, explore possible causes and contributing environmental factors.

Community Assistance Panel (CAP)
A group of people from a community and from health and environmental agencies who work with ATSDR to resolve issues and problems related to hazardous substances in the community. CAP members work with ATSDR to gather and review community health concerns, provide information on how people might have been or might now be exposed to hazardous substances, and inform ATSDR on ways to involve the community in its activities.

Comparison value (CV)
Calculated concentration of a substance in air, water, food, or soil that is unlikely to cause harmful (adverse) health effects in exposed people. The CV is used as a screening level during the public health assessment process. Substances found in amounts greater than their CVs might be selected for further evaluation in the public health assessment process.

Completed exposure pathway [see exposure pathway].

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)
CERCLA, also known as Superfund, is the federal law that concerns the removal or cleanup of hazardous substances in the environment and at hazardous waste sites. ATSDR, which was created by CERCLA, is responsible for assessing health issues and supporting public health activities related to hazardous waste sites or other environmental releases of hazardous substances. This law was later amended by the Superfund Amendments and Reauthorization Act (SARA).

Concentration
The amount of a substance present in a certain amount of soil, water, air, food, blood, hair, urine, breath, or any other media.

Contaminant
A substance that is either present in an environment where it does not belong or is present at levels that might cause harmful (adverse) health effects.

Delayed health effect
A disease or an injury that happens as a result of exposures that might have occurred in the past.

Dermal
Referring to the skin. For example, dermal absorption means passing through the skin.

Dermal contact
Contact with (touching) the skin [see route of exposure].

Descriptive epidemiology
The study of the amount and distribution of a disease in a specified population by person, place, and time.

Detection limit
The lowest concentration of a chemical that can reliably be distinguished from a zero concentration.

Disease prevention
Measures used to prevent a disease or reduce its severity.

Disease registry
A system of ongoing registration of all cases of a particular disease or health condition in a defined population.

DOD
United States Department of Defense.

DOE
United States Department of Energy.

Dose (for chemicals that are not radioactive)
The amount of a substance to which a person is exposed over some time period. Dose is a measurement of exposure. Dose is often expressed as milligram (amount) per kilogram (a measure of body weight) per day (a measure of time) when people eat or drink contaminated water, food, or soil. In general, the greater the dose, the greater the likelihood of an effect. An "exposure dose" is how much of a substance is encountered in the environment. An "absorbed dose" is the amount of a substance that actually got into the body through the eyes, skin, stomach, intestines, or lungs.

Dose (for radioactive chemicals)
The radiation dose is the amount of energy from radiation that is actually absorbed by the body. This is not the same as measurements of the amount of radiation in the environment.

Dose-response relationship
The relationship between the amount of exposure [dose] to a substance and the resulting changes in body function or health (response).

Environmental media
Soil, water, air, biota (plants and animals), or any other parts of the environment that can contain contaminants.
Environmental media and transport mechanism
Environmental media include water, air, soil, and biota (plants and animals). Transport mechanisms move contaminants from the source to points where human exposure can occur. The environmental media and transport mechanism is the second part of an exposure pathway.

EPA United States Environmental Protection Agency.

Epidemiologic surveillance
[see Public health surveillance].

Epidemiology
The study of the distribution and determinants of disease or health status in a population; the study of the occurrence and causes of health effects in humans.

Exposure
Contact with a substance by swallowing, breathing, or touching the skin or eyes. Exposure may be short-term [acute exposure], of intermediate duration, or long-term [chronic exposure].

Exposure assessment
The process of finding out how people come into contact with a hazardous substance, how often and for how long they are in contact with the substance, and how much of the substance they are in contact with.

Exposure-dose reconstruction
A method of estimating the amount of people's past exposure to hazardous substances. Computer and approximation methods are used when past information is limited, not available, or missing.

Exposure investigation
The collection and analysis of site-specific information and biologic tests (when appropriate) to determine whether people have been exposed to hazardous substances.

Exposure pathway
The route a substance takes from its source (where it began) to its end point (where it ends), and how people can come into contact with (or get exposed to) it. An exposure pathway has five parts: a source of contamination (such as an abandoned business); an environmental media and transport mechanism (such as movement through groundwater); a point of exposure (such as a private well); a route of exposure (eating, drinking, breathing, or

touching), and a receptor population (people potentially or actually exposed). When all five parts are present, the exposure pathway is termed a completed exposure pathway.

Exposure registry
A system of ongoing followup of people who have had documented environmental exposures.

Feasibility study
A study by EPA to determine the best way to clean up environmental contamination. A number of factors are considered, including health risk, costs, and what methods will work well.

Geographic information system (GIS)
A mapping system that uses computers to collect, store, manipulate, analyze, and display data. For example, GIS can show the concentration of a contaminant within a community in relation to points of reference such as streets and homes.

Grand rounds
Training sessions for physicians and other health care providers about health topics.

Groundwater
Water beneath the earth's surface in the spaces between soil particles and between rock surfaces [compare with surface water].

Half-life (t½)
The time it takes for half the original amount of a substance to disappear. In the environment, the half-life is the time it takes for half the original amount of a substance to disappear when it is changed to another chemical by bacteria, fungi, sunlight, or other chemical processes. In the human body, the half-life is the time it takes for half the original amount of the substance to disappear, either by being changed to another substance or by leaving the body. In the case of radioactive material, the half life is the amount of time necessary for one half the initial number of radioactive atoms to change or transform into another atom (that is normally not radioactive). After two half lives, 25% of the original number of radioactive atoms remain.

Hazard
A source of potential harm from past, current, or future exposures.

Hazardous Substance Release and Health Effects Database (HazDat)
The scientific and administrative database system developed by ATSDR to manage data collection, retrieval, and analysis of site-specific information on hazardous substances, community health concerns, and public health activities.

Hazardous waste
Potentially harmful substances that have been released or discarded into the environment.

Health consultation
A review of available information or collection of new data to respond to a specific health question or request for information about a potential environmental hazard. Health consultations are focused on a specific exposure issue. Health consultations are therefore more limited than a public health assessment, which reviews the exposure potential of each pathway and chemical [compare with public health assessment].

Health education
Programs designed with a community to help it know about health risks and how to reduce these risks.

Health investigation
The collection and evaluation of information about the health of community residents. This information is used to describe or count the occurrence of a disease, symptom, or clinical measure and to evaluate the possible association between the occurrence and exposure to hazardous substances.

Health promotion
The process of enabling people to increase control over, and to improve, their health.

Health statistics review
The analysis of existing health information (i.e., from death certificates, birth defects registries, and cancer registries) to determine if there is excess disease in a specific population, geographic area, and time period. A health statistics review is a descriptive epidemiologic study.

Indeterminate public health hazard
The category used in ATSDR's public health assessment documents when a professional judgment about the level of health hazard cannot be made because information critical to such a decision is lacking.

Incidence
The number of new cases of disease in a defined population over a specific time period [contrast with prevalence].

Ingestion
The act of swallowing something through eating, drinking, or mouthing objects. A hazardous substance can enter the body this way [see route of exposure].

Inhalation
The act of breathing. A hazardous substance can enter the body this way [see route of exposure].

Intermediate duration exposure
Contact with a substance that occurs for more than 14 days and less than a year [compare with acute exposure and chronic exposure].

In vitro
In an artificial environment outside a living organism or body. For example, some toxicity testing is done on cell cultures or slices of tissue grown in the laboratory, rather than on a living animal [compare with in vivo].
In vivo
Within a living organism or body. For example, some toxicity testing is done on whole animals, such as rats or mice [compare with in vitro].

Lowest-observed-adverse-effect level (LOAEL)
The lowest tested dose of a substance that has been reported to cause harmful (adverse) health effects in people or animals.

Medical monitoring
A set of medical tests and physical exams specifically designed to evaluate whether an individual's exposure could negatively affect that person's health.

Metabolism
The conversion or breakdown of a substance from one form to another by a living organism.

Metabolite
Any product of metabolism.

mg/kg
Milligram per kilogram.

mg/cm2
Milligram per square centimeter (of a surface).

mg/m3
Milligram per cubic meter; a measure of the concentration of a chemical in a known volume (a cubic meter) of air, soil, or water.

Migration
Moving from one location to another.

Minimal risk level (MRL)
An ATSDR estimate of daily human exposure to a hazardous substance at or below which that substance is unlikely to pose a measurable risk of harmful (adverse), noncancerous effects. MRLs are calculated for a route of exposure (inhalation or oral) over a specified time period (acute, intermediate, or chronic). MRLs should not be used as predictors of harmful (adverse) health effects [see reference dose].

Morbidity
State of being ill or diseased. Morbidity is the occurrence of a disease or condition that alters health and quality of life.

Mortality
Death. Usually the cause (a specific disease, a condition, or an injury) is stated.

Mutagen
A substance that causes mutations (genetic damage).

Mutation
A change (damage) to the DNA, genes, or chromosomes of living organisms.

National Priorities List for Uncontrolled Hazardous Waste Sites (National Priorities List or NPL)
EPA's list of the most serious uncontrolled or abandoned hazardous waste sites in the United States. The NPL is updated on a regular basis.

National Toxicology Program (NTP)
Part of the Department of Health and Human Services. NTP develops and carries out tests to predict whether a chemical will cause harm to humans.

No apparent public health hazard
A category used in ATSDR's public health assessments for sites where human exposure to contaminated media might be occurring, might have occurred in the past, or might occur in the future, but where the exposure is not expected to cause any harmful health effects.

No-observed-adverse-effect level (NOAEL)
The highest tested dose of a substance that has been reported to have no harmful (adverse) health effects on people or animals.

No public health hazard
A category used in ATSDR's public health assessment documents for sites where people have never and will never come into contact with harmful amounts of site-related substances.

NPL [see National Priorities List for Uncontrolled Hazardous Waste Sites]

Physiologically based pharmacokinetic model (PBPK model)
A computer model that describes what happens to a chemical in the body. This model describes how the chemical gets into the body, where it goes in the body, how it is changed by the body, and how it leaves the body.

Pica
A craving to eat nonfood items, such as dirt, paint chips, and clay. Some children exhibit pica-related behavior.

Plume
A volume of a substance that moves from its source to places farther away from the source. Plumes can be described by the volume of air or water they occupy and the direction they move. For example, a plume can be a column of smoke from a chimney or a substance moving with groundwater.

Point of exposure
The place where someone can come into contact with a substance present in the environment [see exposure pathway].

Population
A group or number of people living within a specified area or sharing similar characteristics (such as occupation or age).

Potentially responsible party (PRP)
A company, government, or person legally responsible for cleaning up the pollution at a hazardous waste site under Superfund. There may be more than one PRP for a particular site.

ppb
Parts per billion.

ppm
Parts per million.

Prevalence
The number of existing disease cases in a defined population during a specific time period [contrast with incidence].

Prevalence survey
The measure of the current level of disease(s) or symptoms and exposures through a questionnaire that collects self-reported information from a defined population.

Prevention
Actions that reduce exposure or other risks, keep people from getting sick, or keep disease from getting worse.

Public availability session
An informal, drop-by meeting at which community members can meet one-on-one with ATSDR staff members to discuss health and site-related concerns.

Public comment period
An opportunity for the public to comment on agency findings or proposed activities contained in draft reports or documents. The public comment period is a limited time period during which comments will be accepted.

Public health action
A list of steps to protect public health.

Public health advisory
A statement made by ATSDR to EPA or a state regulatory agency that a release of hazardous substances poses an immediate threat to human health. The advisory includes recommended measures to reduce exposure and reduce the threat to human health.

Public health assessment (PHA)
An ATSDR document that examines hazardous substances, health outcomes, and community concerns at a hazardous waste site to determine whether people could be harmed from coming into contact with those substances. The PHA also lists actions that need to be taken to protect public health [compare with health consultation].

Public health hazard
A category used in ATSDR's public health assessments for sites that pose a public health hazard because of long-term exposures (greater than 1 year) to sufficiently high levels of hazardous substances or radionuclides that could result in harmful health effects.

Public health hazard categories
Public health hazard categories are statements about whether people could be harmed by conditions present at the site in the past, present, or future. One or more hazard categories might be appropriate for each site. The five public health hazard categories are no public health hazard, no apparent public health hazard, indeterminate public health hazard, public health hazard, and urgent public health hazard.

Public health statement
The first chapter of an ATSDR toxicological profile. The public health statement is a summary written in words that are easy to understand. The public health statement explains how people might be exposed to a specific substance and describes the known health effects of that substance.

Public health surveillance
The ongoing, systematic collection, analysis, and interpretation of health data. This activity also involves timely dissemination of the data and use for public health programs.

Public meeting
A public forum with community members for communication about a site.

Radioisotope
An unstable or radioactive isotope (form) of an element that can change into another element by giving off radiation.

Radionuclide
Any radioactive isotope (form) of any element.

RCRA [see Resource Conservation and Recovery Act (1976, 1984)]

Receptor population
People who could come into contact with hazardous substances [see exposure pathway].

Reference dose (RfD)
An EPA estimate, with uncertainty or safety factors built in, of the daily lifetime dose of a substance that is unlikely to cause harm in humans.

Registry
A systematic collection of information on persons exposed to a specific substance or having specific diseases [see exposure registry and disease registry].

Remedial investigation
The CERCLA process of determining the type and extent of hazardous material contamination at a site.

Resource Conservation and Recovery Act (1976, 1984) (RCRA)
This Act regulates management and disposal of hazardous wastes currently generated, treated, stored, disposed of, or distributed.

RFA
RCRA Facility Assessment. An assessment required by RCRA to identify potential and actual releases of hazardous chemicals.

RfD [see reference dose]

Risk
The probability that something will cause injury or harm.

Risk reduction
Actions that can decrease the likelihood that individuals, groups, or communities will experience disease or other health conditions.

Risk communication
The exchange of information to increase understanding of health risks.

Route of exposure
The way people come into contact with a hazardous substance. Three routes of exposure are breathing [inhalation], eating or drinking [ingestion], or contact with the skin [dermal contact].

Safety factor [see uncertainty factor]

SARA [see Superfund Amendments and Reauthorization Act]

Sample
A portion or piece of a whole. A selected subset of a population or subset of whatever is being studied. For example, in a study of people the sample is a number of people chosen from a larger population [see population]. An environmental sample (for example, a small amount of soil or water) might be collected to measure contamination in the environment at a specific location.

Sample size
The number of units chosen from a population or an environment.

Solvent
A liquid capable of dissolving or dispersing another substance (for example, acetone or mineral spirits).

Source of contamination
The place where a hazardous substance comes from, such as a landfill, waste pond, incinerator, storage tank, or drum. A source of contamination is the first part of an exposure pathway.

Special populations
People who might be more sensitive or susceptible to exposure to hazardous substances because of factors such as age, occupation, sex, or behaviors (for example, cigarette smoking). Children, pregnant women, and older people are often considered special populations.

Stakeholder
A person, group, or community who has an interest in activities at a hazardous waste site.

Statistics
A branch of mathematics that deals with collecting, reviewing, summarizing, and interpreting data or information. Statistics are used to determine whether differences between study groups are meaningful.

Substance
A chemical.

Substance-specific applied research
A program of research designed to fill important data needs for specific hazardous substances identified in ATSDR's toxicological profiles. Filling these data needs would allow more accurate assessment of human risks from specific substances contaminating the environment. This research might include human studies or laboratory experiments to determine health effects resulting from exposure to a given hazardous substance.

Superfund [see Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and Superfund Amendments and Reauthorization Act (SARA)

Superfund Amendments and Reauthorization Act (SARA)
In 1986, SARA amended the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and expanded the health-related responsibilities of ATSDR. CERCLA and SARA direct ATSDR to look into the health effects from substance exposures at hazardous waste sites and to perform activities including health education, health studies, surveillance, health consultations, and toxicological profiles.

Surface water Water on the surface of the earth, such as in lakes, rivers, streams, ponds, and springs [compare with groundwater].

Surveillance [see public health surveillance]

Survey
A systematic collection of information or data. A survey can be conducted to collect information from a group of people or from the environment. Surveys of a group of people can be conducted by telephone, by mail, or in person. Some surveys are done by interviewing a group of people [see prevalence survey].

Synergistic effect
A biologic response to multiple substances where one substance worsens the effect of another substance. The combined effect of the substances acting together is greater than the sum of the effects of the substances acting by themselves [see additive effect and antagonistic effect].

Teratogen
A substance that causes defects in development between conception and birth. A teratogen is a substance that causes a structural or functional birth defect.

Toxic agent
Chemical or physical (for example, radiation, heat, cold, microwaves) agents that, under certain circumstances of exposure, can cause harmful effects to living organisms.

Toxicological profile
An ATSDR document that examines, summarizes, and interprets information about a hazardous substance to determine harmful levels of exposure and associated health effects. A toxicological profile also identifies significant gaps in knowledge on the substance and describes areas where further research is needed.

Toxicology
The study of the harmful effects of substances on humans or animals.

Tumor
An abnormal mass of tissue that results from excessive cell division that is uncontrolled and progressive. Tumors perform no useful body function. Tumors can be either benign (not cancer) or malignant (cancer).

Uncertainty factor
Mathematical adjustments for reasons of safety when knowledge is incomplete. For example, factors used in the calculation of doses that are not harmful (adverse) to people. These factors are applied to the lowest-observed-adverse-effect-level (LOAEL) or the no-observed-adverse-effect-level (NOAEL) to derive a minimal risk level (MRL). Uncertainty factors are used to account for variations in people's sensitivity, for differences between animals and humans, and for differences between a LOAEL and a NOAEL. Scientists use uncertainty factors when they have some, but not all, the information from animal or human studies to decide whether an exposure will cause harm to people [also sometimes called a safety factor].

Urgent public health hazard
A category used in ATSDR's public health assessments for sites where short-term exposures (less than 1 year) to hazardous substances or conditions could result in harmful health effects that require rapid intervention.

Volatile organic compounds (VOCs)
Organic compounds that evaporate readily into the air. VOCs include substances such as benzene, toluene, methylene chloride, and methyl chloroform.

Other glossaries and dictionaries:
Environmental Protection Agency (http://www.epa.gov/OCEPAterms/)

National Center for Environmental Health (CDC) (http://www.cdc.gov/nceh/dls/report/glossary.htm)

National Library of Medicine (NIH) (http://www.nlm.nih.gov/medlineplus/mplusdictionary.html)

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