WORK ASSIGNMENT NO. CO2022
EPA CONTRACT NO. 68-W9-0002
DOC. NO. 0141y-0144y

FINAL HEALTH AND ENDANGERMENT ASSESSMENT
SYOSSET LANDFILL SITE
OYSTER BAY, LONG ISLAND, NEW YORK

SUBMITTED TO:

CDM FEDERAL PROGRAMS CORPORATION
SUITE 200
13135 LEE JACKSON MEMORIAL HIGHWAY
FAIRFAX, VIRGINIA 22033

SUBMITTED BY:

VERSAR, INC.
6850 VERSAR CENTER
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JULY 9, 1990

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APPENDICES

1.0 INTRODUCTION

CDM Federal Programs Corporation (FPC) received a work assignment (Contract No. 68-W9-0002, WA No. C02022) from the U.S. Environmental Protection Agency (U.S. EPA) Region II to conduct an endangerment assessment for the Syosset Landfill site located in the Town of Oyster Bay, on Long Island, New York. Versar, Inc., under subcontract with CDM FPC, prepared this endangerment assessment.

1.1 Site Description and History

The Syosset Landfill is an inactive sanitary landfill, approximately 35 acres in size, located in Oyster Bay on Long Island, New York (Figure 1-1). As shown in Figure 1-2, the site is bounded by the Long Island Expressway and Miller Road to the southeast, Cerro Wire and Cable Corporation to the southwest, and the Long Island Railroad to the northwest. A residential neighborhood and the South Grove Elementary School are located to the northeast. The site also includes an area of offices and maintenance facilities for the Town of Oyster Bay Department of Public Works (TOB-DPW). This area is located to the east, immediately adjacent to the landfill, and occupies approximately 18 acres. The topography of the site and surrounding areas is relatively flat. Most variations in topography appear to be because of construction or earth moving activities in the area or on site, or near the old incinerator building.

Refuse disposal at the site reportedly began in 1933 and continued until 1975. Between 1933 and 1967, no restrictions were imposed on the types of wastes accepted at the landfill. Waste types included: commercial, industrial, residential, demolition, agricultural, sludge materials, and ash. After 1967, the landfill accepted only rubbish, brush, demolition debris, and scavenger cesspool wastes until its closing in early 1975.

The landfill was excavated to about 65 feet below grade and to within approximately 20 feet of the fence line, and was then backfilled

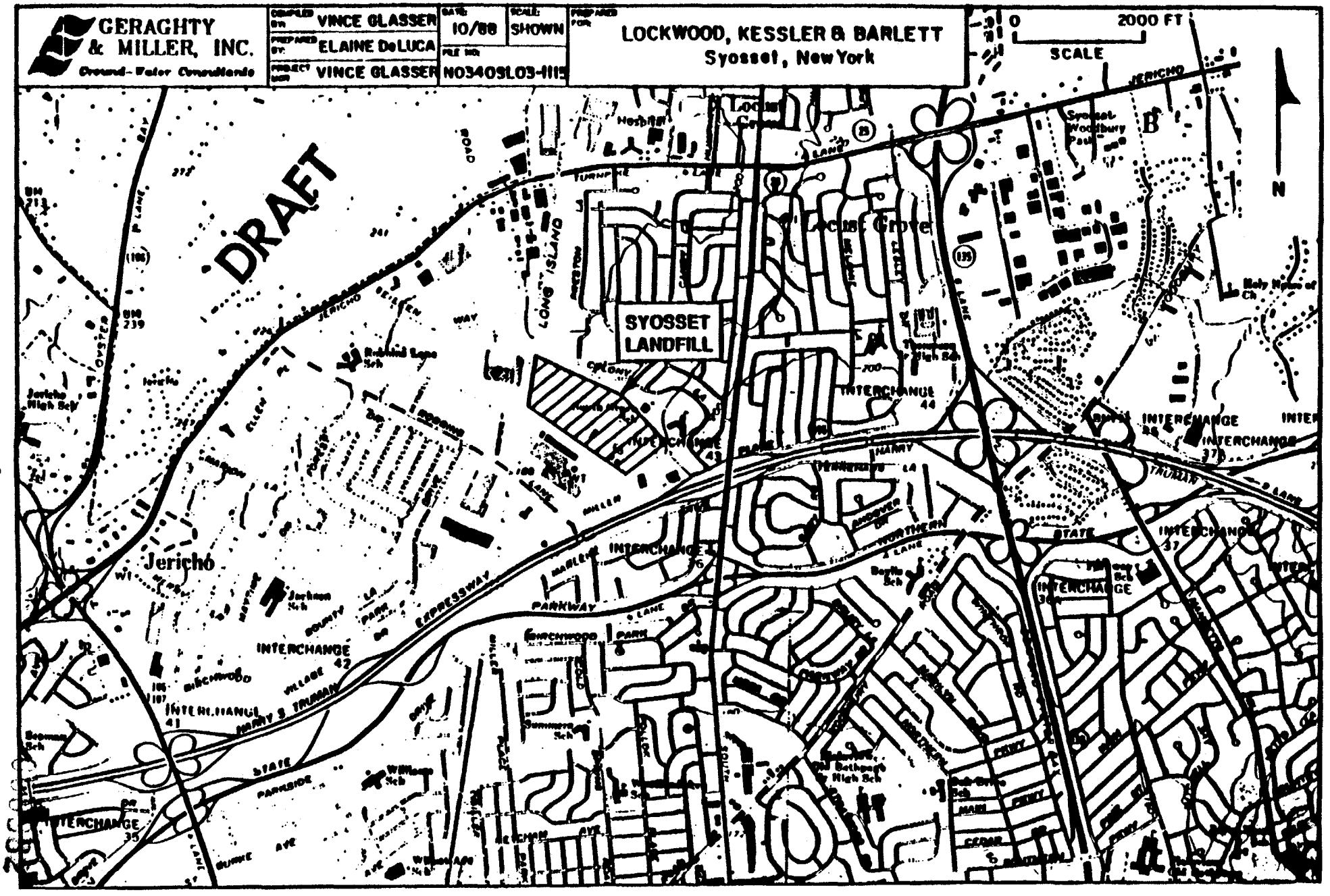

FIGURE 1-1. LOCATION MAP FOR SYOSSET LANDFILL, OYSTER BAY, NEW YORK (GERAGHTY AND MILLER, 1989)

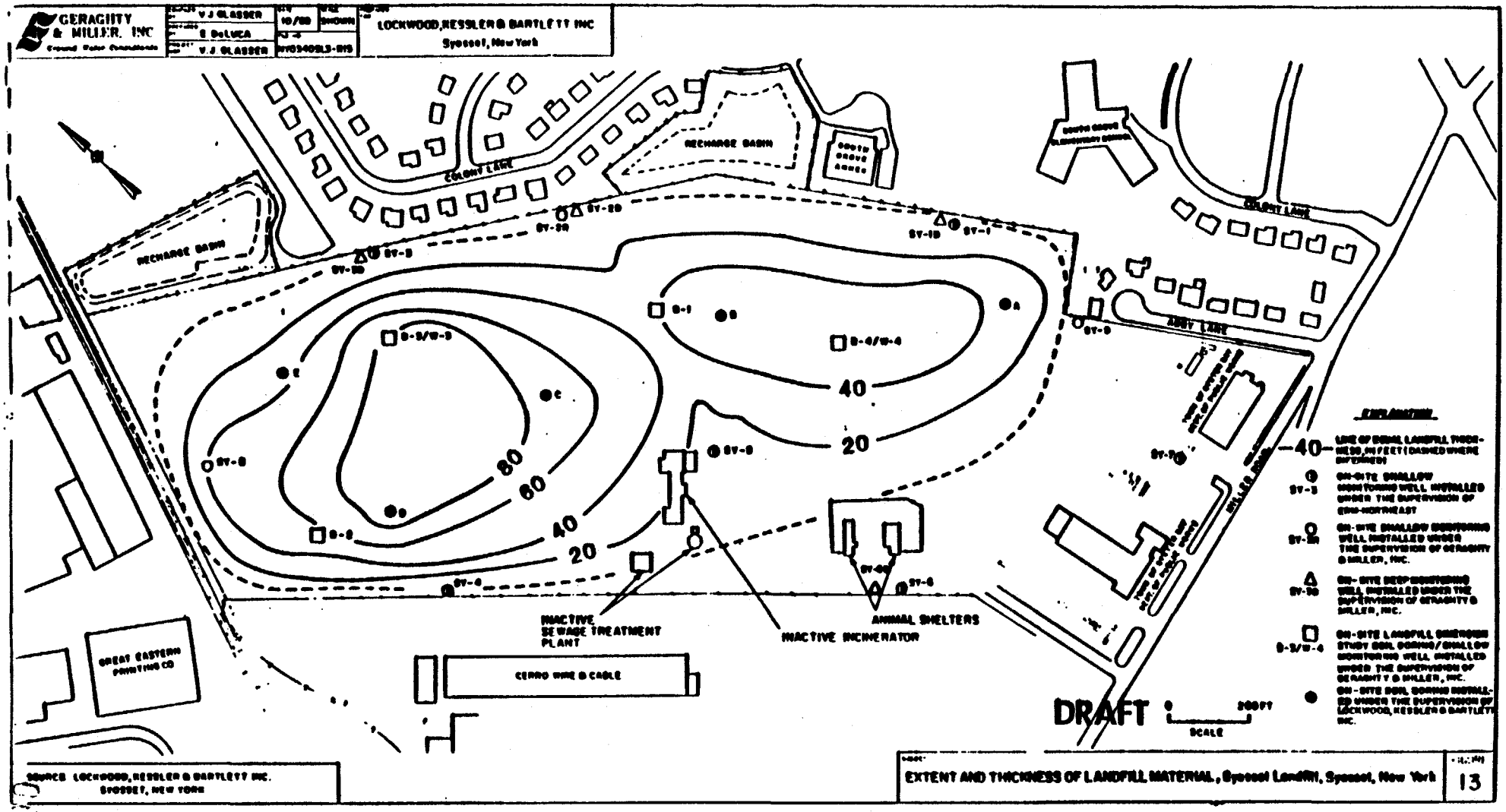

FIGURE 1-2. SYOSSET LANDFILL STUDY AREA, INCLUDING THICKNESS OF FILL MATERIAL, SOIL BORING, AND MONITORING WELL LOCATIONS (GERAGHTY AND MILLER, 1989)

with garbage. A scavenger waste pit was excavated south of the incinerator. There is also evidence that underground burning occurred at the site (ERM, 1981).

Potential responsible parties (PRPs) include Hooker Chemicals and Plastics, and Grumman Aerospace Corporation. According to a CERCLA 103(c) notification prepared by Hooker Chemicals and Plastics, the company disposed of 48 tons of waste at the site. The wastes included (ERM, 1981):

- alcohols
- glycols
- perchloroethylene
- latex waste
- alum
- PVC sludge
- PVC floor scrapings
- vinyl chloride recovery still bottoms
- spent lube oils
- PCB therminal waste
- waste filter cake: (celite, decolorizing carbon, toluene, solfenic [sic] acid catalyst, bicarbonate, trimellitate, plasticize)
- PVC (polyvinyl chloride)
- vinyl chloride
- vinyl acetate
- trichloroethylene
- barium and cadmium soap stabilizers

According to a "Hazardous Waste Disposal Questionnaire" prepared for the New York State Department of Environmental Conservation (NYSDEC) by Grumman Aerospace Corporation, the company disposed of 4,889 tons of wastewater treatment sludges from the chemical conversion coating of aluminum (Hazardous Waste F019)(Versar, 1989).

1.2 Site Characteristics

Nassau County, New York, is located in the west-central portion of Long Island. It is bounded on the north by Long Island Sound and on the south by the Atlantic Ocean. Four major physiographic features are present in Nassau County: the north coast highlands, the Harbor Hill moraine, the Ronkonkoma moraine, and the glacial outwash plain (McClymonds and Franke, 1972). The Syosset Landfill is located in the central portion of the county, in the vicinity of the moraines (Figure 1-3). This area is characterized by gently undulatory hills and ridges with an elevation range of 160 to 340 feet above mean sea level (msl)(Seaburn, 1969). The bedrock in the county is primarily crystalline, composed of metamorphic and igneous rocks.

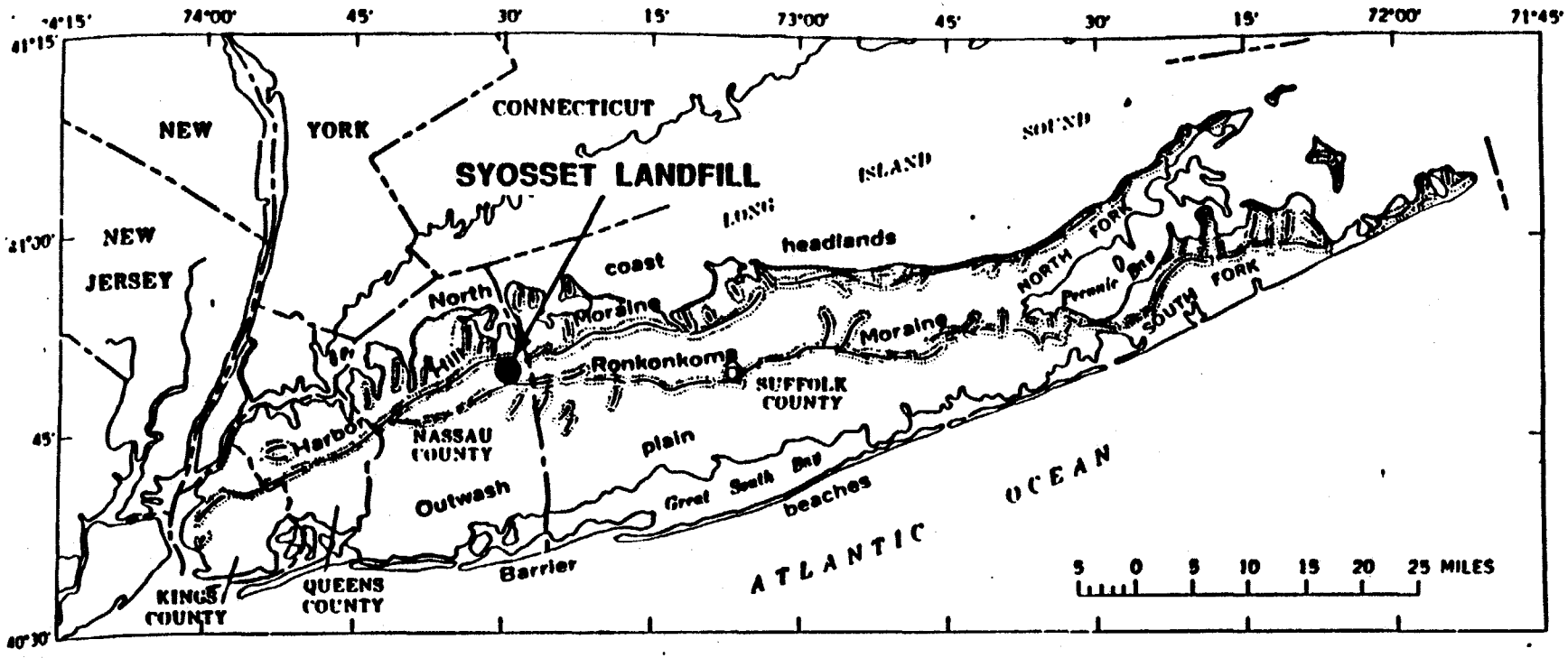

FIGURE 1-3. MAJOR PHYSIOGRAPHIC FEATURES OF LONG ISLAND, NEW YORK (McCLYMONDS & FRANKE, 1972)

Site characteristics important in influencing environmental fate and transport of contaminants at the Syosset Landfill site are presented below and include site geology and soils, topography and drainage, hydrogeology, and climatology.

Geology and Soils

Nassau County is underlain by crystalline bedrock lying at a depth of between 400 and 1,300 feet below the land surface (Figure 1-4) and sloping 80 feet per mile towards the southeast (Isbister, 1966). Bedrock is composed of Pre-Cambrian igneous and metamorphic rock, including biotite-muscovite schist, gneiss, and granite. In the vicinity of the Syosset Landfill, the bedrock is approximately 800 feet below land surface (Isbister, 1966).

Unconformably overlying the crystalline bedrock are Cretaceous sedimentary "red beds" and basalt flows similar to rocks exposed at the surface in New Jersey and Connecticut (Seaburn, 1969). The Cretaceous Raritan and Magothy(?) Formations are composed of sand, silt, and clay. These sedimentary packages were shed off the Appalachian highlands and deposited as deltas in shallow coastal waters (Seaburn, 1969). Two members, each between 0 and approximately 250 feet thick, are defined in the Raritan Formation: the Lloyd Sand Member and an overlying unnamed Clay Member. These sand and clay deposits have localized lenses of coarse sand and gravel (Isbister, 1966). The Magothy(?) Formation also contains coarse sand and gravel layers and lenses and is 0 to 800 feet thick in the study area (Isbister, 1966). The name for the Magothy(?) Formation has been questioned in the geologic literature, and is therefore noted as such, with a (?), in this report.

During the Tertiary period, Long Island was uplifted to the point where some of the Cretaceous deposits were eroded and dissected by rivers and small streams. The valley that now contains Long Island Sound was cut by a river channel at this time (Seaburn, 1969). The Mannetto Gravel, a discontinuous nonmarine gravel deposited at that time, is strongly crossbedded where it is found in Nassau County. These horizontal, stratified beds of sand and gravel are thought to be stream-terrace deposits (Isbister, 1966).

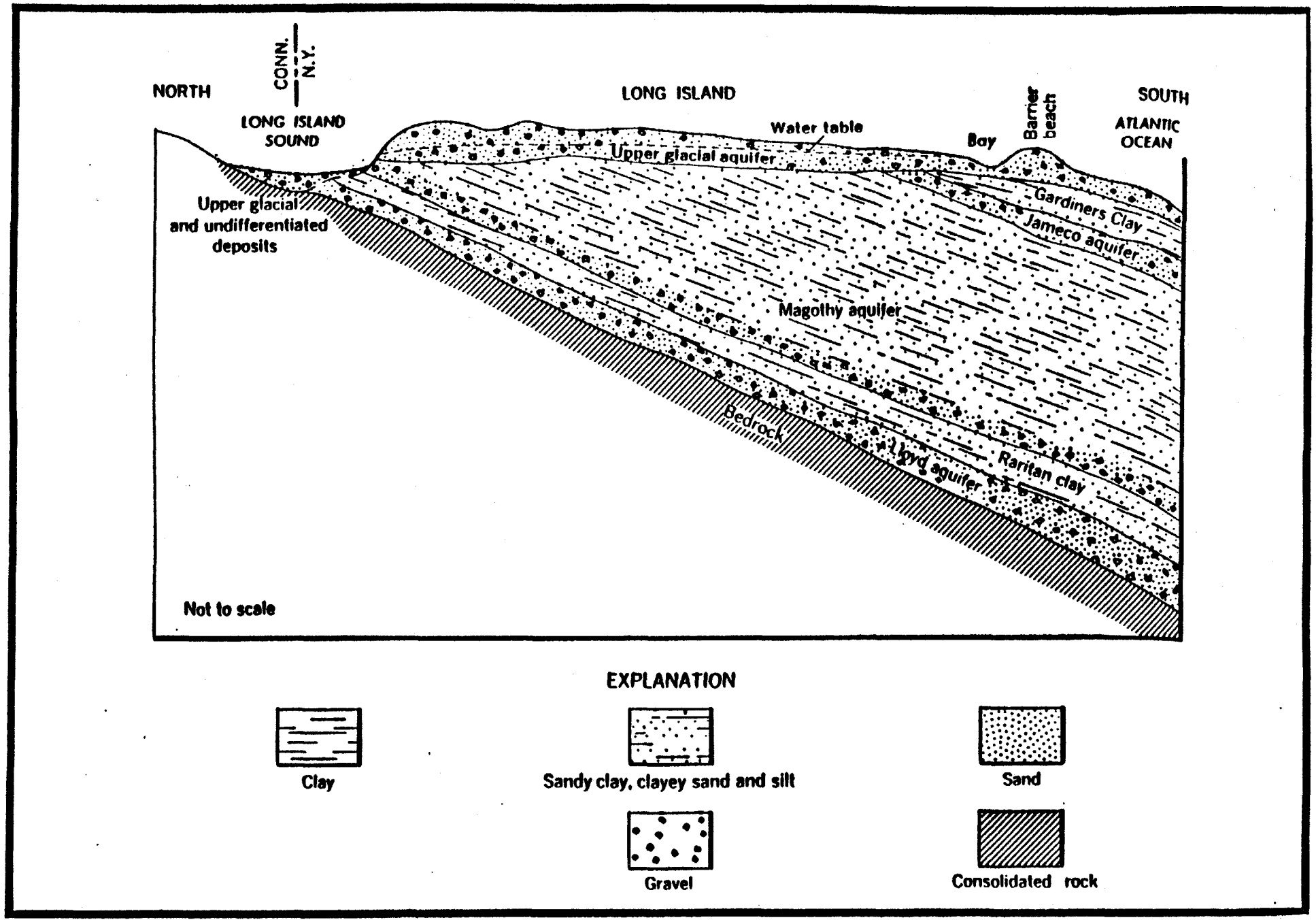

FIGURE 1-4. GENERALIZED GEOLOGIC CROSS SECTION IN THE VICINITY OF THE SYOSSET LANDFILL (McClymonds & Franke, 1972)

The early Pleistocene Jameco Gravel unconformably overlies older formations in Nassau County and represents the earliest glaciation in the area. The 0- to 185-foot thick silt, sand, and gravel beds were deposited as part of an early Pleistocene (Illinoian) outwash plain (Isbister, 1966).

The marine Gardiners Clay overlies either the Jameco Gravels or the Raritan Formation, depending on location in the county. The grayish-green clay and silt interglacial deposits contain localized sand and gravel lenses (Isbister, 1966). Gardiners Clay is an interbedded outwash plain and shallow marine deposit laid down during an interglacial rise in sea level (Seaburn, 1969).

The Upper Pleistocene deposits include all the glacial deposits above the Gardiner Clay. Two morainal deposits were formed during the Wisconsinan (Upper Pleistocene) glacial advance and retreat. The Ronkonkoma Drift is composed of a ground moraine, a terminal moraine, and an outwash plain. These topographic features were formed when the ice sheet reached its maximum seaward position. Later, the ice sheet established a new position along the north shore marked by the Harbor Hill end moraine (Isbister, 1966). In Nassau County, the moraine deposits formed a wide undulatory band, instead of the two distinct moraines notable in neighboring Suffolk County (Seaburn, 1969).

Localized recent surficial deposits include gravel, sand, silt, clay, and peat from river, salt marsh, and shore deposits (Seaburn, 1969).

The types of soils present in Nassau County are greatly varied due to differing surficial deposits and climatic effects. The soil at the Syosset Landfill site is classified by the Soil Conservation Service as Refuse Substratum (Seaburn, 1969). This classification includes nearly level to steep, sandy soils in sanitary landfills that have been reworked by earth moving and grading equipment to cover trash and other refuse. Some areas of this map unit are in former sand and gravel pits, and others have been filled with the original soil material. The original soil material in the vicinity of the Syosset Landfill is the Urban Land-Hempstead Complex. This unit,

which is exposed nearby, consists of urbanized areas and very deep, well-drained soils. This soil unit consists of about 75-percent urbanized areas, 20-percent Hempstead soils, and 5-percent other soils (Seaburn, 1969).

Topography and Drainage

The Syosset Landfill is located in Nassau County, New York, which is part of the Atlantic Coastal Plain physiographic province. The northern part of the county is characterized by undulating or rolling landscapes, resulting from Pleistocene glacial erosion and deposition. Elevation in the county ranges from sea level along the coast to 340 feet above msl 3 miles east of the Syosset Landfill. Areas in the county with higher elevations have irregular topography that is crossed by deep glacial drainage channels. The steepest relief is along these drainage channels or on the side slopes adjacent to the deep bays on the north shore (Wulforst, 1987).

The landscape in the immediate vicinity of the Syosset Landfill slopes gently towards the southeast, with an elevation of approximately 180 feet above msl. The site itself is in a depression of between 160 and 180 feet elevation.

The drainage of Nassau County is dominated by small perennial streams. A few larger streams carry runoff to the estuaries of the south shore. These are, from west to east, Valley Stream, Mill River, East Meadow Brook, Bellmore Creek, and Massapequa Creek. A few shorter creeks, such as Hook, Moths, Powell, and Seaford Creeks, also drain towards the southern shore (Wulforst, 1987). Most of the drainage to the north shore is intermittant. Glen Cove Creek and Mill Neck Creek are the largest creeks that drain towards the north shore. Other shorter, mostly intermittant creeks drain into the bays of the north shore.

The drainage on site is poorly defined (i.e., no well-integrated drainage system is present). The surface runoff for the surrounding area and the TOB-DPW office area is channeled into stormwater drainage pipes

and other culverts. Much of this channeled runoff from the site and surrounding area, between state Routes 25 and 25A, flows into a series of closed depressions or ponds (Wulforst, 1987). Two of these ponds, located to the north and northeast immediately adjacent to the site, may receive runoff from the site. In this developed area, these depressions provide a significant amount of ground-water recharge. The collection and recharge system is designed to reduce the loss of fresh water due to uncontrolled runoff.

Site observations suggest that the drainage on site is poor in some areas. Standing water was observed in ponds and ditches during Versar's site visit in February 1989. Generally, infiltration should be moderately rapid due to sandy surface soils.

Hydrogeology

The water-bearing geologic units at the Syosset Landfill site include the Lloyd Sand Member of the Raritan Formation, the Magothy(?) Formation, the Jameco Gravel, and the Upper Pleistocene till and outwash deposits (Upper Glacial Aquifer)(Figure 1-4). Figure 1-5 shows a generalized cross-section incorporating regional ground-water flow direction and the hydraulic divide near the Syosset Landfill. The following paragraphs describe the hydrogeologic properties of these units.

The 0 to 270 foot thick Lloyd Sand Member of the Raritan Formation is moderately permeable and contains water under artesian pressure. The low permeability of the overlying Clay Member retards, but does not prevent, movement of water downward to the Lloyd Sand Member. Specific capacities from wells in the Lloyd Sand Member range from 3 to 25 gallons per minute (gpm) per foot of drawdown. Wells yield as much as 1,300 gpm (Isbister, 1966) in this unit, which makes up most of the deep confined aquifer.

The Magothy(?) Formation contains relatively impermeable to highly permeable zones yielding water of generally excellent quality. The thickness of the formation in Nassau County varies from 0 to 800 feet. The wells yield up to 1,400 gpm, with specific capacities averaging

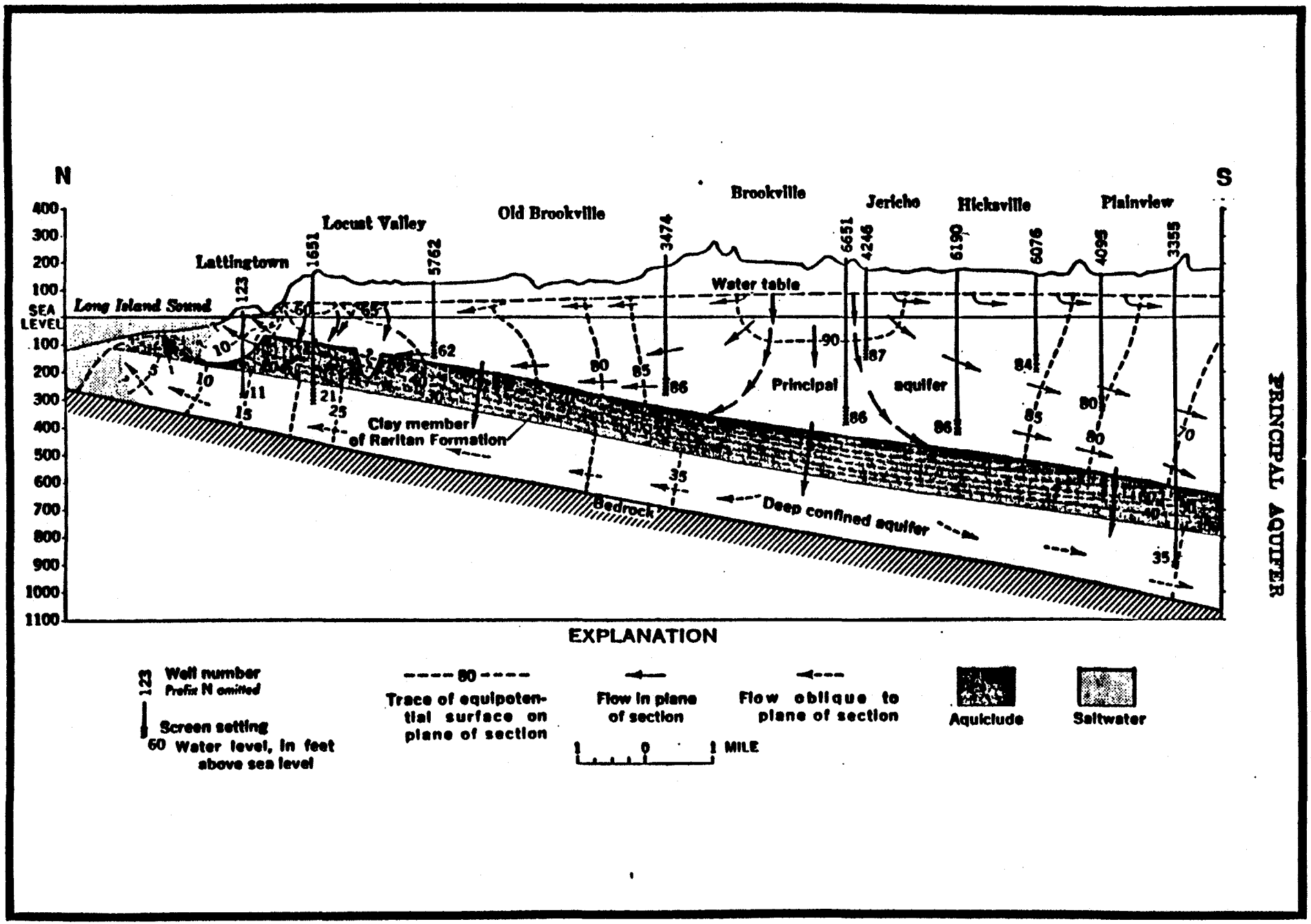

FIGURE 1-5. HYDRAULIC SECTION THROUGH THE GROUND-WATER RESERVOIR IN THE VICINITY OF THE SYOSSET LANDFILL (ISBISTER, 1966)

between 15 and 30 gpm per foot of drawdown. This formation is the principal source for public drinking water in Nassau County and forms most of the principal aquifer. The degree of confinement in this unit increases with depth (Isbister, 1966).

The 0- to 185-foot thick Jameco Gravel is moderately to highly permeable with well yields as high as 1,500 gpm. Specific capacities range from 19 to 25 gpm per foot of drawdown for this unit, which may produce water with high iron content. Water is under artesian pressure and some wells flow naturally. This deposit forms part of the deep confined aquifer (Isbister, 1966).

The Pleistocene glacial till and outwash deposits are up to 400 feet thick in Nassau County and generally possess low permeability. Under the site, the contact between the glacial deposits and the underlying Magothy(?) Formation varies from 70 to 110 feet below land surface (Geraghty & Miller, 1989). The lithologically variable glacial deposits can impede downward percolation of water to underlying beds and cause perched water tables. The outwash-plain deposits are highly permeable. Specific capacitance ranges from 19 to 25 gpm per foot of drawdown and well yields are as much as 1,100 gpm. The glacial deposits form the upper part of the principal aquifer and produce good quality water (Isbister, 1966).

Horizontal ground-water flow in the area of the landfill is to the northeast, with some variation over time and depth to either the east or north. The site is located north of a ground-water divide (Figure 1-5); hence, there is a distinct vertical flow component in the Magothy(?) aquifer. According to observations made at the site (Geraghty & Miller, 1989), the ground-water divide does not intersect the site as a result of seasonal fluctuations.

Climatology

Long Island possesses a modified continental climate, which results from the combined influence of prevailing westerly winds and the proximity of the Atlantic Ocean. The climate is relatively humid and

temperature extremes are modified by the Atlantic Ocean and, to a lesser extent, by Long Island Sound. Mean annual precipitation ranges from 40 to 50 inches with an annual average of 43 inches for the analysis period of 1951 to 1965 (Miller and Frederick, 1969). Precipitation records from the Garden City weather station indicate that precipitation is heaviest in March, July, and August, and lightest in January, February, June, and October (Isbister, 1966). Mean monthly precipitation for the analysis period of 1951 to 1980 ranges from 2.93 inches in June to 4.44 inches in March (NOAA, 1982).

Precipitation is distributed evenly throughout the year. Thunderstorms occur about 25 times per year, usually in the summer months. On the average, 15 days of the year will have at least 1 inch of snow on the ground (Wulforst, 1987).

In winter, the average daily high temperature is 33°F and the average daily low temperature is 27°F. The summertime average temperature is 72°F and the average daily maximum temperature is 81°F (Wulforst, 1987). The annual mean temperature is 52.9°F, with an average minimum of 45.6°F and an average maximum of 60.2°F (NOAA, 1982).

The average relative humidity is about 55 percent in mid-afternoon and 70 percent at dawn. The sun shines 65 percent of the time possible in the summer and 55 percent of the time in the winter (Wulforst, 1987). Based on data compiled from 1965 to 1969, the average annual wind speed at the Fort Totten, New York, weather station is 5.25 meters per second (m/s). Figure 1-6 is a wind rose diagram showing that winds are dominantly from the south and west. However, the highest average wind speeds (6.66 m/s) are from the northwest (GEMS, 1989).

1.3 Contaminants Found On Site

The U.S. EPA Region II provided Versar with three groups of analytical data. The first data set consisted of analytical results for 30 ground-water samples collected in June and July 1988. These samples were analyzed for Target Compound List (TCL) volatile organic compounds

STAR STATION NEW YORK/FT. TOTTEN 1965-1969
SECTOR (FREQUENCY)

N	8.217E-02
NNE	4.690E-02
NE	4.780E-02
ENE	4.268E-02
E	4.869E-02
ESE	2.783E-02
SE	2.905E-02
SSE	2.772E-02
S	1.408E-01
SSW	6.798E-02
SW	5.985E-02
WSW	8.003E-02
W	9.260E-02
WNW	5.870E-02
NW	8.643E-02
NNW	6.121E-02

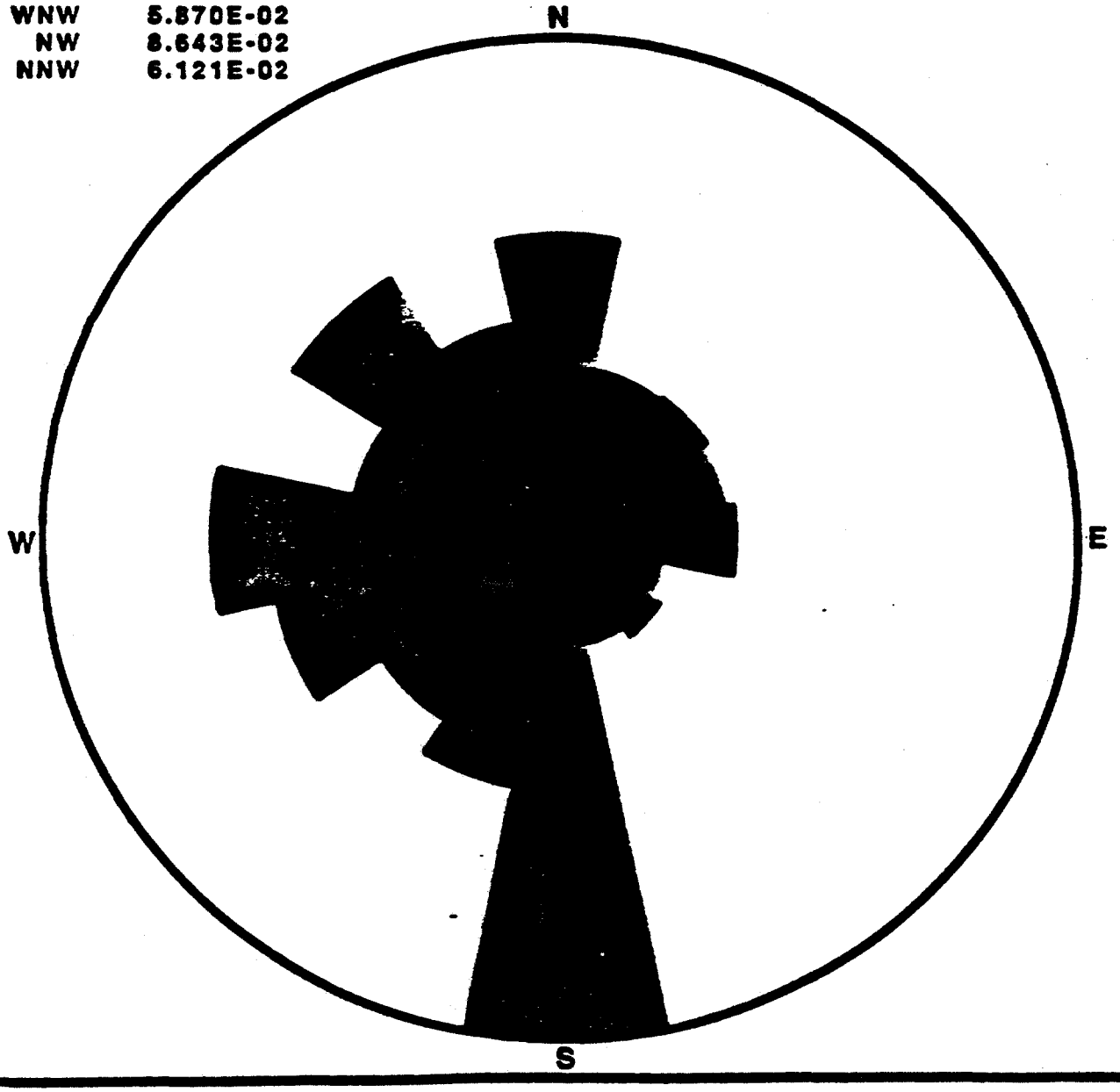

FIGURE 1-6. ROSE DIAGRAM OF WIND DISTRIBUTION FROM FORT TOTTEN, N.Y., WEATHER STATION (GEMS, 1989)

(VOC), TCL semivolatile organic compounds, TCL polychlorinated biphenyls (PCBs), and Target Analyte List (TAL) metals. Both filtered and unfiltered samples were collected for metals analysis in ground water during the May 1988 sampling effort. Only unfiltered analytical results were used in this risk assessment. The second data set consisted of analytical results from ten soil borings at depths varying from 15 to 183 feet. These were analyzed for TCL VOCs, TCL semivolatiles, and leachable metals using the Extraction Procedure (EP) Toxicity Method. In addition, four soil borings (B-1 through B-4), which were analyzed for PCBs, were collected from October 1987 through March 1988. Six of the ten soil borings were collected in conjunction with ground-water monitoring well installation activities. Because only leachable metals results were available from the PRP contractors, total metals analyses from split samples collected during RI/FS activities by Versar, Inc., were used in the risk assessment. The third data set consisted of analytical results from 13 gas monitoring wells for TCL VOCs. These results were sampled on two occasions, in July 1987 and August 1988. In addition to these data sets, Versar received sample splits from approximately 10 percent of the samples collected by Geraghty & Miller. A listing of the compounds and elements resolved by these analytical methods is presented in Table 1-1.

The data was compiled and evaluated to determine the types or classes of contaminants as well as concentrations characterizing the site. The analytical results from the Syosset Landfill site used in this risk assessment may be found in Appendix A. Approximate sample locations for all media are shown in Figures 1-7 and 1-8. The analytical data was statistically summarized in order to estimate the distribution frequency of the positively detected compounds and elements identified from the samples collected at the Syosset Landfill site. Summary statistics presented in Table 1-2 include the number of occurrences, maximum concentrations, and the geometric mean for each compound.

TABLE 1-1
LIST OF CHEMICALS ANALYZED FOR AT SYOSSET LANDFILL SITE

VOLATILE ORGANIC COMPOUNDS

Chloromethane
Bromomethane
Vinyl Chloride
Chloroethane
Methylene Chloride
Acetone
Carbon Disulfide
1,1-Dichloroethene
1,1-Dichloroethane
1,2-Dichloroethene
Chloroform
1,2-Dichloroethane
2-Butanone
1,1,1-Trichloroethane
Carbon Tetrachloride
Vinyl Acetate
Bromodichloromethane
1,2-Dichloropropene
Trans-1,3-Dichloropropene
Trichloroethene
Dibromochloromethane
1,1,2-Trichloroethane
Benzene
cis-1,3-Dichloropropene
2-Chloroethylvinyl Ether
Bromoform
2-Hexanone
4-Methyl-2-Pentanone
Tetrachloroethene
1,1,2,2-Tetrachloroethane
Toluene
Chlorobenzene
Ethylbenzene
Styrene
Total Xylenes
Dichlorodifluoromethane

SEMIVOLATILE ORGANIC COMPOUNDS

Phenol
bis (2-Chloroethyl) Ether
2-Chlorophenol
1,3-Dichlorobenzene
1,4-Dichlorobenzene
1,2-Dichlorobenzene
bis (2-Chloroisopropyl) Ether
N-Nitroso-Di-n-Propylamine
Hexachloroethane
Nitrobenzene
Isophorone
2-Nitrophenol
2,4-Dimethylphenol
bis (2-chloroethoxy) Methane
2,4-Dichlorophenol
1,2,4-Trichlorobenzene
Naphthalene
Hexachlorobutadiene
4-Chloro-3-Methylphenol
Hexachlorocyclopentadiene
2,4,6-Trichlorophenol
2-Chloronaphthalene
Dimethyl Phthalate
Acenaphthylene
Acenaphthene
2,4-Dinitrophenol
4-Nitrophenol
2,4-Dinitrotoluene
2,6-Dinitrotoluene
Diethyl Phthalate
4-Chlorophenyl Phenyl Ether
Fluorene
4,6-Dinitro-2-Methylphenol
N-Nitrosodiphenylamine
4-Bromophenyl Phenyl Ether
Hexachlorobenzene
Pentachlorophenol
Phenanthrene
Anthracene
Di-N-Butyl Phthalate
Fluoranthene
Pyrene
Butyl Benzyl Phthalate
3,3'-Dichlorobenzidine
Benzo(A)Anthracene
bis (2-Ethylhexyl) Phthalate
Chrysene
Di-N-Octyl Phthalate
Benzo(b)Fluoranthene
Benzo(k)Fluoranthene
Benzo(a)Pyrene
Indeno (1,2,3-cd) Pyrene
Dibenzo(a,h)Anthracene
Benzo(g,h,i)Perylene
Benzidine
1,2-Diphenylhydrazine

INORGANIC METALS AND CYANIDE

Aluminum
Antimony
Arsenic
Barium
Beryllium
Cadmium
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Magnesium
Manganese
Mercury
Nickel
Potassium
Selenium
Silver
Sodium
Thallium
Tin
Vanadium
Zinc
Cyanide

EP-TOXICITY METALS

EP-TOX Antimony
EP-TOX Arsenic
EP-TOX Beryllium
EP-TOX Cadmium
EP-TOX Chromium
EP-TOX Copper
EP-TOX Lead
EP-TOX Mercury
EP-TOX Nickel
EP-TOX Selenium
EP-TOX Silver
EP-TOX Thallium
EP-TOX Zinc

POLYCHLORINATED BIPHENYLS (PCBs)

Aroclor-1016
Aroclor-1221
Aroclor-1232
Aroclor-1242
Aroclor-1248
Aroclor-1254
Aroclor-1260

MISCELLANEOUS INORGANIC COMPOUNDS

Phenols (ug/L in aqueous samples)
Ammonia
Nitrites
Nitrates
Nitrate-Nitrite
Chlorides
Total Dissolved Solids
Total Organic Carbon

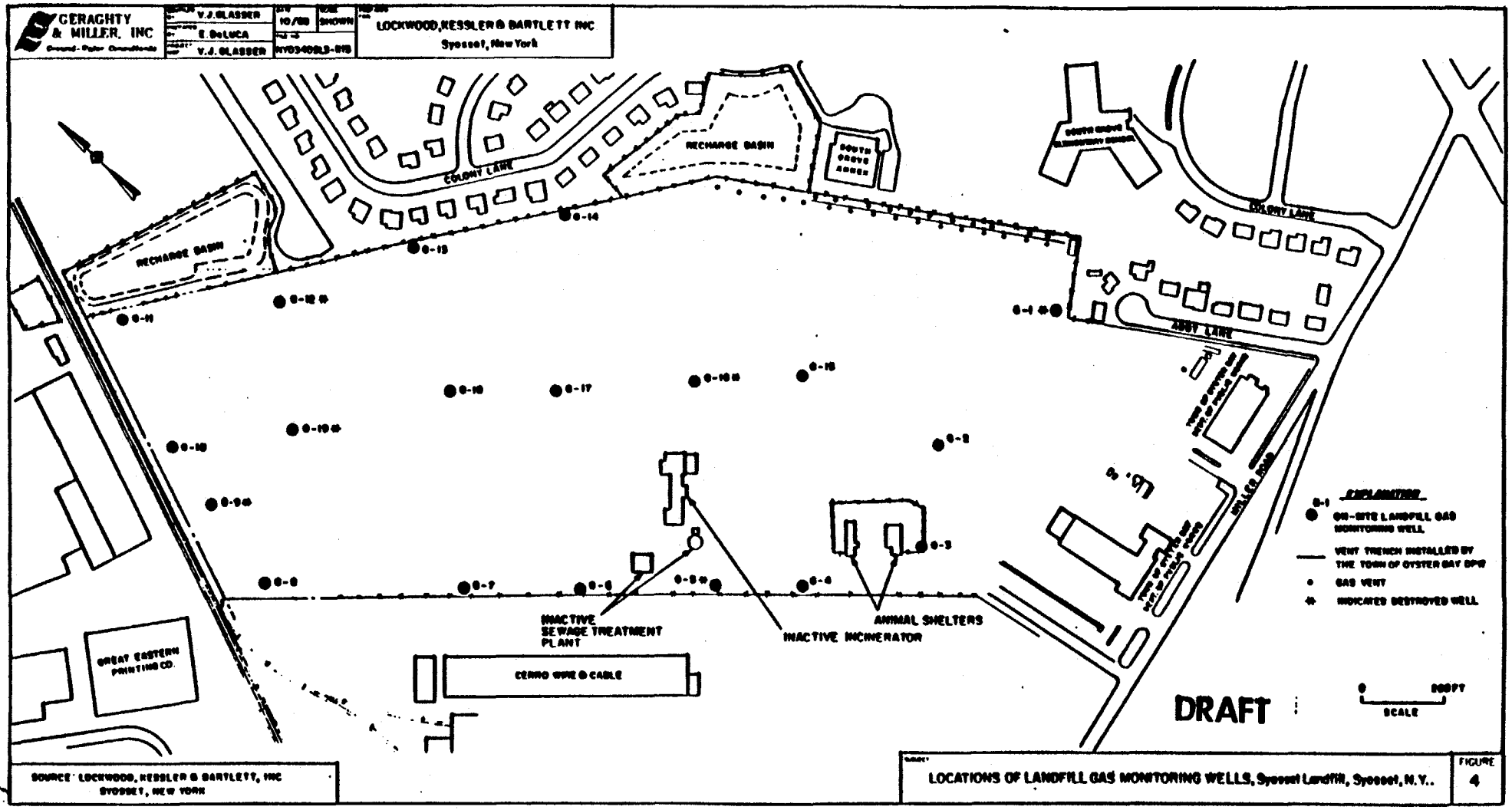

FIGURE 1-7. LOCATIONS OF SOIL GAS MONITORING WELLS, SYOSSET LANDFILL (GERAGHTY AND MILLER, 1989)

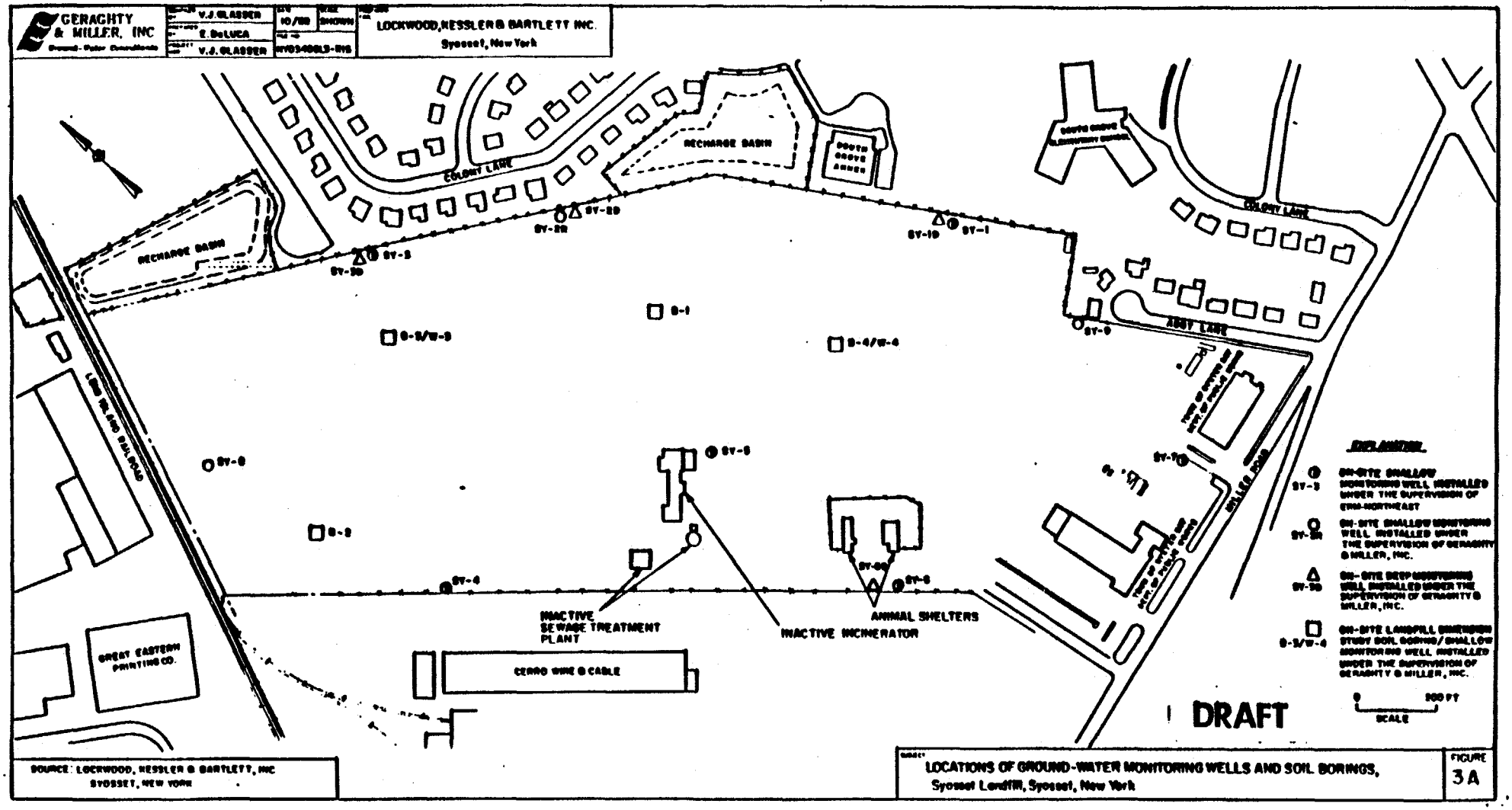

FIGURE 1-8. LOCATIONS OF GROUND-WATER MONITORING WELLS, SYOSSET LANDFILL (GERAGHTY AND MILLER, 1989)

TABLE 1-2
SUMMARY OF ANALYTICAL RESULTS

	GROUNDWATER			SOIL			SOIL GAS		
	GEOMETRIC MEAN	MAX	FREQUENCY	GEOMETRIC MEAN	MAX	FREQUENCY	GEOMETRIC MEAN	MAX	FREQUENCY
Volatile Organic Compounds (ppb)									
Acetone	2.27	7.00	1/20	86.35	750.00	13/42	-	-	-
Carbon disulfide	1.58	2.50	0/20	4.30	22.00	5/42	-	-	-
Chloromethane	1.58	5.00	0/20	1.82	40.00	1/42	0.71	1.00	1/26
Bromoethane	1.58	5.00	0/20	1.81	40.00	2/42	0.71	1.00	1/26
Dichlorodifluoromethane	0.71	1.00	0/20	1.00	5.00	0/42	1.73	100.00	1/26
Vinyl chloride	1.58	5.00	0/20	1.81	40.00	1/42	3.26	400.00	6/26
Chloroethane	1.58	5.00	0/20	1.82	40.00	1/42	1.35	400.00	2/26
Methylene chloride	1.58	2.50	0/20	1.78	74.00	4/42	10.17	180.00	15/26
Trichlorofluoromethane	1.00	1.00	0/20	1.00	10.00	0/42	2.49	29.00	3/26
1,1-Dichloeoethene	1.58	2.50	0/20	1.46	20.00	0/42	1.96	8.00	2/26
1,1-Dichloroethane	1.76	4.00	5/20	1.47	20.00	1/42	2.04	55.00	1/26
1,2-Dichloroethene	1.58	9.00	0/20	1.46	20.00	0/42	1.93	18.00	1/26
Chloroform	1.43	18.00	2/20	1.58	20.00	6/42	4.16	12.00	15/26
1,2-Dichloroethane	1.58	2.50	0/20	1.48	20.00	1/42	1.79	3.00	1/26
1,1,1-Trichloroethane	1.12	2.50	0/20	1.50	20.00	2/42	1.23	4.00	5/26
Carbon Tetrachloride	1.12	2.50	0/20	1.48	20.00	2/42	1.00	1.00	0/26
Bromodichloromethane	1.12	2.50	0/20	1.49	20.00	2/42	1.04	2.00	1/26
1,2-Dichloropropene	1.58	2.50	0/20	1.49	20.00	1/42	1.73	2.00	0/26
Trans-1,3-Dichloropropene	1.58	2.50	0/20	1.49	20.00	1/42	1.73	2.00	0/26
Trichloroethene(or -ylene)	1.40	7.00	4/20	1.48	20.00	1/42	1.29	7.00	4/26
Chlorodibromomethane	0.71	1.00	0/20	1.48	20.00	1/42	1.00	1.00	0/26
1,1,2-Trichloroethane	1.58	2.50	0/20	1.49	20.00	1/42	1.41	2.00	0/26
cis-1,3-Dichloropropene	1.58	2.50	0/20	1.48	20.00	1/42	1.73	2.00	0/26
2-Chloroethyl vinyl ether	1.00	1.00	0/20	1.80	40.00	1/42	1.73	2.00	0/26
Bromoform	1.58	2.50	0/20	1.51	20.00	1/42	1.41	2.00	0/26
1,1,2,2-Tetrachloroethane	1.58	2.50	0/20	1.49	20.00	1/42	1.41	2.00	0/26
Tetrachloroethene	1.61	19.00	3/20	1.49	20.00	3/42	5.70	12.00	20/26
Chlorobenzene	1.86	37.00	8/20	1.71	180.00	6/42	1.00	1.00	0/26
1,3-Dichlorobenzene	1.00	1.00	0/20	1.00	10.00	0/42	-	-	-
1,2-Dichlorobenzene	1.00	1.00	0/20	1.00	10.00	0/42	-	-	-
1,4-Dichlorobenzene	1.05	3.00	0/20	1.00	230.00	1/42	1.41	2.00	0/26
Benzene	1.20	3.00	3/20	1.51	20.00	2/42	3.64	180.00	6/26
Toluene	1.55	2.50	3/20	1.52	20.00	2/42	54.36	240.00	20/26
2-Butanone	1.00	1.00	1/20	2.00	40.00	5/42	-	-	-
Vinyl Acetate	2.24	5.00	0/20	1.80	40.00	0/42	-	-	-
Dibromodichloromethane	1.58	2.50	0/20	-	-	-	-	-	-
4-Methyl-2-pentanone	2.24	5.00	0/20	1.79	40.00	1/42	-	-	-
2-Hexanone	2.24	5.00	0/20	1.80	40.00	0/42	-	-	-
Styrene	1.58	2.50	0/20	1.49	20.00	2/42	-	-	-
Ethylbenzene	1.12	2.50	0/20	1.56	41.00	4/42	4.44	250.00	11/26
m-xylene	1.00	1.00	0/20	1.00	10.00	0/42	17.30	230.00	18/26
o + p xylene	1.41	2.00	0/20	1.00	20.00	0/42	7.58	108.00	11/26
Total Xylenes	1.58	2.50	0/20	1.70	69.00	3/42	-	-	-

For compounds not detected, the value used to calculate means and maximums is 1/2 the detection limit. For compounds there were no detections (i.e., 0 frequency), the mean and maximum values presented are 1/2 the detection limit.

TABLE 1-2
SUMMARY OF ANALYTICAL RESULTS

	GROUNDWATER			SOIL			SOIL GAS		
	GEOMETRIC MEAN	MAX	FREQUENCY	GEOMETRIC MEAN	MAX	FREQUENCY	GEOMETRIC MEAN	MAX	FREQUENCY
Base-Nueutral Extractable Compounds (ppb)									
N-nitrosodimethylamine	-	-	-	469.17	14000	0/12			
bis(2-Chloroethyl)Ether	5.00	5.00	1/30	469.17	14000	0/12			
1,3-Dichlorobenzene	4.09	5.00	2/30	469.17	14000	0/12			
1,4-Dichlorobenzene	3.63	5.00	6/30	469.17	14000	0/12			
1,2-Dichlorobenzene	3.89	5.00	3/30	385.68	14000	1/12			
Benzyl alcohol	5.00	5.00	0/30	-	-	-			
bis(2-chloroisopropyl)ether	5.00	5.00	0/30	469.17	14000	0/12			
Hexachloroethane	5.00	5.00	0/30	469.17	14000	0/12			
N-nitroso-di-n-propylamine	5.00	5.00	0/30	469.17	14000	0/12			
Nitrobenzene	5.00	5.00	0/30	469.17	14000	0/12			
Isophorone	5.00	5.00	0/30	469.17	14000	0/12			
Benzoic Acid	20.24	25.00	3/30	-	-	-			
bis(2-chloroethoxy)methane	5.00	5.00	0/30	469.17	14000	0/12			
1,2,4-trichlorobenzene	5.00	5.00	0/30	469.17	14000	0/12			
Naphthalene	4.80	5.00	1/30	321.47	24000	6/12			
4-chloroaniline	5.00	5.00	0/30	-	-	-			
Hexachlorobutadiene	5.00	5.00	0/30	469.17	14000	0/12			
2-methylnaphthalene	5.00	5.00	0/30	-	-	-			
Hexachlorocyclopentadiene	5.00	5.00	0/30	469.17	14000	0/12			
2-Chloronaphthalene	5.00	5.00	0/30	469.17	14000	0/12			
2-Nitroaniline	25.00	25.00	0/30	-	-	-			
Dimethyl Phthalate	5.00	5.00	0/30	426.03	10000	1/12			
Acenaphthylene	5.00	5.00	0/30	478.98	14000	1/12			
3-nitroaniline	25.00	25.00	0/30	-	-	-			
2,6-Dinitrotoluene	5.00	5.00	0/30	469.17	14000	0/12			
Acenaphthene	5.00	5.00	0/30	251.65	7200	7/12			
Dibenzofuran	5.00	5.00	0/30	-	-	-			
2,4-Dinitrotoluene	5.00	5.00	0/30	469.17	14000				
Diethylphthalate	3.92	5.00	1/30	333.54	14000	3/12			
Flourene	3.97	5.00	2/30	269.46	5600	7/12			
4-Nitroaniline	12.50	25.00	0/30	-	-	-			
4-Chlorophenyl phenyl ether	5.00	10.00	0/30	469.17	14000	0/12			
4-Bromophenyl phenyl ether	5.00	5.00	0/30	469.17	14000	0/12			
N-nitrosodiphenylamine	3.79	5.00	3/30	466.05	14000	1/12			
Hexachlorobenzene	5.00	5.00	0/30	469.17	14000	0/12			
Phenanthrene	5.00	5.00	0/30	373.28	9700	9/12			
Anthracene	5.00	5.00	0/30	321.67	14000	5/12			

For compounds not detected, the value used to calculate means and maximums is 1/2 the detection limit. For compounds there were no detections (i.e., 0 frequency), the mean and maximum values presented are 1/2 the detection limit.

TABLE 1-2
SUMMARY OF ANALYTICAL RESULTS

	GROUNDWATER			SOIL			SOIL GAS		
	GEOMETRIC MEAN	MAX	FREQUENCY	GEOMETRIC MEAN	MAX	FREQUENCY	GEOMETRIC MEAN	MAX	FREQUENCY
Base-Nueutral Extractable Compounds (continued) (ppb)									
Di-n-butyl phthalate	5.00	5.00	0/30	159.73	10000	11/12			
Fluoranthene	3.73	5.00	3/30	388.47	9000	9/12			
Benzidine	0.00	0.00	0/30	469.17	14000	0/12			
Pyrene	4.40	5.00	1/30	243.22	3900	9/12			
Butyl Benzyl Phthalate	3.04	5.00	5/30	458.66	14000	1/12			
3,3'-Dichlorobenzidine	9.10	10.00	0/30	938.17	28000	0/12			
Benzo(a)anthracene	5.00	5.00	0/30	454.24	14000	4/12			
bis(2-Ethylhexyl)Phthalate	6.60	32.00	11/30	1183.34	47000	7/12			
Chrysene	5.00	5.00	0/30	458.56	14000	4/12			
Di-n-Octylphthalate	6.09	39.00	5/30	290.45	27000	3/12			
Benzo(b)Fluoranthene	5.00	5.00	0/30	474.39	10000	3/12			
Benzo(k)Fluoranthene	5.00	5.00	0/30	469.17	14000	0/12			
Benzo(a)pyrene	5.00	5.00	0/30	291.00	10000	6/12			
Indeno(1,2,3-cd)Pyrene	5.00	5.00	0/30	380.58	14000	3/12			
Dibenz(a,h)Anthracene	5.00	5.00	0/30	469.17	14000	0/12			
Benzo(g,h,i)Perylene	5.00	5.00	0/30	465.18	14000	2/12			
1,2-Diphenyl Hydrazine	-	-	-	469.17	14000	0/12			
Propanoic acid	-	-	-	-	-	-			

For compounds not detected, the value used to calculate means and maximums is 1/2 the detection limit. For compounds where there were no detections (i.e., 0 frequency), the mean and maximum values presented are 1/2 the detection limit.

TABLE 1-2
SUMMARY OF ANALYTICAL RESULTS

	GROUNDWATER			SOIL			SOIL GAS		
	GEOMETRIC MEAN	MAX	FREQUENCY	GEOMETRIC MEAN	MAX	FREQUENCY	GEOMETRIC MEAN	MAX	FREQUENCY
Acid-Extractable Compounds (ppb)									
Phenol	5.00	5.00	0/30	469.17	14000	0/12			
2-Chlorophenol	5.00	5.00	0/30	469.17	14000	0/12			
2-Methylphenol	5.00	5.00	0/30	-	-	-			
4-Methylphenol	4.79	5.00	1/30	-	-	-			
2-Nitrophenol	5.00	5.00	0/30	469.17	14000	0/12			
2,4-Dimethylphenol	5.00	5.00	0/30	469.17	14000	0/12			
2,4-Dichlorophenol	5.00	5.00	0/30	469.17	14000	0/12			
4-chloro-3-methylphenol	5.00	5.00	0/30	469.17	14000	0/12			
2,4,6-Trichlorophenol	5.00	5.00	0/30	469.17	14000	0/12			
2,4,5-Trichlorophenol	25.00	25.00	0/30	-	-	-			
2,4-Dinitrophenol	25.00	25.00	0/30	2262.92	65000	0/12			
4-Nitrophenol	25.00	25.00	0/30	2262.92	65000	0/12			
4,6-dinitro-2-methylphenol	25.00	25.00	0/30	2262.92	65000	0/12			
Pentachlorophenol	25.00	25.00	0/30	2262.92	65000	0/12			
PCBs - Polychlorinated Biphenyls (ppb)									
AROCLOR-1016	0.50	1.00	0/30	163.54	20000	5/12			
AROCLOR-1221	0.50	1.00	0/30	69.55	20000	0/12			
AROCLOR-1232	0.50	1.00	0/30	69.55	20000	0/12			
AROCLOR-1242	0.50	1.00	0/30	69.55	20000	0/12			
AROCLOR-1248	0.50	1.00	0/30	69.55	20000	0/12			
AROCLOR-1254	0.50	1.00	0/30	131.56	20000	5/12			
AROCLOR-1260	0.50	1.00	0/30	69.55	20000	0/12			

For compounds not detected, the value used to calculate means and maximums is 1/2 the detection limit. For compounds where there were no detections (i.e., 0 frequency), the mean and maximum values presented are 1/2 the detection limit.

TABLE 1-2
SUMMARY OF ANALYTICAL RESULTS

	GROUNDWATER			SOIL			SOIL GAS		
	GEOMETRIC MEAN	MAX	FREQUENCY	GEOMETRIC MEAN	MAX	FREQUENCY	GEOMETRIC MEAN	MAX	FREQUENCY
Metals (ppb)									
Aluminum	-	-	-	718738	1900000	3/3			
Antimony	5.9	18.0	7/16	3866	5000	0/3			
Arsenic	11.9	180.0	6/16	3217	4500	3/3			
Beryllium	0.7	3.0	1/16	145	250	0/3			
Cadmium	0.5	0.5	0/16	581	650	0/3			
Calcium	-	-	-	752445	2300000	3/3			
Chromium	5.8	38.0	5/16	8816	10000	3/3			
Cobalt	-	-	-	1176	3850	3/3			
Copper	31.2	310.0	4/16	18052	30000	3/3			
Lead	5.0	130.0	2/16	1500000	1500000	1/3			
Magnesium	-	-	-	120078	590000	3/3			
Manganese	-	-	-	57170	170000	3/3			
Mercury	0.1	0.1	0/16	50	50	0/3			
Nickel	50.0	50.0	0/16	1590	6700	1/3			
Selenium	1.0	1.0	0/16	169	400	0/3			
Silver	0.6	2.0	1/16	733	1300	1/3			
Thallium	2.7	5.0	1/16	230	250	0/3			
Zinc	194	5200	10/16	15876	130000	3/3			
Sodium	103781	530000	11/16	130000	130000	1/3			
Potassium	17779	140000	11/16	173765	770000	3/3			
Barium	75	660	9/16	7575	20000	3/3			
Iron	5079	190000	11/16	9760187	18600000	3/3			
Vanadium	-	-	-	8823	14700	2/3			

For compounds not detected, the value used to calculate means and maximums is 1/2 the detection limit. For compounds where there were no detections (i.e., 0 frequency), the mean and maximum values presented are 1/2 the detection limit.

Of the volatile organics, benzene, chlorobenzene, ethylbenzene, chloroform, trichloroethene, tetrachloroethene, toluene, dibromochloroethane, and xylene represent the most frequently observed compounds detected in over 40 percent of the samples collected. Surface soil samples were not collected, so it is unclear whether volatile organic concentrations increase towards the soil surface.

Of the semivolatile compounds, two phthalates, di-n-octyl phthalate and bis(2-ethylhexyl)phthalate, were prevalent in both soil and ground-water media.

The only compound that exceeded the Safe Drinking Water Act Maximum Contaminant Levels (MCLs) in ground water for both mean and maximum contaminant concentrations was vinyl chloride (1 ppb). Vinyl chloride had no hits in the ground-water analytical results; however, detection limits were above the MCL. Because of the high detection limits, vinyl chloride contamination in excess of MCLs may be present. Maximum values for arsenic and lead exceeded primary drinking water standards. The maximum concentration for zinc exceeded secondary drinking water standards.

A soil sample representing background conditions was not collected; therefore, metals contamination in soil is difficult to assess. Frequently, metals are naturally-occurring constituents of soil derived from the underlying bedrock. In order to determine if levels of metals found in soil samples at the Syosset Landfill site represent a potential health risk, comparisons to local averages of these elements in soil can be made. Table 1-3 presents the ranges of concentrations of elements from Nassau County (Schechter, 1990) for comparison to analytical soil data obtained from the Syosset Landfill site. In addition to local data, national ranges and averages are presented, along with values from Nantucket Island, Massachusetts, which has a similar surficial geology.

TABLE 1-3
TRACE METAL CONTENT IN SOILS (ppm)

METAL	NASSAU COUNTY* NEW YORK	NATIONAL SAMPLES ** COMMON RANGE	NATIONAL SAMPLES ** AVERAGE	NANTUCKET ISLAND, MASSACHUSETTS***
Aluminum		10,000-300,000	71,000	700 - 20,000
Antimony		2-10		<1
Arsenic	1.8 - 14	1-50	5	<0.1 - 1.6
Barium	20 - 112	100-3,000	430	10 - 200
Beryllium		0.1-40	6	<1
Cadmium	0.4 - 12.7	0.01-0.7	0.6	
Calcium		Variable		130 - 2,300
Chromium	9.9 - 299	1-1,000	100	1 - 15
Cobalt		1-40	8	<3
Copper		2-100	30	<1 - 10
Iron		10-4,000	200	100 - 10,000
Lead	102 - 269	2-200	10	<10
Magnesium		600-6,000	5,000	50 - 1,500
Manganese		20-3,000	600	200 - 300
Mercury	0.04 - 0.23	0.01-0.3	0.03	<.01 - .02
Nickel		5-500	40	<5 - 5
Potassium		Variable		2,200 - 6,800
Selenium	<0.5	0.01-2	0.3	<0.1 - 0.1
Silver	<5	0.01-5	0.05	
Sodium		Variable		500 - 2,000
Thallium				
Vanadium		20-500	100	<7 - 20
Zinc		10-300	50	<5 - 17

*From Schechter, Joseph, Health Department, Nassau County, New York, Personal Communication, March 27, 1990.

**From U.S. EPA, Hazardous Waste Land Treatment: SW-874, April 1983. ppm = parts per million.

***From Shacklette, Hansford, P., and Boerngen, Josephine G., 1984, Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States. U.S.G.S. Professional Paper No. 1270.

Data collected for the Syosset Landfill site were found to be adequate for characterization of air and ground-water contamination. The evaluation of contamination of surface water and surface soil was not possible with the information provided. No surface water or surface soil analyses were available. Because of these data gaps, risks associated with contamination of surface soil, surface water, and contaminated dust from the site are not addressed in this document. These exposure routes are possible and should be evaluated if surface water and surface soil samples are collected in the future.

Analytical data were evaluated and mathematically converted to a usable format for risk evaluation. Non-detects, or "U" values, were included in the analysis as one-half the detection limit. This was done on the chance that the compound was present at the site below the detection limit. Results qualified with a "J" (estimated value) were used as hits with no mathematical modification. All hits were then evaluated to determine the statistical distribution of contaminants on site. The data set was determined to approximate a log-normal distribution. This distribution is not represented appropriately by an algebraic mean (sum of values divided by total number); therefore, the geometric mean (sum of log of values divided by total number) was calculated and used.

1.4 Findings of Previous Studies

The most recent study performed at the site was a Remedial Investigation (RI) submitted in draft form by Geraghty & Miller in January 1989, and in final form in August 1989. This report has been used as the main data and information basis for this endangerment assessment. The conclusions of the Draft RI were as follows (Geraghty & Miller, 1989):

- The dominant horizontal component of ground-water flow in both shallow and deep zones of the Magothy(?) aquifer is to the northeast. Shifts to the north in the deep zone and to the east in the shallow zone were also reported. The vertical flow component is downwards and is more pronounced than horizontal flow.

- Ground-water quality has been impacted by leachate. The highest concentrations of leachate indicator parameters (chloride, ammonia, alkalinity, hardness, total dissolved solids, specific conductance, and iron) were found in downgradient ground-water monitoring wells (both shallow and deep zones) and wells screened beneath the landfill. This suggests the presence of an off-site plume of leachate-impacted ground water.

- The distribution and concentrations of volatile organic compounds in ground water on site was not found to verify the existence of a plume of these specific compounds.

- No PCBs were detected in on-site wells; base-neutral-acid extractable compounds were not found in quantifiable concentrations in ground water.

- The extent and thickness of the landfill was verified. The landfill is composed of two lobes, one with a maximum thickness of 58 feet, and the other with a maximum thichness of 91 feet.

- Volatile and semivolatile organic compounds and PCBs were detected in inconsistent distributions in the fill samples analyzed.

- Methane concentrations detected in the gas monitoring wells are highest along the central axis of the landfill and lowest at the borders of the site. Landfill gases do not appear to be migrating upwards under detectable pressure. Some volatile organic compounds were detected in landfill gas samples.

Prior to the RI, a study was performed in 1981 by ERM-Northeast (ERM), for the Nassau County Department of Health. The study focused on the existence, magnitude, and quality of leachate plumes generated at the site. Elevated concentrations of leachate indicator parameters (ammonia, chloride, sodium sulfate, calcium, iron, alkalinity, hardness, and specific conductance) were detected in on-site monitoring wells installed by ERM. Heavy metals and volatile organic parameters were also detected at low to moderate concentrations. Water quality from the on-site wells was compared to off-site wells at the Cerro Wire and Cable Company immediately north of the site (N-3569 and N-6741), a well about 1 mile south (downgradient) of the landfill (N-6531), and a well on the Syosset Hospital property about 4,000 feet north of the landfill (N-7052). Evidence was found that the shallower Cerro Wire and Company well (N-3569) was impacted by leachate. An on-site leachate plume was also detected.

1.5 Selection of Indicator Chemicals

This endangerment assessment focuses on selected site contaminants that have been identified through a screening process. The contaminants selected represent chemicals posing the most significant adverse effects on human health or the environment. Indicator chemical selection is recommended when more than 10 or 20 compounds have been identified with the potential to enter the pathway of interest. Indicator chemicals are useful in limiting the number of compounds evaluated and providing measurable surrogates for high risk/high toxicity compounds that may have limited data. The indicator chemicals were selected independently for air and ground water. The indicator chemical selection process for both migration media was based on the approach outlined in the Superfund Public Health Evaluation Manual (SPHEM)(U.S. EPA, 1986a). These "indicator" chemicals are selected considering the following properties: intrinsic toxicological properties, quantity present (includes environmental concentration and prevalence at the site), and properties affecting the chemical's mobility in the environment (and therefore potentially critical exposure routes) (Life Systems, 1985).

The geometric mean of the monitoring data concentrations was used as the representative concentration value, while the highest detected concentration was used as the maximum value. The mean and maximum values were multiplied by the appropriate toxicity constants (ECAO, 1989) to obtain a calculated concentration times toxicity (CT) value for carcinogenic and noncarcinogenic contaminants. The CT scores were then ranked and compared by toxicological effect (carcinogenic or noncarcinogenic). The final selection process took into account the prevalence of the contaminant at the site by examining the frequency of detection. Only contaminants detected in greater than 5 percent of samples were evaluated. In addition, there was an attempt to include representative contaminants on the list of indicator chemicals from each class of compounds.

The indicator chemicals selected are marked with a (+) in the first column of Table 1-4. Indicator chemicals for the air exposure route are all volatile organic compounds. The following compounds were selected for air: benzene, chlorobenzene, chloroform, methylene chloride, tetrachloroethene, toluene, and vinyl chloride.

Equations for evaluation of the emission rates for VOCs require either direct readings of VOCs in soil pore spaces (from gas vents or soil gas surveys) or contaminant data from ground water and soils. Some of the chemicals evaluated were not detected in soil gas, yet had high concentrations in soil and ground water. Chlorobenzene was selected based on a very high soil concentration, of 180 parts per billion (ppb), even though it was undetected in the soil gas survey.

The indicator chemical selection process for ground water was the same as for air, but involved a broader variety of elements, chemicals, and compounds. Indicator chemicals selected are marked with a (+) in the first column in Table 1-5. Among the VOCs detected in the ground water at the site, benzene, chloroform, tetrachloroethene, and trichloroethene were found to rank the highest. Only one base-neutral acid extractable compound (BNA or semivolatile) ranked high enough to be considered: bis(2-ethylhexyl)phthalate. Among the metals present at the site, arsenic, barium, and zinc ranked high and were detected more than once. Although lead ranked high in ground water, it was not selected due to the low number of occurrences (2). A high concentration of lead was detected in one deep soil sample; however, further evaluation was not justified because that value was the only hit out of 47 soil analyses.

In summary, the indicator chemicals selected for this endangerment assessment are listed below:

- Arsenic
- Barium
- Zinc
- Benzene
- Chlorobenzene
- Chloroform
- Methylene chloride
- Bis(2-ethylhexyl)phthalate
- Tetrachloroethene
- Toluene
- Trichloroethene
- Vinyl chloride

TABLE 1-4

INDICATOR CHEMICAL SELECTION DATA SHEET FOR THE AIR PATHWAY

IND CHM	COMPOUND	FREQ (A)	SOIL MEAN CONC (ppb) (B)	GAS MAX CONC (ppb) (B)	CLASS (C)	WT OF EVID-ENCE (D)	RVe (E)	CARCINOGENS AIR TOXICITY (m3/mg) (F)	CT MEAN (G)	MEAN RANK	CT MAX (G)	MAX RANK	NONCARCINOGENS AIR TOXICITY (m3/mg) (F)	CT MEAN (G)	MEAN RANK	CT MAX (G)	MAX RANK
	ACETONE	-	-	-	NC	-	-	-	-	-	-	-	-	-	-	-	-
+	BENZENE	6/20	3.64	180.0	PC	A	10	7.71E-02	2.81E-01	6	1.39E+01	3	1.18E+02	4.30E+02	1	2.12E+04	1
	BROMODICHLOROMETHANE	1/20	1.04	2.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	BROMOETHANE	0/20	0.71	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	CARBON DISULFIDE	-	-	-	NC	-	7	-	-	-	-	-	4.24E+00	0.00E+00		0.00E+00	-
	CARBON TETRACHLORIDE	0/20	1.00	1.0	PC	B2	10	1.88E+01	1.88E+01	1	1.88E+01	1	3.17E+00	3.17E+00	4	3.17E+00	10
+	CHLOROBENZENE	0/20	1.00	1.0	NC	-	1	-	-	-	-	-	2.79E-01	2.79E-01	11	2.79E-01	13
	CHLOROETHANE	2/20	1.35	400.0	-	-	-	-	-	-	-	-	-	-	-	-	-
+	CHLOROFORM	15/20	4.16	12.0	PC	B2	-	5.63E-01	2.34208	3	6.756	5	-	-	-	-	-
	DICHLORODIFLUOROMETHANE	1/20	1.73	100.0	NC	-	-	-	-	-	-	-	-	-	-	-	-
	1,1-DICHLOROETHANE	1/20	2.04	55.0	NC	-	7	-	-	-	-	-	2.58E-01	5.26E-01	9	1.42E+01	6
	1,2-DICHLOROETHANE	0/20	1.79	3.0	PC	B2	8	5.86E-01	1.05E+00	4	1.76E+00	6	1.10E+00	1.97E+00	7	3.30E+00	9
	1,1-DICHLOROETHENE	2/20	1.96	8.0	PC	C	5	1.23E+00	2.41E+00	2	9.84E+00	4	5.65E+00	1.11E+01	3	4.52E+01	4
	1,2-DICHLOROETHENE	1/20	1.93	10.0	NC	-	5	-	-	-	-	-	5.29E-01	1.02E+00	8	5.29E+00	8
	ETHYLBENZENE	11/20	4.44	250.0	NC	-	4	-	-	-	-	-	1.10E-01	4.88E-01	10	2.75E+01	5
	METHYL ETHYL KETONE	-	-	-	NC	-	10	-	-	-	-	-	7.75E-02	0.00E+00	-	0.00E+00	-
+	METHYLENE CHLORIDE	15/20	10.17	180.0	PC	B2	10	-	-	-	-	-	9.20E-03	9.36E-02	13	1.66E+00	11
	STYRENE	-	-	-	NC	-	-	-	-	-	-	-	-	-	-	-	-
+	TETRACHLOROETHENE	20/20	5.70	12.0	PC	B2	10	8.86E-02	5.05E-01	5	1.06E+00	7	2.75E-02	1.57E-01	12	3.30E-01	12
+	TOLUENE	20/20	54.36	240.0	NC	-	7	-	-	-	-	-	5.20E-02	2.83E+00	6	1.25E+01	7
	1,1,1-TRICHLOROETHANE	5/20	1.23	4.0	NC	-	2	-	-	-	-	-	7.33E-03	9.02E-03	15	2.93E-02	14
	TRICHLOROETHENE	4/20	1.29	7.0	PC	B2	4	4.29E-02	5.53E-02	8	3.00E-01	8	2.96E+01	3.82E+01	2	2.07E+02	3
	TRICHLOROFLUOROMETHANE	3/20	2.49	29.0	NC	-	-	-	-	-	-	-	-	-	-	-	-
+	VINYL CHLORIDE	6/20	3.26	400.0	PC	A	10	4.29E-02	1.40E-01	7	1.72E+01	2	8.77E-01	2.86E+00	5	3.51E+02	2
	m-XYLENE	18/20	17.30	230.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	o + p XYLENE	11/20	7.58	108.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	XYLENES	-	-	-	NC	-	-	-	-	-	-	-	-	-	-	-	-

NOTES:

(A) Frequency is the total number of detections of a chemical out of 20 analyses.
(B) Concentrations are statistical summaries of analytical data. Compounds not detected are represented as 1/2 the detection limit.
(C) Potential carcinogens are labeled PC, and noncarcinogens are labeled NC (U.S. EPA,, 1986a).
(D) Weight of evidence refers to the certainty of carcinogenicity in humans, 'A' being the most certain (U.S. EPA, 1986a).
(E) Rating Value (RVe) refers to the severity of noncarcinogenic toxicity, 10 being the most toxic (U.S. EPA, 1986a).
(F) Toxicity constants for carcinogenic and noncarcinogenic effects of chemicals (U.S. EPA, 1986a).
(G) CT is the product of either the mean or maximum concentration and toxicity constant.

TABLE 1-5
INDICATOR CHEMICAL SELECTION DATA SHEET FOR THE GROUND-WATER PATHWAY

IND CHM	COMPOUND	FREQ (A)	GROUND WATER MEAN CONC (ug/l) (B)	GROUND WATER MAX CONC (ug/l) (B)	CLASS (C)	WT OF EVID-ENCE (D)	RVe (E)	CARCINOGENS: WATER TOXICITY (mg/kg/day) (F)	CARCINOGENS: CT MEAN (G)	CARCINOGENS: MEAN RANK	CARCINOGENS: CT MAX (G)	CARCINOGENS: MAX RANK	NONCARCINOGENS: WATER TOXICITY (mg/kg/day) (F)	NONCARCINOGENS: CT MEAN (G)	NONCARCINOGENS: MEAN RANK	NONCARCINOGENS: CT MAX (G)	NONCARCINOGENS: MAX RANK
	Acetone	1/16	2.27	7.0	NC	-	5	-	-	-	-	-	1.67E-02	3.79E-02	26	1.17E-01	26
	Carbon disulfide	0/16	1.58	2.5	NC	-	10	-	-	-	-	-	4.52E-02	7.15E-02	23	1.13E-01	27
	Chloromethane	0/16	1.58	5.0	PC	C	-	-	-	-	-	-	-	-	-	-	-
	Bromoethane	0/16	1.58	5.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	Dichlorodifluoromethane	0/16	0.71	1.0	NC	-	-	-	-	-	-	-	-	-	-	-	-
+	Vinyl chloride	0/16	1.58	5.0	PC	A	10	4.29E-03	6.78E-03	14	2.14E-02	14	8.77E-02	1.39E-01	20	4.38E-01	19
	Chloroethane	0/16	1.58	5.0	-	-	-	-	-	-	-	-	-	-	-	-	-
+	Methylene chloride	0/16	1.58	2.5	PC	B2	10	-	-	-	-	-	-	-	-	-	-
	Trichlorofluoromethane	0/16	1.00	1.0	NC	-	-	-	-	-	-	-	-	-	-	-	-
	1,1-Dichloroethene	0/16	1.58	2.5	PC	C	6	-	-	-	-	-	-	-	-	-	-
	1,1-Dichloroethane	5/16	1.76	4.0	NC/PC	B2	-	-	-	-	-	-	-	-	-	-	-
	1,2-Dichloroethene	0/16	1.58	9.0	PC	B2	5	-	-	-	-	-	-	-	-	-	-
+	Chloroform	2/16	1.43	18.0	PC	B2	7	5.63E-02	8.04E-02	10	1.01E+00	10	4.43E-02	6.32E-02	25	7.97E-01	18
	1,2-Dichloroethane	0/16	1.58	2.5	NC	C	10	3.71E-03	5.87E-03	15	9.28E-03	17	1.76E-02	2.78E-02	27	4.40E-02	28
	1,1,1-Trichloroethane	0/16	1.12	2.5	NC	-	2	-	-	-	-	-	-	-	-	-	-
	Carbon Tetrachloride	0/16	1.12	2.5	PC	B2	10	-	-	-	-	-	-	-	-	-	-
	Bromodichloromethane	0/16	1.12	2.5	PC	B2	-	-	-	-	-	-	-	-	-	-	-
	1,2-Dichloropropane	0/16	1.58	2.5	PC	B2	-	-	-	-	-	-	-	-	-	-	-
	Trans-1,3-Dichloropropene	0/16	1.58	2.5	-	-	10	-	-	-	-	-	-	-	-	-	-
+	Trichloroethene(or -ylene)	4/16	1.40	7.0	PC	B2	5	2.00E-03	2.80E-03	17	1.40E-02	16	1.05E+00	1.47E+00	16	7.35E+00	15
	Chlorodibromomethane	0/16	0.71	1.0	-	B2	6	-	-	-	-	-	-	-	-	-	-
	1,1,2-Trichloroethane	0/16	1.58	2.5	NC/PC	C	-	-	-	-	-	-	-	-	-	-	-
	cis-1,3-Dichloropropene	0/16	1.58	2.5	-	-	10	-	-	-	-	-	-	-	-	-	-
	2-Chloroethyl vinyl ether	0/16	1.00	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bromoform	0/16	1.58	2.5	-	D	-	-	-	-	-	-	-	-	-	-	-
	1,1,2,2-Tetrachloroethane	0/16	1.58	2.5	PC	C	5	-	-	-	-	-	-	-	-	-	-
+	Tetrachloroethene	3/16	1.61	19.0	PC	B2	7	8.29E-03	1.34E-02	11	1.58E-01	12	9.62E-03	1.55E-02	28	1.83E-01	22
+	Chlorobenzene	8/16	1.86	37.0	NC	-	4	-	-	-	-	-	1.43E-01	2.65E-01	17	5.29E+00	16
	1,3-Dichlorobenzene	0/16	1.00	1.0	-	D	-	-	-	-	-	-	-	-	-	-	-
	1,2-Dichlorobenzene	0/16	1.00	1.0	NC	D	6	-	-	-	-	-	-	-	-	-	-
	1,4-Dichlorobenzene	0/16	1.05	3.0	NC/PC	B2	-	-	-	-	-	-	-	-	-	-	-
+	Benzene	3/16	1.20	3.0	PC	A	5	7.71E-03	9.26E-03	13	2.31E-02	13	1.17E-01	1.40E-01	19	3.51E-01	20
+	Toluene	3/16	1.55	2.5	NC	-	7	-	-	-	-	-	5.20E-03	8.06E-03	30	1.30E-02	30
	2-Butanone	1/16	1.00	1.0	NC	-	-	-	-	-	-	-	-	-	-	-	-
	Vinyl Acetate	0/16	2.24	5.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	Dibromodichloromethane	0/16	1.58	2.5	-	D	-	-	-	-	-	-	1.82E+00	2.88E+00	15	4.55E+00	17
	4-Methyl-2-pentanone	0/16	2.24	5.0	-	-	4	-	-	-	-	-	3.07E-02	6.86E-02	24	1.53E-01	23
	2-Hexanone	0/16	2.24	5.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	Styrene	0/16	1.58	2.5	NC	-	-	-	-	-	-	-	-	-	-	-	-
	Ethylbenzene	0/16	1.12	2.5	NC	-	4	-	-	-	-	-	1.10E-02	1.23E-02	29	2.75E-02	29
	m-xylene	0/16	1.00	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	o + p xylene	0/16	1.41	2.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total Xylenes	0/16	1.58	2.5	NC	-	10	-	-	-	-	-	4.40E-03	6.96E-03	31	1.10E-02	31

TABLE 1-5 (CONTINUED)
INDICATOR CHEMICAL SELECTION DATA SHEET FOR THE GROUND-WATER PATHWAY

IND CHM	COMPOUND	FREQ (A)	GROUND WATER MEAN CONC (ug/l) (B)	GROUND WATER MAX CONC (ug/l) (B)	CLASS (C)	WT OF EVID-ENCE (D)	RVe (E)	CARCINOGENS WATER TOXICITY (mg/kg/day) (F)	CARCINOGENS CT MEAN (G)	CARCINOGENS MEAN RANK	CARCINOGENS CT MAX (G)	CARCINOGENS MAX RANK	NONCARCINOGENS WATER TOXICITY (mg/kg/day) (F)	NONCARCINOGENS CT MEAN (G)	NONCARCINOGENS MEAN RANK	NONCARCINOGENS CT MAX (G)	NONCARCINOGENS MAX RANK
	N-nitrosodimethylamine	-	-	-	PC	B2	-	-	-	-	-	-	-	-	-	-	-
	bis(2-Chloroethyl)Ether	1/16	5.00	5.0	PC	B2	-	1.74E-01	8.70E-01	2	8.70E-01	11	-	-	-	-	-
	1,3-Dichlorobenzene	2/16	4.09	5.0	NC	D	-	-	-	-	-	-	-	-	-	-	-
	1,4-Dichlorobenzene	6/16	3.63	5.0	NC/PC	B2	-	-	-	-	-	-	-	-	-	-	-
	1,2-Dichlorobenzene	3/16	3.89	5.0	NC	D	6	-	-	-	-	-	2.41E-02	9.38E-02	22	1.20E-01	25
	Benzyl alcohol	0/16	5.00	5.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	bis(2-chloroisopropyl)ether	0/16	5.00	5.0	-	-	10	-	-	-	-	-	-	-	-	-	-
	Hexachloroethane	0/16	5.00	5.0	NC/PC	C	6	-	-	-	-	-	-	-	-	-	-
	N-nitroso-di-n-propylamine	0/16	5.00	5.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	Nitrobenzene	0/16	5.00	5.0	NC	-	-	-	-	-	-	-	-	-	-	-	-
	Isophorone	0/16	5.00	5.0	NC/PC	C	-	-	-	-	-	-	-	-	-	-	-
	Benzoic Acid	3/16	20.24	25.0	NC	-	-	-	-	-	-	-	-	-	-	-	-
	bis(2-chloroethoxy)methane	0/16	5.00	5.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	1,2,4-trichlorobenzene	0/16	5.00	5.0	NC	-	4	-	-	-	-	-	-	-	-	-	-
	Naphthalene	1/16	4.80	5.0	NC	-	-	-	-	-	-	-	-	-	-	-	-
	4-chloroaniline	0/16	5.00	5.0	NC	C	-	-	-	-	-	-	-	-	-	-	-
	Hexachlorobutadiene	0/16	5.00	5.0	NC	C	-	-	-	-	-	-	-	-	-	-	-
	2-methylnaphthalene	0/16	5.00	5.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	Hexachlorocyclopentadiene	0/16	5.00	5.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	2-Chloronaphthalene	0/16	5.00	5.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	2-Nitroaniline	0/16	25.00	25.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	Dimethyl Phthalate	0/16	5.00	5.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	Acenaphthylene	0/16	5.00	5.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	3-nitroaniline	0/16	25.00	25.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	2,6-Dinitrotoluene	0/16	5.00	5.0	PC	B2	9	-	-	-	-	-	-	-	-	-	-
	Acenaphthene	0/16	5.00	5.0	-	C	-	-	-	-	-	-	-	-	-	-	-
	Dibenzofuran	0/16	5.00	5.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	2,4-Dinitrotoluene	0/16	5.00	5.0	PC	B2	9	-	-	-	-	-	-	-	-	-	-
	Diethylphthalate	1/16	3.92	5.0	-	-	4	-	-	-	-	-	-	-	-	-	-
	Flourene	2/16	3.97	5.0	-	D	-	-	-	-	-	-	-	-	-	-	-
	4-Nitroaniline	0/16	12.50	25.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	4-Chlorophenyl phenyl ether	0/16	5.00	10.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	4-Bromophenyl phenyl ether	0/16	5.00	5.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	N-nitrosodiphenylamine	3/16	3.79	5.0	PC	B2	-	-	-	-	-	-	-	-	-	-	-
	Hexachlorobenzene	0/16	5.00	5.0	NC/PC	B2	10	-	-	-	-	-	-	-	-	-	-
	Phenanthrene	0/16	5.00	5.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	Anthracene	0/16	5.00	5.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	Di-n-butyl phthalate	0/16	5.00	5.0	-	-	-	-	-	-	-	-	3.81E-02	1.90E-01	18	1.90E-01	21
	Fluoranthene	3/16	3.73	5.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	Benzidine	0/16	0.00	0.0	NC/PC	A	10	-	-	-	-	-	-	-	-	-	-
	Pyrene	1/16	4.40	5.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	Butyl Benzyl Phthalate	5/16	3.04	5.0	NC	C	-	-	-	-	-	-	-	-	-	-	-
	3,3'-Dichlorobenzidine	0/16	9.10	10.0	PC	B2	6	-	-	-	-	-	-	-	-	-	-
	Benzo(a)anthracene	0/16	5.00	5.0	-	B2	-	5.81E-01	2.90E+00	1	2.90E+00	2	-	-	-	-	-
+	bis(2-Ethylhexyl)Phthalate	11/16	6.60	32.0	NC/PC	B2	-	5.72E-04	3.78E-03	16	1.83E-02	15	-	-	-	-	-

TABLE 1-5 (CONTINUED)
INDICATOR CHEMICAL SELECTION DATA SHEET FOR THE GROUND-WATER PATHWAY

IND CHM	COMPOUND	FREQ (A)	GROUND WATER MEAN CONC (ug/l) (B)	GROUND WATER MAX CONC (ug/l) (B)	CLASS (C)	WT OF EVID-ENCE (D)	RVe (E)	CARCINOGENS WATER TOXICITY (mg/kg/day) (F)	CARCINOGENS CT MEAN (G)	CARCINOGENS MEAN RANK	CARCINOGENS CT MAX (G)	CARCINOGENS MAX RANK	NONCARCINOGENS WATER TOXICITY (mg/kg/day) (F)	NONCARCINOGENS CT MEAN (G)	NONCARCINOGENS MEAN RANK	NONCARCINOGENS CT MAX (G)	NONCARCINOGENS MAX RANK
	Chrysene	0/16	5.00	5.0	-	B2	-	-	-	-	-	-	-	-	-	-	-
	Di-n-Octylphthalate	5/16	6.09	39.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	Benzo(b)Fluoranthene	0/16	5.00	5.0	-	B2	-	-	-	-	-	-	-	-	-	-	-
	Benzo(k)Fluoranthene	0/16	5.00	5.0	-	D	-	-	-	-	-	-	-	-	-	-	-
	Benzo(a)pyrene	0/16	5.00	5.0	PC	B2	8	-	-	-	-	-	2.68E-02	1.34E-01	21	1.34E-01	24
	Indeno(1,2,3-cd)Pyrene	0/16	5.00	5.0	-	C	-	-	-	-	-	-	-	-	-	-	-
	Dibenz(a,h)Anthracene	0/16	5.00	5.0	-	B2	-	-	-	-	-	-	-	-	-	-	-
	Benzo(g,h,i)Perylene	0/16	5.00	5.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	Phenol	0/16	5.00	5.0	NC	-	4	-	-	-	-	-	-	-	-	-	-
	2-Chlorophenol	0/16	5.00	5.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	2-Methylphenol	0/16	5.00	5.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	4-Methylphenol	1/16	4.79	5.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	2-Nitrophenol	0/16	5.00	5.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	2,4-Dimethylphenol	0/16	5.00	5.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	2,4-Dichlorophenol	0/16	5.00	5.0	-	-	5	-	-	-	-	-	-	-	-	-	-
	4-chloro-3-methylphenol	0/16	5.00	5.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	2,4,6-Trichlorophenol	0/16	5.00	5.0	-	B2	-	-	-	-	-	-	-	-	-	-	-
	2,4,5-Trichlorophenol	0/16	25.00	25.0	-	-	6	-	-	-	-	-	-	-	-	-	-
	2,4-Dinitrophenol	0/16	25.00	25.0	-	-	8	-	-	-	-	-	-	-	-	-	-
	4-Nitrophenol	0/16	25.00	25.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	4,6-dinitro-2-methylphenol	0/16	25.00	25.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	Pentachlorophenol	0/16	25.00	25.0	NC	D	7	-	-	-	-	-	-	-	-	-	-
	AROCLOR-1016	0/16	0.50	1.0	PC	B2	7	1.44E+00	7.20E-01	3	1.44E+00	3	9.33E+01	4.66E+01	4	9.33E+01	4
	AROCLOR-1221	0/16	0.50	1.0	PC	B2	7	1.44E+00	7.20E-01	4	1.44E+00	4	9.33E+01	4.66E+01	5	9.33E+01	5
	AROCLOR-1232	0/16	0.50	1.0	PC	B2	7	1.44E+00	7.20E-01	5	1.44E+00	5	9.33E+01	4.66E+01	6	9.33E+01	6
	AROCLOR-1242	0/16	0.50	1.0	PC	B2	7	1.44E+00	7.20E-01	6	1.44E+00	6	9.33E+01	4.66E+01	7	9.33E+01	7
	AROCLOR-1248	0/16	0.50	1.0	PC	B2	7	1.44E+00	7.20E-01	7	1.44E+00	7	9.33E+01	4.66E+01	8	9.33E+01	8
	AROCLOR-1254	0/16	0.50	1.0	PC	B2	7	1.44E+00	7.20E-01	8	1.44E+00	8	9.33E+01	4.66E+01	9	9.33E+01	9
	AROCLOR-1260	0/16	0.50	1.0	PC	B2	7	1.44E+00	7.20E-01	9	1.44E+00	9	9.33E+01	4.66E+01	10	9.33E+01	10

TABLE 1-5 (CONTINUED)
INDICATOR CHEMICAL SELECTION DATA SHEET FOR THE GROUND-WATER PATHWAY

IND CHM	COMPOUND	FREQ	GROUND WATER MEAN CONC (ug/l)	GROUND WATER MAX CONC (ug/l)	CLASS	WT OF EVID-ENCE	RVe	CARCINOGENS WATER TOXICITY (mg/kg/day)	CARCINOGENS CT MEAN	CARCINOGENS MEAN RANK	CARCINOGENS CT MAX	CARCINOGENS MAX RANK	NONCARCINOGENS WATER TOXICITY (mg/kg/day)	NONCARCINOGENS CT MEAN	NONCARCINOGENS MEAN RANK	NONCARCINOGENS CT MAX	NONCARCINOGENS MAX RANK
		(A)	(B)	(B)	(C)	(D)	(E)	(F)	(G)		(G)		(F)	(G)		(G)	
	Aluminum	NA	NA	NA	-	-	-	-	-	-	-	-	-	-	-	-	-
	Antimony	7/16	5.9	18.0	NC	-	10	-	-	-	-	-	4.35E+00	2.58E+01	11	7.83E+01	14
+	Arsenic	6/16	11.9	180.0	NC/PC	A	9	-	-	-	-	-	1.80E+01	2.14E+02	2	3.24E+03	1
	Beryllium	1/16	0.7	3.0	NC/PC	B2	-	-	-	-	-	-	-	-	-	-	-
	Cadmium	0/16	0.5	0.5	NC/PC	B1	8	-	-	-	-	-	-	-	-	-	-
	Calcium	NA	NA	NA	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chromium	5/16	5.8	38.0	-	-	-	-	-	-	-	-	-	-	-	-	-
	Cobalt	NA	NA	NA	-	-	-	-	-	-	-	-	-	-	-	-	-
	Copper	4/16	31.2	310.0	NC	-	5	-	-	-	-	-	7.14E-01	2.23E+01	12	2.21E+02	4
	Lead	2/16	5.0	130.0	NC/PC	B2	10	-	-	-	-	-	8.93E-01	4.49E+00	14	1.16E+02	6
	Magnesium	NA	NA	NA	-	-	-	-	-	-	-	-	-	-	-	-	-
	Manganese	NA	NA	NA	NC	-	-	-	-	-	-	-	-	-	-	-	-
	Mercury	0/16	0.1	0.1	NC	-	7	-	-	-	-	-	-	-	-	-	-
	Nickel	0/16	50.0	50.0	NC/PC	A	10	2.29E-01	1.14E+01	12	1.14E+01	1	4.26E+00	2.13E+02	3	2.13E+02	5
	Selenium	0/16	1.0	1.0	NC	-	10	-	-	-	-	-	-	-	-	-	-
	Silver	1/16	0.6	2.0	-	-	1	-	-	-	-	-	-	-	-	-	-
	Thallium	1/16	2.7	5.0	NC	-	4	-	-	-	-	-	-	-	-	-	-
+	Zinc	10/16	194	5200	NC	-	8	-	-	-	-	-	1.07E-01	2.08E+01	13	5.56E+02	3
	Sodium	11/16	103781	530000	-	-	-	-	-	-	-	-	-	-	-	-	-
	Potassium	11/16	17779	140000	-	-	-	-	-	-	-	-	-	-	-	-	-
+	Barium	9/16	75	660	NC	-	10	-	-	-	-	-	4.08E+00	3.06E+02	1	2.69E+03	2
	Iron	11/16	5079	190000	-	-	-	-	-	-	-	-	-	-	-	-	-

NOTES:
(A) Frequency is the total number of detections of a chemical out of 16 analyses.
(B) Concentrations are statistical summaries of analytical data. Compounds not detected are represented as 1/2 the detection limit.
(C) Potential carcinogens are labeled PC; noncarcinogens are labeled NC (U.S. EPA, 1986a).
(D) Weight of evidence refers to the certainty of carcinogenicity in humans, 'A' being the most certain (U.S. EPA, 1986a).
(E) Rating Value (RVe) refers to the severity of noncarcinogenic toxicity, 10 being the most toxic (U.S. EPA, 1986a).
(F) Toxicity constants for carcinogenic and noncarcinogenic effects of chemicals (U.S. EPA, 1986a).
(G) CT is the product of either the mean or maximum concentration and toxicity constant.

2.0 ENVIRONMENTAL FATE AND TRANSPORT MECHANISMS EVALUATION

2.1 Arsenic

Though a rare element, arsenic (As) is ubiquitous in the earth's crust and occurs in hundreds of minerals, often with sulfur. With four possible oxidation states (3-, 0, 3+, and 5+), arsenic's speciation is both complex and important in determining its fate. Interconversions of the 3+ and 5+ states and organic complexation have the greatest impact of any transformations (Clement Associates, Inc., 1985). Arsenic is generally mobile in all environments in comparison to other metals. The chemical form of arsenic and the properties of the surrounding medium determine the degree of mobility of the metal.

When atmospheric deposition, runoff from soils, and industrial discharge send arsenic into aqueous environments, it tends to cycle through the water column, sediments, and biota. Arsenate (As^{5+}) is generally the dominant species in aquatic systems, but biological activities may produce arsenite (As^{3+}), methylated arsenicals (As^{3-}), and the highly volatile arsenic hydrides (AsH_3)(U.S. EPA, 1984a). Most salts and compounds of arsenic are soluble in water (USDHHS, 1985). Ambient pH and Eh (reduction-oxidation potential) conditions determine the prevailing form of the metal and thus influence its fate (U.S. EPA, 1979). Adsorption to and desorption from sediments dominates the aquatic cycling process. Iron concentration affects aqueous arsenic sorption, and coprecipitation with hydrous oxides of iron is a prevalent process (U.S. EPA, 1979). Transport in solution to ocean sediments is the major sink for arsenic in water. Volatilization of arsenic or methylarsenics through biotransformations and highly reducing conditions is also an important mobilization process from surface waters (Clement Associates, Inc., 1985). Due to arsenic's toxicity, bioaccumulation is not an important fate in aqueous media and is significant only in lower trophic levels (U.S. EPA, 1979).

On land and in the atmosphere, arsenic is also quite mobile. In the air, arsenic trioxide (As_2O_3) is the dominant species. Arsenic

particles remain in the atmosphere for only a short period before continuing to cycle through the environment. Wet or dry deposition removes arsenic from the air. The properties of the soil determine the fate of arsenic on land. Soils containing clays and organic matter sorb arsenic well and retard its leachability. Arsenic will mobilize into the ground water from soils with low sorptive capacity (U.S. EPA, 1984a). As with aquatic biota, bioaccumulation of toxic arsenic by terrestrial organisms contributes little to its transport and fate.

2.2 Barium

Barium is a naturally-occurring metal found in many types of rock. Limestones, sandstones, and soils in the eastern United States may contain 300 to 500 ppm barium (Federal Register, 1985). Barium is extremely reactive, decomposes in water, and readily forms insoluble carbonate and sulfate salts. Barium is present in solution in surface or ground water only in trace amounts. Large amounts will not dissolve because natural waters usually contain sulfate, and the solubility of barium sulfate is generally low. Barium is not soluble at more than a few parts per million in water that contains sulfate at more than a few parts per million. The presence of chloride or other anions may increase barium sulfate solubility (Clement Associates, Inc., 1985).

Atmospheric particulate barium is removed by wet and dry deposition and it has a residence time of several days. In aquatic media, barium is likely to be present primarily as suspended particulate matter or sediments. In soils, barium is not expected to be very mobile because of its formation of water-insoluble salts and its inability to form soluble complexes with humic and fulvic materials. Under acidic conditions, however, some of the water insoluble barium compounds may be solubilized and move back into ground water (U.S. EPA, 1984b).

2.3 Zinc

Zinc can occur in both suspended and dissolved forms. Dissolved zinc may occur as the free (hydrated) zinc ion or as dissolved complexes

and compounds with varying degrees of stability and toxicity. Suspended (undissolved) zinc may be dissolved following minor changes in water chemistry or may be sorbed to suspended matter. The predominant fate of zinc in aerobic aquatic systems is sorption of the divalent cation onto hydrous iron and manganese oxides, clay minerals, and organic material. The efficiency of these materials in removing zinc from solution varies according to their compositions and concentrations, the pH and salinity of the water, the concentrations of complexing ligands, and the concentration of zinc. Concentrations of zinc in suspended and bed sediments always exceed concentrations in ambient water. In reducing environments, precipitation of zinc sulfide limits the mobility of zinc. However, under aerobic conditions, precipitation of zinc compounds is probably important only where zinc is present in high concentrations. Zinc tends to be more readily sorbed at higher pH than lower pH and tends to be desorbed from sediments as salinity increases. Compounds of zinc with the common ligands of surface waters are soluble in most neutral and acidic solutions, so that zinc is readily transported in most unpolluted, relatively organic-free waters (Clement Associates, Inc., 1985).

The relative mobility of zinc in soil is determined by the same factors affecting its transport in aquatic systems. Atmospheric transport of zinc is also possible. However, except near sources such as smelters, zinc concentrations in air are relatively low and fairly constant (Clement Associates, Inc., 1985).

Because it is an essential nutrient, zinc is strongly bioaccumulated even in the absence of abnormally high ambient concentrations. Zinc does not appear to be biomagnified. Although zinc is actively bioaccumulated in aquatic systems, the biota appear to represent a relatively minor sink compared to the sediments. Zinc is one of the most important metals in biological systems. Because it is bioaccumulated, the environmental concentrations of zinc probably exhibit seasonal fluctuations (Clement Associates, Inc., 1985).

2.4 Benzene

Benzene is a clear, colorless, highly flammable liquid and is slightly soluble in water (Windholz et al., 1983). Volatilization is a primary transport process. Based on cloud-chamber data, photooxidative destruction in the troposphere is thought to be rapid and complete (Clement Associates, Inc., 1985). The half-life of benzene in the atmosphere has been reported to range from 2.4 to 50 hours, depending on relative reactivities. Due to the relatively rapid attack of hydroxyl radicals, and because benzene does not absorb at wavelengths of light longer than 260 nm, diffusion to the stratosphere and subsequent photolysis are not expected (Callahan et al., 1979).

Because atmospheric transport is benzene's principal transport mechanism, it can be anticipated that volatilization is the major transport process of benzene from the landfill to the ambient air. The atmospheric destruction of benzene is probably the most likely fate process because volatilization is likely to be the main transport process (Clement Associates, Inc., 1985).

Sorption processes are likely removal mechanisms in both surface water and ground water. Values for benzene's log octanol/water partition coefficient indicate that adsorption onto organic material may be significant under conditions of constant exposure. Gradual biodegradation also probably occurs, and may be enhanced by the presence of other hydrocarbons. With regard to the fate of light aromatic hydrocarbons, such as benzene, these chemicals are not expected to persist in surface waters or the marine environment. Therefore, exposures are most likely to occur under situations where there is a continual source of chemicals to the surface water system. Without a continual source, a long-term accumulation of these chemicals in sediments would not be expected. Bioaccumulation or biomagnification in aquatic organisms is not expected (GRI, 1988).

2.5 Chlorobenzene

Chlorobenzene is a derivative of benzene and is a colorless liquid that has low solubility in water (Windholz et al., 1983). Unlike many

priority pollutants, it is not possible to predict a predominant transport and fate process for chlorobenzene. It is thought to evaporate to the atmosphere, where it undergoes photooxidation at a relatively rapid rate, but this has not been quantified in the available literature. There is some evidence that photooxidation occurs in the presence of nitric acid, but this is not conclusive (Callahan et al., 1979). No evidence of the direct photolysis of chlorobenzene was found.

It should be noted that chlorobenzene is persistent in the environment and has a high affinity for lipophilic materials (Callahan et al., 1979). Due to its relatively high log octanol/water partition coefficient of 2.84 (U.S. EPA, 1986a), chlorobenzene is expected to move slowly through soil, and consequently, adsorb to any organic materials present. Biodegradation probably occurs eventually, but not at a substantial rate. Bioaccumulation is thought to be greater for chlorobenzene than for the other indicator chemicals selected. Bioaccumulation of chlorobenzene may help to regulate its fate (Clement Associates, Inc., 1985). If the rate of volatilization is more rapid than the rates of sorption and bioaccumulation, then atmospheric fate processes will dominate. Aquatic processes will dominate if the converse is true.

2.6 Chloroform

Chloroform is a colorless, heavy liquid with an etheral odor. It is volatile in surface waters and is not likely to be present in the environment (Sax, 1984). The atmospheric half-life of chloroform is 80 days (U.S. EPA, 1986a).

Volatilization into the atmosphere is the major transport process for removal of chloroform from aquatic systems (U.S. EPA, 1979). Once in the troposphere, chloroform is attacked by hydroxyl radicals with the subsequent formation of phosgene ($COCl_2$) and possibly chlorine oxide (ClO) radicals. Neither of these reaction products is likely to persist; phosgene is readily hydrolyzed to hydrochloric acid and carbon dioxide. Reaction with hydroxyl radicals is thought to be the primary

environmental fate of chloroform. However, chloroform that remains in the troposphere may return to earth in precipitation or adsorbed on particulates, and a small amount may diffuse upward to the stratosphere where it photodissociates via interaction with ultraviolet light.

Photolysis, hydrolysis, and sorption do not appear to be significant environmental fate processes for chloroform. However, sorption processes may have some importance as a removal mechanism in ground water and soil. The log octanol/water partition coefficient indicates that this compound may bioaccumulate under conditions of constant exposure. Studies with marine organisms provide evidence for only weak to moderate bioaccumulation. Although chloroform is somewhat lipophilic and tends to be found at higher concentrations in fatty tissues, there is no evidence for biomagnification in aquatic food chains.

2.7 Methylene Chloride

Methylene chloride, also known as methylene dichloride and dichloromethane, is a colorless, volatile liquid.

Volatilization to the atmosphere appears to be the major mechanism for removal of methylene chloride from aquatic systems and its primary environmental transport process (U.S. EPA, 1979). Photooxidation in the troposphere appears to be the dominant environmental fate of methylene chloride. Once in the troposphere, the compound is attacked by hydroxyl radicals, resulting in the formation of carbon dioxide, and to a lesser extent, carbon monoxide and phosgene. Phosgene is readily hydrolyzed to HCl and CO_2. About 1 percent of tropospheric methylene chloride would be expected to reach the stratosphere where it would probably undergo photodissociation resulting from interaction with high energy ultravoilet radiation. Aerial transport of methylene chloride is partly responsible for its relatively wide environmental distribution. Atmospheric methylene chloride may be returned to the earth in precipitation. It has an atmospheric half-life of 53 to 127 days (U.S. EPA, 1984c).

Photolysis, oxidation, and hydrolysis do not appear to be significant environmental fate processes for methylene chloride, and

there is no evidence to suggest that either adsorption or bioaccumulation are important fate processes for this chemical. Although methylene chloride is potentially biodegradable, especially by acclimatized microorganisms, biodegradation probably only occurs at a very slow rate.

2.8 Bis(2-ethylhexyl)phthalate (DEHP)

Bis(2-ethylhexyl)phthalate is used as a plasticizer for polyvinyl chloride (PVC) and other polymers in large quantities and is likely to be released to air and water during production and disposal of these plastic products.

Phthalate esters are bioaccumulated by a variety of organisms. There is little evidence to suggest that any long-term bioaccumulation or biomagnification, such as that demonstrated for some of the persistent organochlorine compounds (PCBs and DDT), will occur for phthalate esters. Phthalate esters, however, are concentrated by higher animals and man in specific tissues and organs. Phthalates strongly partition into the lipids (fats) of both plants and animals. DEHP released to water systems will biodegrade fairly rapidly (half-life 2 to 3 weeks). There is evidence that they are degraded by microbiota and metabolized by fish and animals. The degree to which biotransformation and biodegradation occur is important in determining the significance of bioaccumulation as an aquatic fate process; however, it is not clear to what extent their effect is exerted. As a result, phthalates are not likely to biomagnify (U.S. EPA, 1979).

Mixed microbial systems can degrade phthalate esters under aerobic conditions. Degradation is generally slower under anaerobic conditions and ceases to be effective for bis(2-ethylhexyl)phthalate. A variety of multicellular organisms have demonstrated the ability to biotransform and eliminate phthalate esters. Hydrolysis will occur in the water column, but it may be too slow to be environmentally significant. Bioaccumulation, biotransformation, and biodegradation are probably the most important processes in determining the aquatic fate of phthalate esters (U.S. EPA, 1979). Atmospheric DEHP will be carried long distances

and be removed by rain. Washout by rain appears to be a significant removal process (Atlas, 1984). It is unknown whether direct photolysis and photooxidation are important atmospheric processes.

The phthalates are sparingly soluble in water and have very high organic carbon partition coefficients (Koc). As a result, they tend to adsorb strongly to soils, sediments, and organic material, and be highly immobile in the environment with the possible exception of surface water transport of sediments.

2.9 Tetrachloroethene

Tetrachloroethene is a colorless, nonflammable, highly volatile liquid that is slightly soluble in water.

Volatilization has been found to be the most important transport process for tetrachloroethene in surface water and soil. It evaporates to the troposphere, where hydroxyl radicals attack the double bond, producing hydrochloric acid, carbon dioxide, carbon monoxide, and carboxylic acid (Clement Associates, Inc., 1985). Due to the rapid reaction with hydroxyl radicals, the lifetime of tetrachloroethene in the troposphere is 10 days. The primary fate of this chemical in the troposphere is oxidation, and this is thought to be relatively rapid and complete. Photooxidation is rapid enough so that tetrachloroethene cannot diffuse upward to the stratosphere, and thus, direct photolysis does not contribute to its fate (Callahan et al., 1979).

Due to its rapid volatilization to the atmosphere, direct photolysis, hydrolysis, and oxidation do not contribute significantly to the fate of tetrachloroethene in the aquatic environment. In soils with high organic levels, adsorption can occur, and some bioaccumulation has been reported, although not to appreciable amounts (Clement Associates, Inc., 1985). The octanol/water partition coefficient of 2.60 (U.S. EPA, 1986a) supports the thought that bioaccumulation occurs. It is not clear whether adsorbed tetrachloroethene can be destroyed through degradation by microorganisms, or if it must first be desorbed. No biomagnification in aquatic food chains has been reported (Callahan et al., 1979).

2.10 Toluene

Volatilization appears to be the major route of removal of toluene from aquatic environments, and atmospheric reactions of toluene probably subordinate all other fate processes (U.S. EPA, 1979). Photooxidation is the primary atmospheric fate process for toluene, and benzaldehyde is reported to be the principal organic product. Subsequent precipitation or dry deposition can deposit toluene and its oxidation products into aquatic and terrestrial systems. Direct photolytic cleavage of toluene is energetically improbable in the troposphere, and oxidation and hydrolysis are probably not important as aquatic fates.

The log octanol/water partition coefficient of toluene indicates that sorption processes may be significant. However, no specific environmental sorption studies are available, and the extent to which adsorption by sedimentary and suspended organic material may interfere with volatilization is unknown. Bioaccumulation is probably not an important environmental fate process. Although toluene is known to be degraded by microorganisms and can be detoxified and excreted by mammals, the available data do not allow estimation of the relative importance of biodegradation/biotransformation processes (Clement Associates, Inc., 1985).

2.11 Trichloroethene

Trichloroethene (TCE) is a nonflammable, highly toxic, mobile liquid that is practically insoluble in water.

The most important transport process for trichloroethene in surface water and in the upper layer of soil is thought to be volatilization. Trichloroethene enters the troposphere by evaporation; then hydroxyl radicals attack the double bond to form hydrochloric acid, carbon dioxide, carbon monoxide, and carboxylic acid (Clement Associates, Inc., 1985). Based on the reaction with hydroxyl radicals, the reported lifetime in the troposphere is approximately 4 days. Oxidation is the primary fate of trichloroethene in the troposphere, and reportedly,

photooxidation is so rapid that it never enters the stratosphere. Therefore, direct photolysis does not contribute to the fate, because photolysis occurs above the ozone layer (Callahan et al., 1979).

In the aquatic environment, direct photolysis, hydrolysis, and oxidation do not contribute significantly to the fate of trichloroethene due to the rapid volatilization and the subsequent attack of the hydroxyl radicals. Additionally, the process of adsorption occurs, but is not thought to be important. Based on available information, it is unclear whether trichloroethene can be biodegraded by microorganisms. At least two species of microorganisms have been isolated that metabolize trichloroethene (Newsweek, 1988) and there is some evidence that it can be metabolized by higher organisms. Finally, bioaccumulation in marine organisms may occur, but no biomagnification in the food chain has been observed (Clement Associates, Inc., 1985). Studies have shown that bioaccumulation is directly related to a compound's octanol/water partition coefficient, which for trichloroethene is 2.47 (U.S. EPA, 1986a). This indicates that bioaccumulation is possible, but probably is not as important as volatilization (Callahan et al., 1979).

2.12 Vinyl Chloride

Vinyl chloride is an extremely toxic and hazardous material by all avenues of exposure and is a recognized human carcinogen. It is slightly soluble in water and has an extremely high vapor pressure.

Limited data are available on the persistence of vinyl chloride in the environment, particularly in surface waters, soil, and ground water. Although a half-life for vinyl chloride in surface water has been estimated, significant uncertainty exists. The half-lives in surface water range from 1 to 5 days. Due to lack of data, it was not possible to estimate a half-life for vinyl chloride in soil or ground water.

The fate of vinyl chloride in soil is not known with certainty. Evaporation is expected to be the predominant loss mechanism from the soil surface. The half-life from soil evaporation should be longer than its evaporation half-life from water.

Due to the high vapor pressure, volatilization from aquatic and terrestrial systems is the most important transport process for the distribution of vinyl chloride throughout the environment (Clement Associates, Inc., 1985). Under most natural conditions, vinyl chloride should not remain upon release to an aquatic ecosystem. Half-lives in aquatic systems range from several minutes to a few hours. Photooxidation in the troposphere is the dominant environmental fate of vinyl chloride.

Vinyl chloride reacts rapidly with hydroxyl radicals in the air, forming hydrogen chloride or formal chloride. Formyl chloride, with a half-life of about 20 minutes, is reported to decompose at ambient temperatures, to carbon monoxide and hydrogen chloride. As a result, vinyl chloride in the troposphere should be decomposed within a day or two of release (Callahan et al., 1979). The hydrogen chloride formed is removed from the troposphere during precipitation (Clement Associates, Inc., 1985).

Based on the information found, it does not appear that oxidation, hydrolysis, and biodegradation are important fate processes for vinyl chloride in aquatic environments. There is little information pertaining specifically to the rate of adsorption of vinyl chloride to particulate matter. Based on a low log octanol/water partition coefficient (1.38), vinyl chloride typically travels rapidly through subsurface strata and is often found as a contaminant in ground-water supplies.

3.0 EXPOSURE EVALUATION

This section presents an evaluation of existing routes of exposures to humans and other potential receptors (fish and wildlife), as well as routes that may reasonably be expected to occur in the future. Releases from the Syosset Landfill Site were identified through a contaminant release screening process. Specific routes through which exposures may occur will be identified through an environmental fate screening process to qualitatively assess all releases from the site, and the anticipated ranges of ambient concentrations at affected points at the site (U.S. EPA, 1986a).

The contaminant release information section (Section 3.1) presents a summary of the site history and contaminants found on site based on the earlier Remedial Investigation report on the Syosset Landfill site by Geraghty & Miller (1989). This section identifies the operational activities and waste handling practices employed by site owners/operators that contributed to the contamination of the site. This information, along with the chemical fate and transport data, was used to identify all potential migration pathways (Section 3.2) and probable routes of exposure (Section 3.3). These sections helped to characterize the populations exposed (Section 3.4), and quantify, as much as possible, the extent of exposure (Section 3.5). These objectives have been achieved through chemical analysis of soil gas and ground water at the site and an evaluation of the site's environmental setting.

3.1 Extent of Contamination

Contaminants found on site are outlined in Section 1.3. This section contains a brief summary of the extent of contamination at the Syosset Landfill.

Analysis of ground-water samples taken from shallow and deep monitoring wells reveals that volatile organic compounds were detected in some on-site ground-water monitoring wells. Metals were also detected in on-site ground water samples at both shallow and deep locations. Distribution and concentrations of contaminants were not consistent with a contiguous body (plume) of ground-water contamination.

The soil gas analysis indicates that gases generated in the landfill have migrated upward into the overlying soils. Maximum concentrations of methane were generally detected along the axis of the landfill. Elevated levels of VOCs were also detected in gas samples at the Syosset Landfill site.

The Remedial Investigation report of the Syosset Landfill site suggests that waste materials and byproducts have escaped from the landfill and pose a threat to the environment (Geraghty & Miller, 1989). Although there are insufficient historical data to determine the exact nature of hazardous substances present on site, sampling and analysis of soil gas and ground water do provide sufficient data for this endangerment assessment.

3.2 Potential Contaminant Migration Pathways

Several chemical migration pathways are found to be accessible for contaminant releases at the Syosset Landfill. These include surface and ground water, soil, and air. Chemical specific fate and transport information from Section 2.0 is summarized for each of the indicator chemicals and migration pathways evaluated.

Surface Water

Contaminants present in surface soils on site are susceptible to migration in surface water runoff. Most arsenic compounds and salts are soluble in water; however, they can readily be adsorbed onto soil particles with changes in pH and reduction potential. In aquatic media, barium is likely to be present primarily as suspended particulate matter or sediments. Zinc can occur in both suspended and dissolved forms, depending on water chemistry. Although low concentrations of VOCs are released to the air, higher concentrations of VOCs may be transported in surface water runoff. Bis(2-ethylhexyl)pthalate, a semivolatile organic compound, tends to adsorb strongly to soils and detritus and could therefore be transported by surface water processes.

Almost all of the contaminants on site are susceptible to migration in surface water runoff, due to their solubility or potential for

adsorption onto transported sediments. However, not all contaminants are likely to be transported due to restricted contact with runoff and due to the physical characteristics of the site. Wastes buried in the landfill have been covered with fill and are generally not susceptible to erosion, because topographically the site is flat to slightly undulating, and surface soils are sandy and generally subject to rapid infiltration. The exceptions to this are small ephemeral ponds. Some areas of the site also might be disturbed by earth-moving equipment traveling across the landfilled area. There are no defined areas where runoff may be channeled and carried off site, except in the area of the TOB-DPW buildings and parking lot, where storm drains control drainage. Because no data exists regarding contamination of surface soils, an evaluation of migration of adsorbed (to sediments) or dissolved contaminants via transport by surface runoff presently cannot be conducted.

Ground Water

Many of the contaminants found on site may be transported in the ground-water system. As stated above, arsenic is soluble in water and is commonly transported in that media. Adsorption and desorption to soil materials dominates the aquatic cycling process for arsenic. Large amounts of barium will not dissolve, because natural waters usually contain sulfate, and the solubility of barium sulfate is generally low. Undissolved zinc may be dissolved following minor changes in water chemistry or may be sorbed to suspended matter. Concentrations of zinc in suspended and nonsuspended sediments always exceed concentrations in ambient water. For dissolved volatile organic compounds, such as chlorobenzene, the rate of volatilization tends to be negligible compared to the rates of sorption and biodegradation at depth; therefore, aquatic processes will dominate.

Generally, contaminants are transported to the ground-water flow system via infiltrating precipitation or surface waters. Cover soils at the site are sandy and infiltration is generally rapid through the Upper Glacial deposits in which the landfill is placed, downwards to the

Magothy(?) aquifer. The landfill, therefore, represents a continuing source of contaminated recharge to the Magothy(?) aquifer. The aquifer itself contains lenses of clay and silt that can sorb contaminants at low concentration, and may also retard vertical movement of contamination to some extent. Horizontal flow in the aquifer varies from northwest to more easterly or northerly directions, dependent upon depth. In general, vertical flow in the aquifer is significant (Geraghty & Miller, 1989). The aquifer is a primary source of public and industrial water supplies in the region. The ground-water migration pathway is a very significant route for contaminants leaching the Syosset Landfill site.

Soil

Landfilled contaminants at the Syosset Landfill have the potential of migrating into the overlying soils at the site. According to the original RI report, the upper fill dirt at the site was "clean" fill (which is a component of the refuse substratum soil classification, Seaburn, 1969), brought in from off site. This material may now be contaminated with chemicals released from the landfill debris. Soils beneath the landfilled debris may also be contaminated by leachates from the waste. Soils containing clays and organic matter sorb arsenic well and retard its leachability. Barium is not expected to be very mobile because of its formation of water-insoluble salts and its inability to form soluble complexes with humic and fulvic materials. The relative mobility of zinc in soil is determined by the same factors affecting transport in aquatic systems. Volatile organic compounds generally escape from the soil into the atmosphere and are therefore not likely to remain in surface soils on site. VOC's may, however, remain for some time at depth.

Air

The release of contaminants into the air in the vicinity of the Syosset Landfill is a potential pathway for exposures at the site. There are two types of pathways for contaminant release into the air, both amenable to chemical constituents found on site.

The first, volatilization, is the most significant migration pathway in air. Contaminants that have high vapor pressures readily vaporize at relatively low temperatures. Based on the physical properties presented in Table 3-1, the following VOCs are capable of being released from surface soils through volatilization: benzene, chlorobenzene, trichloroethene, chloroform, methylene chloride, tetrachloroethene, toluene, and vinyl chloride. Additionally, arsenic can form trioxides (As_2O_3) and hydrides (AsH_3), which are readily volatilized and mobile in the atmosphere.

The second contaminant migration pathway in air involves the emission of contaminated dust particles via wind erosion or vehicular traffic. Arsenic particles remain in the atmosphere for only a short period before continuing to cycle through the environment. Atmospheric particulate barium is removed by wet and dry deposition and has a short atmospheric residence time of several days. Atmospheric transport of zinc is possible, but generally is only significant near high zinc sources. VOCs are generally not found in fugitive dust, because the compounds vaporize into the atmosphere readily.

3.3 Routes of Exposure

All possible exposure routes at the Syosset Landfill site were assessed and eliminated if found to be unrealistic, insignificant, or unable to be evaluated. Table 3-2 outlines the potential migration pathways and possible exposure routes and identifies gaps in the data provided for this evaluation. Based on the data available, possible migration pathways, and presence of receptors, the following significant exposure routes identified were evaluated addressing current site conditions:

- Exposures to organic compounds and metals from ingestion of or contact with contaminated ground water in the vicinity of the site.

TABLE 3-1

SUMMARY OF CHEMICAL AND PHYSICAL PROPERTIES
FOR INDICATOR CHEMICALS AT THE
SYOSSET LANDFILL SITE (A)

COMPOUND	CAS NUMBER	MOLECULAR WEIGHT (g/mol)	WATER SOLUBILITY (mg/l)	VAPOR PRESSURE (mm Hg)	HENRY'S CONSTANT (atm m3/ mol K)	Koc (ml/g) (B)	LOG Kow (C)
Arsenic	7440-38-2	74.90	-	-	-	-	-
Barium	7440-39-3	137.00	-	-	-	-	-
Zinc	7440-66-6	65.00	-	-	-	-	-
Benzene	71-43-2	78.11	1.75E+03	9.52E+01	5.59E-03	83	2.12
Chlorobenzene	108-90-7	112.56	4.66E+02	1.17E+01	3.72E-03	330	2.84
Chloroform	67-66-3	119.00	8.20E+02	1.51E+02	2.87E-03	31	1.97
Methylene Chloride	75-09-2	85.00	2.00E+04	3.62E+02	2.03E-03	8.8	1.3
bis(2-ethylhexyl)phthalate	117-81-7	391.00	-	-	-	-	-
Tetrachloroethene	127-18-4	166.00	1.50E+02	1.78E+01	2.59E-02	364	2.6
Trichloroethene	79-1-6	131.00	1.10E+03	5.79E+01	9.10E-03	126	2.38
Toluene	108-88-3	92.00	5.35E+02	2.81E+01	6.37E-03	300	2.73
Vinyl chloride	75-01-4	62.49	2.67E+03	2.66E+03	8.19E-02	57	1.38

Note: All values determined between 20 and 30 C.
(A) Reference: Superfund Public Health Evaluation Manual, (EPA, 1986a)
(B) Koc refers to the organic carbon partition coefficient.
(C) Kow refers to the log octanol-water partition coefficient.

TABLE 3-2

POTENTIAL MIGRATION PATHWAY AND EXPOSURE ROUTE EVALUATION

POTENTIAL MIGRATION PATHWAY	POTENTIAL EXPOSURE ROUTE	DATA AVAILABLE/ ACCEPTABLE	IS ROUTE POSSIBLE?	POSSIBLE RECEPTORS ON-SITE WORKERS	ELEMENTARY STUDENTS	OFF-SITE RESIDENTS	ON-SITE TRESPASSERS	ECOLOGICAL/ ENVIRONMENTAL
AIR	* VOC INHALATION	YES	YES	X	X	X	X	X
	DUST INHALATION	NO	YES	X	X	X	X	X
SOIL	INGESTION	NO	YES	X			X	
	DERMAL CONTACT	NO	YES	X			X	
SURFACE WATER	INGESTION	NO	YES				X	X
	FISH INGESTION	NO	NO				X	
	DERMAL CONTACT	NO	YES	X			X	
GROUND-WATER								
PUBLIC WELLS	* INGESTION	YES	YES	X	X	X		
	* DERMAL CONTACT	YES	YES	X	X	X		
	* VOC INHALATION SHOWERING	YES	YES	X	X	X		
INDUSTRIAL WELLS	* INGESTION	YES	YES	X				
	* DERMAL CONTACT	YES	YES	X				

NOTES:
EVALUATION BASED ON CURRENT CONDITIONS AND AVAILABILITY OF ADEQUATE DATA
* - EXPOSURE ROUTES EVALUATED IN THIS ENDANGERMENT ASSESSMENT

- Inhalation exposures to volatile organic compounds emitted from contaminated soils at the Syosset Landfill site.

- Inhalation exposures to volatile organic compounds released from contaminated ground water during showering in the residences adjacent to the site..

Ground-water Exposure

Migration of contaminants from the landfill into the Magothy(?) aquifer beneath the site was identified in Section 3.2 as a potential pathway. Detailed aquifer characteristics are presented in Section 1.2. The principal concern of exposure is the potential migration of contaminants to the local public water supply wells and also to local industrial supply wells in the area. There are several supply wells of both types located within a 3-mile radius of the site. Ingestion of contaminated ground water and dermal absorption of contaminated water while showering are the major concerns related to public waters.

The ground water beneath the site has been estimated to flow towards the northeast, with northerly and easterly components (Geraghty & Miller, 1989). The principal aquifer beneath the site is the Magothy(?) aquifer, which is the source for the public and industrial wells. This aquifer is monitored beneath the site by both shallow and deep wells installed by Geraghty & Miller and ERM. Once any contaminants have entered the ground water beneath the site, they are transported with the ground water towards potential receptor points. There are 35 public supply wells within 3 miles of the site, providing water to 53,000 citizens. Fourteen industrial supply wells are present within 1 mile of the site. The nearest public supply well to the site is approximately 2,500 feet from the nearest site boundary, while the closest industrial supply well is 550 feet away; neither of these two wells are presently in service. Not all of the public and industrial wells are located in the principal

direction of ground-water flow; however, flow direction may vary temporarily or be affected locally by the cone of depression from a pumping well. All wells were considered to be potentially affected.

The Soil Contamination Evaluation Methodology (SOCEM)(CH2M Hill, 1985) was used to characterize the threat that contaminated ground water below the Syosset Landfill site may have on local water supply wells. Versar has substituted actual ground-water monitoring results to estimate contaminant concentrations reaching receptor wells. The model assumes the following:

- steady-state conditions,
- continuous source of contaminants,
- constant source concentration,
- no retardation of contaminants,
- no losses or decay mechanisms (degradation, volatilization),
- no diffusion, and
- no precipitation recharge.

These assumptions will produce a conservative estimate of potential off-site contaminant concentrations. The numbers can be viewed essentially as a "worst-case" situation, because they do not allow for important loss mechanisms. Exposure levels computed from these numbers will therefore be biased high. This conservative approach is taken to ensure that the potential human or environmental health risks will be identified, and that selected remedial alternatives will be protective.

The codified version of SOCEM used in this endangerment assessment was based on the U.S. EPA Vertical and Horizontal Spread (VHS) model (50 Federal Register, 1985), adapted from an equation presented by Domenico and Palciauskas (1982). The SOCEM equation used here is:

$$C_{gw} = C_o * \text{erf}[Z/(2(d_L*X)^{0.5})] * \text{erf}[Y/(4(d_T*X)^{0.5})]$$

Where:
- C_{gw} = contaminant concentration at the ground-water receptor; in this case, the selected well;
- C_o = initial ground-water contaminant concentrations at the source; in this case, concentrations in selected monitoring wells;
- d_L = aquifer longitudinal dispersivity;
- d_T = aquifer transverse dispersivity;
- X = distance to receptor in the direction of ground-water flow;
- Y = width of contaminated zone at the waste boundary (measured perpendicular to the direction of ground-water flow);
- Z = thickness of the contaminated zone at the waste boundary (measured downward from the ground-water table); and
- erf(f) = the error function of any function (f).

This version has been adapted by Versar to include longitudinal as well as transverse dispersion.

The developers of SOCEM (CH2M Hill, 1985) intended that the method be used to evaluate the effects that alternate remedial options may have on reducing contaminant concentrations at the receptor. They suggest that it be used as a straightforward, simplified procedure to characterize the threat contaminated soil may pose to ground water at Superfund sites; however, a method of estimating C_o, one of the more critical input values to the SOCEM model, is not provided. To reduce the uncertainty associated with generating ground-water concentration values from soil concentration values, the ground-water exposure assessment relies on the ground-water monitoring data and not soils concentration data. In such an approach, each monitoring well with constituent concentration C_o acts as a source of contaminated ground water that will be transported to the receptor well. Figure 3-1 shows all public wells surrounding the site within a 3-mile radius and all industrial wells within a 1-mile radius. Wells that were evaluated were selected based on proximity to the site. Wells N3569 and N4133 were selected as the closest industrial and closest public well, respectively, regardless

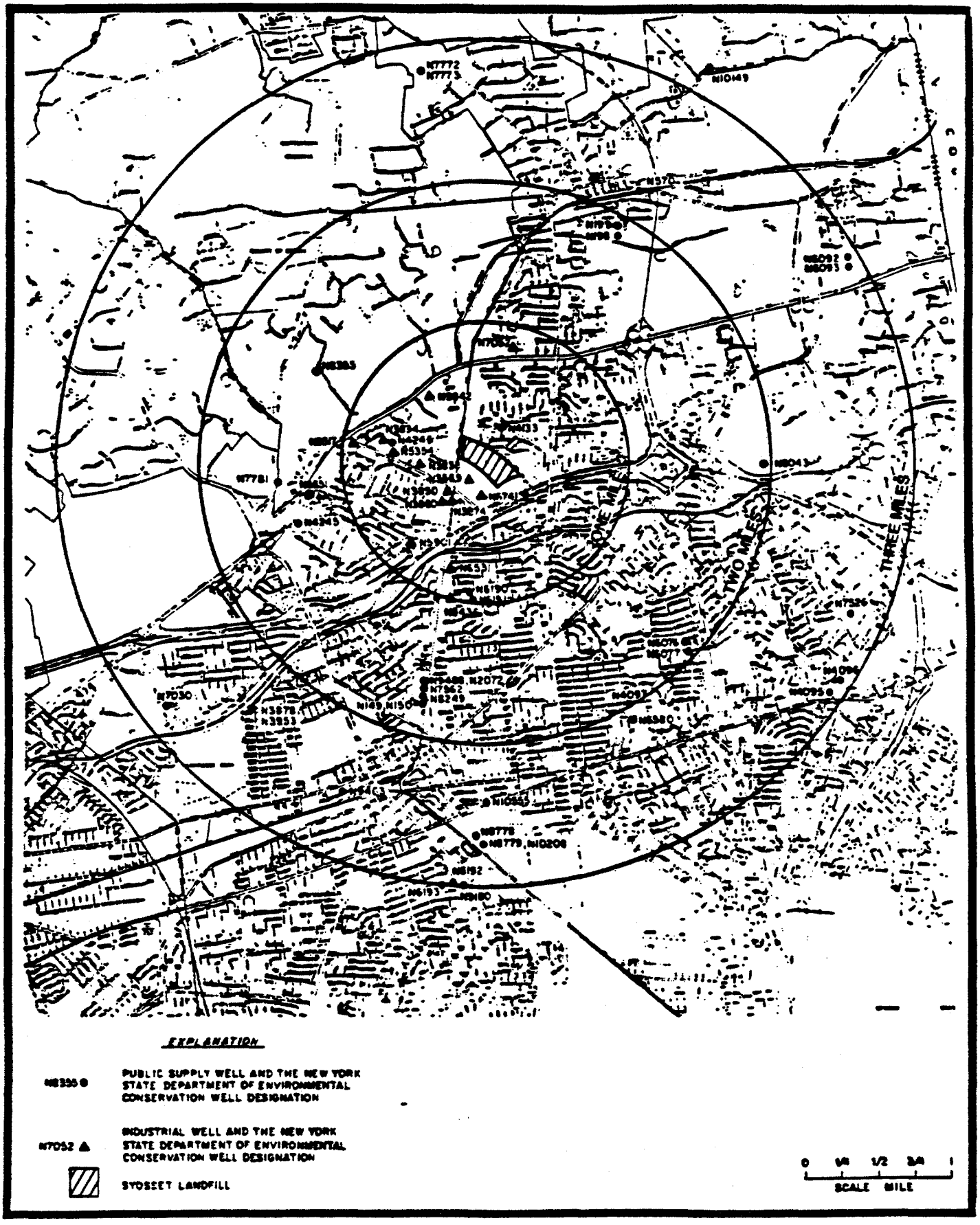

FIGURE 3-1. LOCATIONS OF PUBLIC AND INDUSTRIAL WELLS SURROUNDING THE SYOSSET LANDFILL SITE

of ground-water flow direction, as a worst-case assumption. It was determined in a preliminary screening that the nearest industrial well would not be appreciably different from the public supply well. In light of this, N-3569 was not modeled to completion.

The public well N4133 was sealed in 1982, due to odor problems. Another nearby public well, N4246, is also currently out of service due to detection of volatile organic compounds (Geraghty & Miller, 1989). Well N4133 was selected as a worst case, because it is both the nearest existing public supply well and it lies in the general direction of ground-water flow. Even though actual exposure of populations is not ongoing, exposures may have resulted from its past usage.

Because on-site monitoring wells are treated as point sources of contamination, the final concentration C_x at each receptor well can be calculated using the SOCEM model. The on-site monitoring well closest to the receptor well was presumed to be the source of contamination, so that the longitudinal distance X was the straight line distance measured from the source well to the receptor well. The source area width (Y) was taken to be one-tenth of the total length of the site. The penetration depth of the contamination (Z) was determined for the receptor wells by subtracting the average depth to water on site, 111 feet, from the total depth of the receptor well. The longitudinal dispersivity was calculated to be 0.1 of the total longitudinal distance X. Transverse dispersivity was calculated to be 0.1 of the longitudinal dispersivity (personal communication, J. Bear, 1989). SOCEM was used to calculate the concentration of each indicator parameter at the receptor wells. Source concentrations were assumed to be the highest concentration of each indicator parameter detected at the site in ground water. This estimation of ground-water contamination at the receptor wells is highly conservative in that it makes use of the maximum contaminant levels at the source and incorporates no attenuation factors, such as half-life or retardation. Table 3-3 contains ground-water concentrations estimated for the selected receptor well N4133 in the vicinity of the Syosset Landfill.

TABLE 3-3

MODELED CONCENTRATIONS OF INDICATOR CHEMICALS AT PUBLIC WATER SUPPLY WELL N4133

Indicator Parameter	Co (mean) (ug/L) (a)	Co (max) (ug/L) (b)	X (ft) (c)	Y (ft) (d)	d(T) (ft) (e)	d(L) (ft) (f)	Z (ft) (g)	Cx (mean) (ug/L) (h)	Cx (max) (ug/L) (i)
Arsenic	10	180	987	220	9.87	98.7	289.00	2.77	49.95
Zinc	190	5200	987	220	9.87	98.7	289.00	52.72	1442.87
Barium	80	660	987	220	9.87	98.7	289.00	22.20	183.13
Bis(2-ethylhexyl)phthalate	6.6	34	987	220	9.87	98.7	289.00	1.83	9.43
Chlorobenzene	1.86	37	987	220	9.87	98.7	289.00	0.52	10.27
Chloroform	1.43	18	987	220	9.87	98.7	289.00	0.40	4.99
Tetrachloroethene	1.61	19	987	220	9.87	98.7	289.00	0.45	5.27
Trichloroethene	1.4	7	987	220	9.87	98.7	289.00	0.39	1.94
Toluene	1.55	2.5	987	220	9.87	98.7	289.00	0.43	0.69
Methylene chloride	1.58	2.5	987	220	9.87	98.7	289.00	0.44	0.69
Vinyl chloride	1.58	5	987	220	9.87	98.7	289.00	0.44	1.39
Benzene	1.2	3	987	220	9.87	98.7	289.00	0.33	0.83

NOTES:
(a) Mean concentration of indicator parameter, from Table 1-2.
(b) Maximum concentration of indicator parameter, from Table 1-2.
(c) Distance from on-site source well to receptor well.
(d) Source width, equal to one-tenth of total site length.
(e) Transverse dispersivity, equal to 0.1*d(L).
(f) Longitudinal dispersivity, equal to 0.1*(X).
(g) Zone depth, equal to the total receptor well depth minus the average on-site depth to water (111 feet).
(h) Concentration of indicator parameter at receptor well derived from Co (mean).
(i) Concentration of indicator parameter at receptor well derived from Co (max).

Volatile organic compounds can be emitted when heated household water is sprayed out of a shower head. Because nearby residents may use ground water contaminated by site activities, they may be exposed to the VOCs identified in the ground water. To evaluate the risks associated with the emission of VOCs from shower water, equations are used which estimate the release efficiency of contaminants of concern by comparing them to the release efficiency of trichloroethene (TCE) which has been determined in laboratory studies. Scaling to other chemicals is accomplished by assuming that the rate of volatilization between shower water and the air is proportional to the Henry's Law constant. A ratio of a contaminant's Henry's Law constant and TCE's Henry's Law constant can provide the efficiency of release for the contaminant in question. The method is derived from work by Andelman (1984, 1985a, and 1985b) and is outlined in the Gas Research Institute's (GRI) risk assessment manuals, (1988). This exposure scenario will be evaluated for nearby residents, both adult and children, that would use ground water for showering.

In order to estimate the rate of emission for VOCs from shower water, the release efficiency, E, of the contaminant in question was first determined using the following relationship:

$$E = (E_{TCE})\ (H)\ /\ (H_{TCE})$$

Where:

E_{TCE} - efficiency of release of trichloroethene from water to air based on controlled experiments (unitless); 0.6 is a typical value (GRI, 1988) (unitless),

H - Henry's Law constant for an organic compound (m^3- atm/mol), values from the SPHEM (U.S. EPA, 1986), and

H_{TCE} - Henry's Law constant for trichloroethene, 9.10E-03 (m^3-atm/mol) (U.S. EPA, 1986).

As the contaminants are emitted into the shower area over a long period, the concentration asymptotically approaches a maximum value,

C_{MAX}. The time required to reach C_{MAX} is much longer than typical showering times of 5-10 minutes (GRI, 1988). C_{MAX} is determined with the following relationship:

$$C_{MAX} = [(E)(F_W)(C_t/1000)]/F_a$$

Where:

F_W = flow rate of water in shower, typical value is 8 L/min (GRI, 1988)

C_t = concentration of contaminant in shower water, from on-site monitoring well data (ug/L)

F_a = flow rate of air in the shower, typical value is 2.4 m^3/min

The rate constant for the exponential function describing the concentration over time, k, is defined as the ratio between the air flow rate and the volume of the bathroom. A typical bathroom volume of 12 m^3 was used.

With these parameters describing the concentration as it asymptotically approaches C_{MAX} one can calculate the average concentration of a contaminant in the shower air over a duration of t_s minutes:

$$C_s = C_{MAX} [1 + (1/k \times t_s)] (\exp - k \times t_s)$$

Ambient concentrations for contaminants released during showering are presented in Table 3-4.

Air Exposure

Inhalation exposures evaluated in this Endangerment Assessment involve vapors released from the contaminated soils on the site. Information contained in Section 2.0 suggests that volatilization of

TABLE 3-4

AMBIENT AIR CONCENTRATION DURING SHOWERING

COMPOUND	WATER CONC MEAN (ug/L) Ct(mean) (a)	SHOWER TIME (min) ts (b)	FLOW RATES WATER (L/min) Fw (c)	FLOW RATES AIR (m3/min) Fa (d)	BATHROOM VOLUME (m3) Vb (e)	COMPOUND HENRY'S LAW (m3-atm/mol) H (f)	ASYMPTOTIC AIR CONC (mg/m3) C_inf(mean) (g)	RATE CONST (1/min) k (h)	RELEASE EFFICIENCY COMPOUND E (i)	RELEASE EFFICIENCY TCE E_TCE (j)	TCE HENRY'S LAW (m3-atm/mol) H_TCE (k)	MEAN AIR CONC (mg/m3) Cs(mean) (l)
BENZENE	1.20E+00	10	8	2.4	12	5.59E-03	1.47E-03	0.2	0.4	0.6	9.10E-03	8.37E-04
CHLOROBENZENE	1.86E+00	10	8	2.4	12	3.72E-03	1.52E-03	0.2	0.2	0.6	9.10E-03	8.63E-04
CHLOROFORM	1.43E+00	10	8	2.4	12	2.87E-03	9.02E-04	0.2	0.2	0.6	9.10E-03	5.12E-04
METHYLENE CHLORIDE	1.58E+00	10	8	2.4	12	2.03E-03	7.05E-04	0.2	0.1	0.6	9.10E-03	4.00E-04
TETRACHLOROETHENE	1.61E+00	10	8	2.4	12	2.59E-02	5.37E-03	0.2	1.0	0.6	9.10E-03	3.05E-03
TOLUENE	1.55E+00	10	8	2.4	12	6.37E-03	2.17E-03	0.2	0.4	0.6	9.10E-03	1.23E-03
TRICHLOROETHENE	1.40E+00	10	8	2.4	12	9.10E-03	2.80E-03	0.2	0.6	0.6	9.10E-03	1.59E-03
VINYL CHLORIDE	1.58E+00	10	8	2.4	12	8.19E-02	5.27E-03	0.2	1.0	0.6	9.10E-03	2.99E-03

COMPOUND	WATER CONC MAX (ug/L) Ct(mean) (a)	SHOWER TIME (min) ts (b)	FLOW RATES WATER (L/min) Fw (c)	FLOW RATES AIR (m3/min) Fa (d)	BATHROOM VOLUME (m3) Vb (e)	COMPOUND HENRY'S LAW (m3-atm/mol) H (f)	ASYMPTOTIC AIR CONC (mg/m3) C_inf(mean) (g)	RATE CONST (1/min) k (h)	RELEASE EFFICIENCY COMPOUND E (i)	RELEASE EFFICIENCY TCE E_TCE (j)	TCE HENRY'S LAW (m3-atm/mol) H_TCE (k)	MAX AIR CONC (mg/m3) Cs(mean) (l)
BENZENE	3.00E+00	10	8	2.4	12	5.59E-03	3.69E-03	0.2	0.4	0.6	9.10E-03	2.09E-03
CHLOROBENZENE	3.70E+01	10	8	2.4	12	3.72E-03	3.03E-02	0.2	0.2	0.6	9.10E-03	1.72E-02
CHLOROFORM	1.80E+01	10	8	2.4	12	2.87E-03	1.14E-02	0.2	0.2	0.6	9.10E-03	6.45E-03
METHYLENE CHLORIDE	2.50E+00	10	8	2.4	12	2.03E-03	1.12E-03	0.2	0.1	0.6	9.10E-03	6.33E-04
TETRACHLOROETHENE	1.90E+01	10	8	2.4	12	2.59E-02	6.33E-02	0.2	1.0	0.6	9.10E-03	3.60E-02
TOLUENE	2.50E+00	10	8	2.4	12	6.37E-03	3.50E-03	0.2	0.4	0.6	9.10E-03	1.99E-03
TRICHLOROETHENE	7.00E+00	10	8	2.4	12	9.10E-03	1.40E-02	0.2	0.6	0.6	9.10E-03	7.95E-03
VINYL CHLORIDE	5.00E+00	10	8	2.4	12	8.19E-02	1.67E-02	0.2	1.0	0.6	9.10E-03	9.46E-03

NOTES:

a - Concentratins of contaminants found in ground water from onsite monitoring wells.
b - Time that shower is used, average of 10 minutes used.
c - Estimated flow rate of water in shower, typical value from GRI, 1988.
d - Estimated flow rate of air in shower, typical value from GRI, 1988.
e - Volume of bathroom, typical value from GRI, 1988.
f - Henry's Law for compound, from Superfund Public Health Evaluation Manual (EPA, 1986)
g - Asymptotic air concentration if shower ran for a long time (much longer than 5 minutes), calculated as described in text.
h - Rate constant for exponential function, calculated as described in text.
i - Efficiency of release of compounds from water to air, calculated as described in text.
j - Efficiency of release for trichloroethene, as determined through research (GRI, 1988).
k - Henry's Law for trichloroethene.
l - Air concentration in shower, calculated as described in text.

organic compounds in surface soils is a potentially significant pathway for release of site contaminants into the atmosphere. Once these VOCs have been emitted from the soil, they are transported by wind to potential receptor points. The dominant wind directions at the site are out of the west, northwest, and north.

Thibodeaux (1981) developed a method for estimating toxic vapor releases from co-disposal landfills. These facilities contain toxic wastes in combination with municipal or sanitary wastes that, because of their considerable organic content, generate landfill gases (e.g., H_2, CH_4, CO_2). In these cases, the upward movement (convective sweep) of the landfill gas becomes the significant controlling factor, greatly accelerating the upward migration and subsequent release to the atmosphere of the co-disposed toxic substances. In fact, review of Thibodeaux's work indicates that the acceleration effect of the landfill gas is so great that both soil- and gas-phase diffusion essentially become insignificant as contributing factors to migration of the toxic gas. The following simplified equation (U.S. EPA, 1988) is recommended for estimating the volatilization of toxic substances from co-disposal landfills:

$$E_i = C_i * V_y * A$$

Where:

E_i = emission rate (g/sec) of compound i,

C_i = concentration of compound i in the soil pore spaces (g/cm^3),

V_y = mean landfill gas velocity in the soil pore spaces (cm/sec), Thibodeaux (1981) provides an average value of 1.63E-03 cm/sec for this factor, and

A = area (cm^2).

To determine the concentration of a compound in the soil pore spaces (C_i) in grams per cubic centimeter (g/cm^3), the following conversion from parts per billion by volume [ppb (v)] is necessary (AIHA, 1984):

$$C_i \frac{g}{cm^3} = \frac{C_i[ppb(v)] \times MW \frac{g}{mol}}{24.45 \times 10^4 \frac{cm^3}{mol}}$$

Where: C_i - Concentration as reported [ppb(v)] (i.e., cm^3 per $10^9 cm^3$).

MW - Molecular weight (g/mol).

The conversion factor in the denominator accounts for the molar volume of a gas (cm^3/mol) at 25°C and 760 mm Hg, and converts the volume of a contaminant to moles. The conversion factor in the numerator accounts for the molecular weight of the contaminant, and converts the moles to grams.

Recalculation of the toxic vapor release estimates, E_i, presented in Thibodeaux, (1981) using this simplified equation yields results within approximately 1 percent of the values obtained using the full computation cited in the paper. Thibodeaux (1981) notes, however, that various site factors, such as the presence of saturated soils, will tend to reduce the rate of volatile chemical release from landfills. The degree to which this model is able to accurately reflect contaminant release rates for gases, especially soluble gases, generated at sites with moist or wet soils is unknown (U.S. EPA, 1988a). Six of the seven indicator chemicals were evaluated using this emission rate model. Chlorobenzene was not detected in the soil gas monitoring effort. However, high concentrations reported from analysis of soil samples on site necessitate evaluation of chlorobenzene emission. In order to estimate volatile emission rates for chlorobenzene, equations for VOC escape from contaminated soils from the Superfund Exposure Assessment Manual (SEAM) were utilized (U.S. EPA, 1988a).

To estimate contaminant diffusion, D_{AB} (cm^2/sec), from the soil solution phase to soil gas phase, and then to the atmosphere, the following relationship was used:

$$D_{AB} = D_i \, P_t^{1.33} \, H_i$$

Where: P_t = total soil porosity (0.48 for sandy loam)
H_i = dimensionless Henry's Law constant (1.50E-01) (U.S. EPA, 1986a, 1988a), and
D_i = diffusion coefficient for chlorobenzene (7.63E-02) (U.S. EPA, 1988a)

Mean and maximum emission rates were computed using equations developed specifically for spills, leaks, or intentional disposal of organic chemicals directly to the soil (U.S. EPA, 1988a). Volatile release rates were estimated as follows:

$$E_i = \frac{2D_{AB}C_o A}{d + \sqrt{\frac{2D_{AB}C_o t}{C_B} + d^2}}$$

Where: E_i = emission rate of contaminant i, (g/sec),
D_{AB} = diffusion coefficient of contaminant i in soil, (cm^2/sec),
C_o = liquid phase concentration of chemical (i) in soil,
C_B = contaminant concentration in bulk soil,
t = time since sample was collected (sec),
d = depth of dry zone at time of sampling (cm), and
A = area of contamination.

The soil diffusion coefficient for chlorobenzene, D_{AB}, calculated as described above is 4.30E-03 cm^2/s. For an estimate of the liquid phase concentration in soil, mean and maximum ground-water concentrations were determined from analytical data found in Appendix A (1.60E-09 g/cm^3; 3.70E-08 g/cm^3). The mean and maximum contaminant concentration was derived by multiplying mean and maximum analytical data from the site RI (see Appendix A) by an average soil bulk density of 1.4 g/cm^3 (U.S. EPA, 1988a). The time between data collection and analysis, t, was assumed to be approximately 10 days (8.64E+05 seconds). The depth of dry

zone, d, was estimated to be 30.48 cm. This parameter was estimated due to a lack of field measurements and was based on site characteristics. The area of contamination, A, was measured directly from site maps using the "Galaxy" computer digitizing software package (R.S. Means Co.) and table.

Table 3-5 presents the emission rates, E_i, calculated for the volatile organic indicator chemicals.

In order to evaluate the concentrations of VOCs on site, a model designed for short distances should be used. The U.S. EPA's Graphical Exposure Modeling System (GEMS) uses Gaussian dispersion algorithms that are invalid when used for distances of less than 100 meters (U.S. EPA, 1988b). An alternative to the approach used by the GEMS Atmospheric Modeling System is to consider simple conservation of mass in the dispersion of contaminated particles. A near field box model, which is accurate at short downwind distances (i.e., less than 100 meters), was selected because it is applicable to scenarios where the receptor is on site or very nearby (Pasquill, 1975, and Horst, 1979, as cited in GRI, 1988).

The equations for the near field box model (GRI, 1988) are presented below:

$$C = Q/(H*W*u)$$

Where:

C = concentration of contaminant in ambient air on site ($\mu g/m^3$),
Q = emission rate of contaminant ($\mu g/s$),
H = downwind height of box (m),
W = width of box (m), and
u = average wind speed through the box (m/s).

TABLE 3-5

EMISSION RATES FOR VOCS EMITTED FROM SURFACE SOILS

COMPOUND	COMPOUND MOLECULAR WEIGHT (g/mole) (A)	SOIL GAS CONCENTRATION MEAN (ppb) (B)	SOIL GAS CONCENTRATION MAX (ppb) (C)	SOIL GAS CONCENTRATION MEAN (g/cm3) (D)	SOIL GAS CONCENTRATION MAX (g/cm3) (D)	SITE AREA (cm2) (E)	EMISSION RATE MEAN (g/sec) (F)	EMISSION RATE MAX (g/sec) (F)
BENZENE	78.11	3.64	180.00	1.16E-11	5.75E-10	1.85E+09	3.50E-05	1.73E-03
CHLOROBENZENE	-	-	-	-	-	-	3.42E-04	7.81E-03
CHLOROFORM	119.00	4.16	12.00	2.02E-11	5.84E-11	1.85E+09	6.10E-05	1.76E-04
METHYLENE CHLORIDE	85.00	9.82	180.00	3.41E-11	6.26E-10	1.85E+09	1.03E-04	1.89E-03
TETRACHLOROETHENE	166.00	5.70	12.00	3.87E-11	8.15E-11	1.85E+09	1.17E-04	2.46E-04
TOLUENE	92.00	54.36	240.00	2.05E-10	9.03E-10	1.85E+09	6.17E-04	2.72E-03
VINYL CHLORIDE	62.49	3.26	400.00	8.34E-12	1.02E-09	1.85E+09	2.52E-05	3.08E-03

NOTES:
(A) - From Table 3-1, required for conversion from ppb to g/cm3, see text for details.
(B) - Geometric mean of soil gas readings (ppb).
(C) - Maximum of soil gas readings (ppb).
(D) - Converted soil gas readings (g/cm3).
(E) - Area of landfill from site maps.
(F) - Emission rates calculated as described in text.

The downwind height of the box, H, is estimated using a specific relationship between the length and height of the box. As seen in Table 3-6, a box height of 1.4 m, which roughly corresponds to the human breathing zone, provides a distance from source to receptor of 10 meters. This close distance was used to estimate concentrations of VOCs on the site. To evaluate contaminant concentrations off the site at the South Grove Elementary School and the adjoining residential neighborhood, a distance from source to receptor (50 meters), was chosen. This distance yields a box height of 3.8 meters (Table 3-6). Box width (W) was estimated from site maps provided in the RI report (Geraghty & Miller, 1989). Three hundred meters was chosen as an average cross wind width for the site. Average wind speed through the box, u, is estimated with the following equation (GRI, 1988):

$$u = 0.22\ (v)\ \ln(2.5\ H)$$

Where:

v = the average annual wind velocity at the site. This value was determined from the National Weather Service station in Fort Totten, New York. The average wind speed was 5.25 meters per second.

Predicted concentrations for the VOCs of interest calculated at 10 and 50 meters as described above are found in Table 3-7.

3.4 Populations Exposed

A quantitative analysis of exposed populations was completed to determine the likelihood of receptor contact with environmental contaminant data presented in Section 3.1. Exposed population screening involved an examination of each of the migration pathways listed in Table 3-2. Results of the screening process identified potential exposure via ingestion of contaminated ground water from public water supplies or possibly industrial supplies, dermal exposure to the same waters via activities such as showering or bathing, and exposure due to inhalation of vapors emanating from onsite soils.

TABLE 3-6

PLUME HEIGHT USED IN NEAR FIELD BOX MODEL

Length of Side of Box, x (m)	Box Height, H_b (m)
10	1.4
20	2.1
30	2.7
40	3.3
50	3.8
60	4.3
70	4.8
80	5.3
90	5.8
100	6.2

Reference: GRI, 1988, derived from work by Pasquill, 1975, and Horst, 1979.

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TABLE 3-7

AMBIENT CONCENTRATIONS FOR VOLATILE ORGANIC COMPOUNDS IN AIR
10 Meters From Source

COMPOUND	Emission Rate Mean (Qmean) (g/s) (A)	Emission Rate Max (Qmax) (g/s) (A)	Emission Rate Mean (Qmean) (ug/s) (B)	Emission Rate Max (Qmax) (ug/s) (B)	Box Width (W) (m) (C)	Wind Speed On Site (u10) (m/s) (D)	Box Height (H) (m) (E)	Wind Speed In Box (um) (m/s) (F)	Ambient Concentration Mean (Cmean) (ug/m3) (F)	Ambient Concentration Max (Cmax) (ug/m3) (F)
BENZENE	3.50E-05	1.73E-03	3.50E+01	1.73E+03	300	5.25	1.4	1.45	5.76E-02	2.85E+00
CHLOROBENZENE	3.42E-04	7.81E-03	3.42E+02	7.81E+03	300	5.25	1.4	1.45	5.63E-01	1.29E+01
CHLOROFORM	6.10E-05	1.76E-04	6.10E+01	1.76E+02	300	5.25	1.4	1.45	1.00E-01	2.90E-01
METHYLENE CHLORIDE	1.03E-04	1.89E-03	1.03E+02	1.89E+03	300	5.25	1.4	1.45	1.69E-01	3.11E+00
TETRACHLOROETHENE	1.17E-04	2.46E-04	1.17E+02	2.46E+02	300	5.25	1.4	1.45	1.93E-01	4.05E-01
TOLUENE	6.17E-04	2.72E-03	6.17E+02	2.72E+03	300	5.25	1.4	1.45	1.02E+00	4.48E+00
VINYL CHLORIDE	2.52E-05	3.08E-03	2.52E+01	3.08E+03	300	5.25	1.4	1.45	4.15E-02	5.07E+00

AMBIENT CONCENTRATIONS FOR VOLATILE ORGANIC COMPOUNDS IN AIR
50 Meters From Source

COMPOUND	Emission Rate Mean (Qmean) (g/s) (A)	Emission Rate Max (Qmax) (g/s) (A)	Emission Rate Mean (Qmean) (ug/s) (B)	Emission Rate Max (Qmax) (ug/s) (B)	Box Width (W) (m) (C)	Wind Speed On Site (u10) (m/s) (D)	Box Height (H) (m) (E)	Wind Speed In Box (um) (m/s) (F)	Ambient Concentration Mean (Cmean) (ug/m3) (F)	Ambient Concentration Max (Cmax) (ug/m3) (F)
BENZENE	3.50E-05	1.73E-03	3.50E+01	1.73E+03	300	5.25	3.8	2.60	1.18E-02	5.84E-01
CHLOROBENZENE	3.42E-04	7.81E-03	3.42E+02	7.81E+03	300	5.25	3.8	2.60	1.15E-01	2.63E+00
CHLOROFORM	6.10E-05	1.76E-04	6.10E+01	1.76E+02	300	5.25	3.8	2.60	2.06E-02	5.94E-02
METHYLENE CHLORIDE	1.03E-04	1.89E-03	1.03E+02	1.89E+03	300	5.25	3.8	2.60	3.47E-02	6.38E-01
TETRACHLOROETHENE	1.17E-04	2.46E-04	1.17E+02	2.46E+02	300	5.25	3.8	2.60	3.95E-02	8.30E-02
TOLUENE	6.17E-04	2.72E-03	6.17E+02	2.72E+03	300	5.25	3.8	2.60	2.08E-01	9.18E-01
VINYL CHLORIDE	2.52E-05	3.08E-03	2.52E+01	3.08E+03	300	5.25	3.8	2.60	8.50E-03	1.04E+00

NOTES:
- A - From Table 3-5
- B - Converted by multiplying by (1000000 ug/g).
- C - From site dimensions on location map.
- D - From Ft. Totten, New York weather station data (Gems, 1989).
- E - From Table 3-6
- F - From supporting calculations in text.

Identification and enumeration of exposed human populations was derived from 1980 census data compiled by the U.S. Department of Commerce for the Town of Oyster Bay. Separate information for Syosset is not available, because it is not an incorporated town. Census information for 1980 indicates that the total population for Oyster Bay is 305,750. Females (all age groups) comprise 51 percent (156,694) of the population. Child-bearing age groups, conservatively figured at 15 to 54 years of age, comprise 31 percent (93,594) of the population. The total population of elderly, age 65 years and over, was 8 percent (25,024). Children (age 17 and under) comprise 26 percent (79,537) of the population. The median age for all age groups is 33.5 years (USDOC, 1988).

3.4.1 Ground Water

Ingestion Exposure

Chemical contaminants released to the ground water are expected to lead to ingestion exposure to individuals using the public water supplies, which are derived from the Magothy(?) aquifer that underlies the site. Approximately 59,000 persons are supplied with water from the public supply system (ERM, 1981). This includes 291 students and 45 full-time faculty and staff of the South Grove Elementary School (personal communication, Campiani, 1989). Exposure may also result from industrial supply wells, when this water is used in bathroom facilities or as the sole factory water supply.

Dermal Exposure

Various activities such as showering or bathing are expected to produce dermal exposures to the local population supplied by public water. This could also occur to individuals employed by companies that have industrial supply wells for general use.

3.4.2 Air

The migration pathway screening process outlined in Section 3.2 also identified inhalation of VOCs as a probable exposure route. Landfill gases generated from the degradation of buried wastes have migrated upward through the clean fill dirt covering the landfill. These VOCs are emitted from the surface soils through vaporization and dispersed into the atmosphere around the site. Populations exposed to the contaminated air include the following: workers at the Town of Oyster Bay - Department of Public Works (TOB-DPW) and animal shelter facilities; children, faculty, and staff at the South Grove Elementary School; employees of other businesses in the immediate vicinity of the landfill; residents of the surrounding neighborhoods; and trespassers on site.

Inhalation Exposure

The workers at the TOB-DPW facility were determined to be the most at risk because of the close proximity to the landfill. The facility, including vehicle storage areas, is adjacent to a portion of the landfill. According to Tony Marino, Town of Oyster Bay, Environmental Control Department, approximately 75 full-time personnel are employed at the TOB-DPW facility. Additionally, 200 sanitation workers come to the facility daily to pick up and drop off their trucks. Only ten full-time workers are employed at the Town of Oyster Bay animal shelter located on the southwestern margin of the landfill (personal communication, Marino, 1989). All of these employees spend the majority of their time indoors, because very little work takes place outside of the facilities.

The close proximity of South Grove Elementary School places the children, faculty, and staff of the school at some risk. According to inquiries directed at school personnel, there are 291 students between the ages of 6 and 12 attending the school during the 1989-90 school year. Full-time faculty and staff employed at the school number 45 (personal communication, Campiani, 1989).

Employees of surrounding businesses may also be at risk from inhalation exposures to airborne VOCs released from the Syosset Landfill site. The Cerro Wire and Cable Corporation, shown on Figure 1-2, was not occupied at the time of this report. The Great Eastern Printing Company, also shown on Figure 1-2, has 65 full-time employees, according to a staff member.

The populations exposed to the VOCs emitted from surface soils at the Syosset Landfill site include trespassers on site. Although most of the site is secured with a 10-foot chain-link fence, access is possible through holes in the fence and breaks in the perimeter fence. Because trespassers onto the site are not likely to spend as many hours, days, or years on site as the TOB-DPW workers, this population group was not evaluated further.

The residents of the surrounding community can also be exposed to the volatile organic compounds emitted from the site. The exact number of individuals exposed to concentrations high enough to be hazardous is not known. However, there are at least 100 homes within 100 meters of the perimeter of the site.

3.5 Exposure Assessment

Two exposure (i.e., intake) levels are calculated for each chemical, because short-term (subchronic) exposures to relatively high concentrations can cause different toxic effects than those caused by long-term (chronic) exposures to lower concentrations. The exposure levels are subchronic daily intake (SDI) and chronic daily intake (CDT).

Ingestion of Ground Water

Ingestion of contaminants will occur when an individual consumes tap water and beverages made from tap water at his residence. It is assumed that 75 percent of the individuals liquid intake comes from one contaminated tap water source, and is not treated prior to consumption. The remaining 25 percent of ones fluid intake comes from distant sources (e.g., milk, soda, processed foods).

Noncarcinogenic subchronic exposure was calculated (U.S. EPA, 1989b) as:

$$SDI = \frac{(C)(CR)(DF)}{(BW)}$$

Where: SDI = subchronic daily intake (mg/kg/day),
C = concentration of contaminant in water (mg/L),
CR = water consumption rate (L/day),
BW = body weight (kg), and
DF = diet fraction (unitless) to account for the portion of fluid intake from local sources.

Values used in evaluation of adult subchronic exposures are as follows:

Parameter	Value
C =	chemical specific maximum values
CR =	1.4
BW =	70
DF =	0.75

For evaluation of subchronic exposures for children, the only alteration of the above values is the BW term. The average weight for children between the ages of 5 and 12 (representing the elementary school students) is approximately 25 kg (U.S. EPA, 1989b).

For noncarcinogenic chronic exposure from ground-water ingestion, it is assumed that an individual is likely to consume 1.4 liters of water per day over a 9-year averaging time. The following equation is used to calculate the chronic daily intake:

$$CDI = \frac{(CR)(C)(ED)(DF)}{(BW)(AT)}$$

Where: CDI = Chronic daily intake (mg/kg/day),
CR = water consumption rate (L/day),
C = concentration of contaminant in water (mg/L),
ED = exposure duration (day),
DF = diet fraction,
BW = body weight (kg), and
AT = averaging time, (day).

Chronic exposure refers to an estimate of a daily exposure level that is likely to be without an appreciable risk of deleterious effects. Values used for these parameters in evaluation of adult chronic exposures are as follows:

Parameter	Value
CR =	1.4
C =	chemical specific mean value
ED =	3,285 (9 years)
DF =	0.75
BW =	70
AT =	3,285 (9 years)

For carcinogenic exposure, it is assumed that an individual consumes an average of 1.4 liters per day of contaminated water over an average nine-year residence in the area. The following equation is used to calculate lifetime average daily dose (LADE) (U.S. EPA, 1989b):

$$LADE = \frac{(CR)(C)(ED)(DF)}{(BW)(LT)(365\ days/yr)}$$

Where: LADE = Lifetime average daily exposure (mg/kg/day),
CR = water consumption rate (L/day),
C = concentration of contaminant in water (mg/L),
ED = exposure duration (day),
DF = diet fraction (proportion consumed from one contaminated source),
BW = body weight (kg), and
LT = lifetime (yr).

Values used for these parameters are as follows:

Parameter	Value
CR =	1.4
C =	chemical specific mean value
ED =	3,285
DF =	0.75
BW =	70
LT =	75

In evaluating noncarcinogenic chronic and carcinogenic exposures for children, the body weight was reduced to 25 kg. The results of this estimation procedure are shown in Tables 3-8a and 3-8b.

Dermal Contact with Ground Water

Dermal contact with ground water will occur if the water is used for showering or bathing. As with the scenario for ingestion of ground water, it can be assumed that no treatment of the ground water occurs prior to use; therefore, exposure will be directly to the contaminated water.

For noncarcinogenic subchronic dermal exposure, it is assumed that an individual would shower daily and exposure would be to the entire surface of the body, or 18,150 cm^2. The thickness of the film of water on the body is assumed to be constant for the duration of the shower. A film thickness of 4.99E-03 cm was used. In the absence of chemical-specific values, 100-percent absorption was used as a conservative assumption.

To calculate the noncarcinogenic subchronic exposure from dermal contact with ground water while showering, the following equation is used:

$$SDI = \frac{(C)(ET)(A)(FT)(0.001\ L/cm^3)}{(BW)}$$

Where: SDI = Subchronic daily exposure (mg/kg/day),
C = contaminant concentration in water (mg/L),
ET = exposure time as percent of day,
A = surface area of exposure per day (cm^2/day),
FT = film thickness of the water (cm), and
BW = body weight of average adult (kg).

To calculate the noncarcinogenic subchronic exposure from dermal contact with ground water while showering, the following equation is used:

$$SDI = \frac{(C)(ET)(A)(FT)(0.001\ L/cm^3)}{(BW)}$$

Where: SDI = Subchronic daily exposure (mg/kg/day),
C = contaminant concentration in water (mg/L),
ET = exposure time as percent of day,
A = surface area of exposure per day (cm^2/day),
FT = film thickness of the water (cm), and
BW = body weight of average adult (kg).

TABLE 3-8a

CALCULATION OF INTAKES FROM ADULT INGESTION OF GROUND WATER
FROM NEAREST PUBLIC WATER SUPPLY WELL (N4133)

CHEMICAL	Ground Water Mean Conc. (mg/L)	Ground Water Max Conc. (mg/L)	Consumption Rate (L/day)	Body Weight (kg)	Noncarcinogenic SDI* (mg/kg/day)	Noncarcinogenic CDI** (mg/kg/day)	Carcinogenic LADE*** (mg/kg/day)
Arsenic	2.77E-03	5.00E-02	1.4	70	7.49E-04	4.16E-05	4.99E-06
Barium	2.22E-02	1.83E-01	1.4	70	2.75E-03	3.33E-04	NA
Zinc	5.27E-02	1.44E+00	1.4	70	2.16E-02	7.91E-04	NA
Benzene	3.30E-04	8.30E-04	1.4	70	1.24E-05	4.95E-06	5.94E-07
Chlorobenzene	5.20E-04	1.03E-02	1.4	70	1.54E-04	7.80E-06	NA
Chloroform	4.00E-04	4.99E-03	1.4	70	7.49E-05	6.00E-06	7.20E-07
Methylene Chloride	4.40E-04	6.90E-04	1.4	70	1.03E-05	6.60E-06	7.92E-07
Bis(2-Ethylhexyl)Phthalate	1.83E-03	9.43E-03	1.4	70	1.41E-04	2.74E-05	3.29E-06
Tetrachloroethene	4.50E-04	5.27E-03	1.4	70	7.90E-05	6.75E-06	8.10E-07
Toluene	4.30E-04	6.90E-04	1.4	70	1.03E-05	6.45E-06	NA
Trichloroethene	3.90E-04	1.94E-03	1.4	70	2.91E-05	5.85E-06	7.02E-07
Vinyl Chloride	4.40E-04	1.39E-03	1.4	70	2.08E-05	6.60E-06	7.92E-07

Notes: * Subchronic exposures are based on maximum concentrations and a diet fraction of 0.75.
** Chronic exposures are based on mean concentrations, a 9 year averaging time, an exposure duration of 9 years, and a diet fraction of 0.75.
*** Lifetime Average Daily Exposure.
NA - Not available or not applicable

TABLE 3-8b

CALCULATION OF INTAKES FROM INGESTION OF GROUND WATER FOR SCHOOL CHILDREN
FROM NEAREST PUBLIC WATER SUPPLY WELL (N4133)

CHEMICAL	Ground Water Mean Conc. (mg/L)	Ground Water Max Conc. (mg/L)	Consumption Rate (L/day)	Body Weight (kg)	Noncarcinogenic SDI* (mg/kg/day)	Noncarcinogenic CDI** (mg/kg/day)	Carcinogenic LADE*** (mg/kg/day)
Arsenic	2.77E-03	5.00E-02	1.4	25	2.10E-03	1.16E-04	1.09E-05
Barium	2.22E-02	1.83E-01	1.4	25	7.69E-03	9.32E-04	NA
Zinc	5.27E-02	1.44E+00	1.4	25	6.06E-02	2.21E-03	NA
Benzene	3.30E-04	8.30E-04	1.4	25	3.49E-05	1.39E-05	1.30E-06
Chlorobenzene	5.20E-04	1.03E-02	1.4	25	4.33E-04	2.18E-05	NA
Chloroform	4.00E-04	4.99E-03	1.4	25	2.10E-04	1.68E-05	1.57E-06
Methylene Chloride	4.40E-04	6.90E-04	1.4	25	2.90E-05	1.85E-05	1.73E-06
Bis(2-Ethylhexyl)Phthalate	1.83E-03	9.43E-03	1.4	25	3.96E-04	7.69E-05	7.20E-06
Tetrachloroethene	4.50E-04	5.27E-03	1.4	25	2.21E-04	1.89E-05	1.77E-06
Toluene	4.30E-04	6.90E-04	1.4	25	2.90E-05	1.81E-05	NA
Trichloroethene	3.90E-04	1.94E-03	1.4	25	8.15E-05	1.64E-05	1.53E-06
Vinyl Chloride	4.40E-04	1.39E-03	1.4	25	5.84E-05	1.85E-05	1.73E-06

Notes: * Subchronic exposures are based on maximum concentrations and a diet fraction of 0.75.
** Chronic exposures are based on mean concentrations, a 9-year averaging time, an exposure duration of 9 years, and a diet fraction of 0.75.
*** Lifetime Average Daily Exposure.
NA - Not available or not applicable

Values used for these parameters for evaluation of adult subchronic noncarcinogenic exposures are as follows:

Parameter	Value
C =	chemical specific maximum values
ET =	0.01
A =	18,150
FT =	4.99E-03
BW =	70

For evaluation of dermal exposure for children attending the nearby South Grove Elementary School, the body weight was reduced to 25 kg, and the surface area of exposure was reduced to 8,000 cm^2/day (U.S. EPA, 1989b).

For the noncarcinogenic chronic and carcinogenic exposure scenarios, it is assumed that an adult would shower daily and exposure would be to the entire surface of the body, or 18,150 cm^2/day. The thickness of the film of water on the body is assumed to be constant for the duration of the shower. A film thickness of 4.99E-03 cm was used to represent a reasonable worst-case situation (U.S. EPA, 1989b). A 9-year average residence time (3,285 days) was used as the exposure duration, 365 days per year was used as exposure frequency, and 0.01 of a day was used as exposure time for both scenarios.

To calculate the noncarcinogenic chronic exposure from dermal contact with ground water while showering, the following equation is used:

$$CDI = \frac{(C)(ED)(ET)(EF)(A)(FT)(0.001\ L/cm^3)}{(BW)(AT)}$$

Where:
- CDI = Chronic daily exposure (mg/kg/day),
- C = contaminant concentration in water (mg/L),
- ET = exposure time as percent of day,
- EF = exposure frequency (days/year),
- ED = exposure duration (years),
- A = surface area of exposure per day (cm^2/day),
- FT = film thickness of the water (cm),
- BW = body weight (kg), and
- AT = averaging time (day).

Values used for these parameters in evaluation of adult exposures are as follows:

Parameter	Value
C =	chemical specific mean values
ED =	9
ET =	0.01
EF =	365
A =	18,150
FT =	4.99E-03
BW =	70
AT =	3,285

To calculate LADE resulting from dermal contact with ground water while showering, the following equation is used:

$$LADE = \frac{(C)(ED)(ET)(EF)(A)(FT)(0.001\ L/cm^3)}{(BW)(LT)(365\ days/yr)}$$

Where:
- LADE = Lifetime average daily exposure (mg/kg/day),
- C = contaminant concentration in water (mg/L),
- ED = exposure duration (years),
- EF = exposure frequency (days/year),
- ET = exposure time as percent of day,
- A = surface area of exposure per day (cm^2/day),
- FT = film thickness of the water (cm),
- BW = body weight of average adult (kg), and
- LT = lifetime (yr).

Values used for these parameters for evaluation of adult exposures are as follows:

Parameter	Value
C =	chemical specific mean values
ED =	9
ET =	0.01
EF =	365
A =	18,150
FT =	4.99E-03
BW =	70
LT =	75

For the children's exposure scenario, the body weight was reduced to 25 kg and the skin surface area to 8,000 cm^2/day,(U.S. EPA, 1989b). Tables 3-9a and 3-9b contain the data for calculating exposures due to dermal contact.

Inhalation of VOCs From Ground Water While Showering

As in the dermal contact scenario, it is assumed that for narcarcinogenic subchronic exposures, an individual would shower daily and be exposed for 0.01 of a day (approximately 14 minutes) to the VOCs emitted from the contaminated ground water. Subchronic VOC shower inhalation exposures were calculated as follows:

$$SDI = \frac{(C)(V)(ET)}{(BW)}$$

Where: SDI = subchronic daily exposure (mg/kg/d),
C = concentration in ambient shower air (mg/m^3),
V = volume of air inhaled (m^3/day)
ET = exposure time as percent of day,
BW = body weight (kg).

Values used for these parameters for evaluation of adult subchronic noncarcinogenic exposures are as follows:

Parameter	Value
C =	chemical specific maximum values
V =	22.4
ET =	0.01
BW =	70

For evaluation of shower VOC inhalation exposure for children in the neighboring residential area, the body weight was reduced to 25 kg and the inhalation volume was increased to 24.48 m^3/day (U.S. EPA, 1989b).

For adult noncarcinogenic chronic exposure, it is assumed that adults would shower daily for 0.01 of a day, 365 days per year for 9 years. The volume of air inhaled is the same as in the subchronic calculations. The chronic averaging time was 9 years for adults.

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TABLE 3-9a

CALCULATION OF ADULT EXPOSURES DUE TO DERMAL
ABSORPTION OF GROUND WATER WHILE SHOWERING

CHEMICAL	Ground-Water Conc. Mean (mg/L)	Ground-Water Conc. Max (mg/L)	Exposure Area (cm2/d)	Film Thickness (cm)	Exposure Time	Exposure Frequency (days/year)	Exposure Duration (years)	Noncarcinogenic SDI* (mg/kg/day)	Noncarcinogenic CDI** (mg/kg/day)	Carcinogenic LADE*** (mg/kg/day)
Arsenic	2.77E-03	5.00E-02	18150	0.0499	0.01	365	9	6.46E-06	3.58E-07	1.12E-05
Barium	2.22E-02	1.83E-01	18150	0.0499	0.01	365	9	2.37E-05	2.87E-06	NA
Zinc	5.27E-02	1.44E+00	18150	0.0499	0.01	365	9	1.87E-04	6.82E-06	NA
Benzene	3.30E-04	8.30E-04	18150	0.0499	0.01	365	9	1.07E-07	4.27E-08	1.33E-06
Chlorobenzene	5.20E-04	1.03E-02	18150	0.0499	0.01	365	9	1.33E-06	6.73E-08	NA
Chloroform	4.00E-04	4.99E-03	18150	0.0499	0.01	365	9	6.46E-07	5.18E-08	1.62E-06
Methylene Chloride	4.40E-04	6.90E-04	18150	0.0499	0.01	365	9	8.93E-08	5.69E-08	1.78E-06
Bis(2-Ethylhexyl)Phthalate	1.83E-03	9.43E-03	18150	0.0499	0.01	365	9	1.22E-06	2.37E-07	7.40E-06
Tetrachloroethene	4.50E-04	5.27E-03	18150	0.0499	0.01	365	9	6.82E-07	5.82E-08	1.82E-06
Toluene	4.30E-04	6.90E-04	18150	0.0499	0.01	365	9	8.93E-08	5.56E-08	NA
Trichloroethene	3.90E-04	1.94E-03	18150	0.0499	0.01	365	9	2.51E-07	5.05E-08	1.58E-06
Vinyl Chloride	4.40E-04	1.39E-03	18150	0.0499	0.01	365	9	1.80E-07	5.69E-08	1.78E-06

Notes: * Subchronic exposures are based on maximum concentrations.
** Chronic exposures are based on mean concentrations and a 9-year averaging time.
*** Lifetime Average Daily Exposure.
NA - Not available or not applicable

TABLE 3-9b

CALCULATION OF EXPOSURES FOR CHILDREN DUE TO DERMAL ABSORPTION OF GROUND WATER WHILE SHOWERING

CHEMICAL	Ground-Water Conc. Mean (mg/L)	Max (mg/L)	Exposure Area (cm2/d)	Film Thickness (cm)	Exposure Time	Exposure Frequency (days/year)	Exposure Duration (years)	Noncarcinogenic SDI* (mg/kg/day)	CDI** (mg/kg/day)	Carcinogenic LADE*** (mg/kg/day)
Arsenic	2.77E-03	5.00E-02	8000	0.0499	0.01	365	9	7.98E-06	4.42E-07	5.31E-08
Barium	2.22E-02	1.83E-01	8000	0.0499	0.01	365	9	2.92E-05	3.54E-06	NA
Zinc	5.27E-02	1.44E+00	8000	0.0499	0.01	365	9	2.30E-04	8.42E-06	NA
Benzene	3.30E-04	8.30E-04	8000	0.0499	0.01	365	9	1.33E-07	5.27E-08	6.32E-09
Chlorobenzene	5.20E-04	1.03E-02	8000	0.0499	0.01	365	9	1.64E-06	8.30E-08	NA
Chloroform	4.00E-04	4.99E-03	8000	0.0499	0.01	365	9	7.97E-07	6.39E-08	7.66E-09
Methylene Chloride	4.40E-04	6.90E-04	8000	0.0499	0.01	365	9	1.10E-07	7.03E-08	8.43E-09
Bis(2-Ethylhexyl)Phthalate	1.83E-03	9.43E-03	8000	0.0499	0.01	365	9	1.51E-06	2.92E-07	3.51E-08
Tetrachloroethene	4.30E-04	5.27E-03	8000	0.0499	0.01	365	9	8.42E-07	7.19E-08	8.62E-09
Toluene	4.30E-04	6.90E-04	8000	0.0499	0.01	365	9	1.10E-07	6.87E-08	NA
Trichloroethene	3.90E-04	1.94E-03	8000	0.0499	0.01	365	9	3.10E-07	6.23E-08	7.47E-09
Vinyl Chloride	4.40E-04	1.39E-03	8000	0.0499	0.01	365	9	2.22E-07	7.03E-08	8.43E-09

Notes: * Subchronic exposures are based on maximum concentrations.
** Chronic exposures are based on mean concentrations and a 9-year averaging time.
*** Lifetime Average Daily Exposure.
NA - Not available or not applicable

To calculate the noncarcinogenic chronic exposure from inhalation of VOCs emitted from contaminated shower water, the following equation is used:

$$CDI = \frac{(C)(V)(ED)(ET)(EF)}{(BW)(AT)}$$

Where: CDI = chronic daily exposure (mg/kg/day),
C = mean concentration in ambient shower air (mg/m^3),
V = volume of air inhaled per day (m^3/day),
ED = exposure duration (years),
ET = exposure time as percent of day,
EF = exposure frequency (days/year),
BW = body weight (kg),
AT = averaging time (day).

Values used to calculate the adult chronic noncarcinogenic exposures are as follows:

Parameter	Value
C =	chemical specific mean values
V =	22.4
ED =	9
ET =	0.01
EF =	365
BW =	70
AT =	3,285

For chronic shower water inhalation exposures for children, the body weight was reduced to 25 kg and the volume inhaled was increased to 24.48 m^3/day.

The carcinogenic exposure calculations use all of the factors discussed for chronic exposure, except the risk is evaluated over a 75-year lifetime. To calculate the lifetime average daily exposure (LADE) for the showering inhalation scenario, the following equation was used:

$$LADE = \frac{(C)(V)(ED)(ET)(EF)}{(BW)(LT)(365\ d/yr)}$$

Where: LADE= lifetime average daily exposure (mg/kg/day),
C = mean concentration in ambient shower air (mg/m^3),
V = volume of air inhaled per day (m^3/day),
ED = exposure duration (year),
ET = exposure time as percent of day,
EF = exposure frequency (days/year),
BW = body weight (kg),
LT = lifetime (year).

Values used for these parameters for evaluation of adult carcinogenic exposures are as follows:

Parameter	Value
C =	chemical specific mean values
V =	22.4
ED =	9
ET =	0.01
EF =	365
BW =	70
LT =	75

The carcinogenic exposures for children were calculated with all the same values as chronic noncarcinogenic exposures except that the body weight was reduced to 25 kg and the volume was increased to 24.48m^3/day. Tables 3-10a and 3-10b calculate inhalation exposures to VOCs from contaminated shower water.

Inhalation of VOCs From Surface Soils

Noncarcinogenic subchronic inhalation exposures to county workers adjacent to the abandoned landfill were based on concentrations of volatile organic chemicals emitted from surface soil at the site (as predicted by the models in Section 3.2), standard human inhalation rates, an 8-hour work day (33 percent), and a 5-day work week. VOC inhalation exposures were calculated as:

$$SDI = \frac{(C)(V)(ET)}{(BW)}$$

Where: SDI = subchronic daily exposure (mg/kg/day),
C = max concentration in ambient air (mg/m^3),
V = volume of air inhaled per day (m^3/day), and
ET = exposure time as percent of day,
BW = body weight (kg).

TABLE 3-10a

CALCULATION OF ADULT EXPOSURES DUE TO INHALATION
OF VOCS EMITTED WHILE SHOWERING

CHEMICAL	Air Conc. (Mean) (mg/m3)	Air Conc. (Max) (mg/m3)	Inhalation Volume (m3/d)	Exposure Time	Exposure Frequency (day/year)	Exposure Duration (years)	Noncarcinogenic SDI* (mg/kg/day)	Noncarcinogenic CDI** (mg/kg/day)	Carcinogenic LADE*** (mg/kg/day)
Arsenic	NA	NA					NA	NA	NA
Barium	NA	NA					NA	NA	NA
Zinc	NA	NA					NA	NA	NA
Benzene	8.37E-04	2.09E-03	22.4	0.01	365	9	6.69E-06	2.68E-06	3.21E-07
Chlorobenzene	8.63E-04	1.72E-02	22.4	0.01	365	9	5.50E-05	2.76E-06	NA
Chloroform	5.12E-04	6.45E-03	22.4	0.01	365	9	2.06E-05	1.64E-06	1.97E-07
Methylene Chloride	4.00E-04	6.33E-03	22.4	0.01	365	9	2.03E-05	1.28E-06	1.54E-07
Bis(2-Ethylhexyl)Phthalate	NA	NA					NA	NA	NA
Tetrachloroethene	3.05E-03	3.60E-02	22.4	0.01	365	9	1.15E-04	9.76E-06	1.17E-06
Toluene	1.23E-03	1.99E-03	22.4	0.01	365	9	6.37E-06	3.94E-06	NA
Trichloroethene	1.59E-03	7.95E-03	22.4	0.01	365	9	2.54E-05	5.09E-06	6.11E-07
Vinyl Chloride	2.99E-03	9.46E-03	22.4	0.01	365	9	3.03E-05	9.57E-06	1.15E-06

Notes: * Subchronic exposures are based on maximum concentrations.
** Chronic exposures are based on mean concentrations and a 9-year averaging time.
*** Lifetime Average Daily Exposure.
NA - Not available or not applicable

TABLE 3-10b

CALCULATION OF EXPOSURES FOR CHILDREN DUE TO
INHALATION OF VOCS EMITTED WHILE SHOWERING

CHEMICAL	Air Conc. (Mean) (mg/m3)	Air Conc. (Max) (mg/m3)	Inhalation Volume (m3/d)	Exposure Time	Exposure Frequency (day/year)	Exposure Duration (years)	Noncarcinogenic SDI* (mg/kg/day)	Noncarcinogenic CDI** (mg/kg/day)	Carcinogenic LADE*** (mg/kg/day)
Arsenic	NA	NA					NA	NA	NA
Barium	NA	NA					NA	NA	NA
Zinc	NA	NA					NA	NA	NA
Benzene	8.37E-04	2.09E-03	24.48	0.01	365	9	2.05E-05	8.20E-06	9.84E-07
Chlorobenzene	8.63E-04	1.72E-02	24.48	0.01	365	9	1.68E-04	8.45E-06	NA
Chloroform	5.12E-04	6.45E-03	24.48	0.01	365	9	6.32E-05	5.01E-06	6.02E-07
Methylene Chloride	4.00E-04	6.33E-03	24.48	0.01	365	9	6.20E-05	3.92E-06	4.70E-07
Bis(2-Ethylhexyl)Phthalate	NA	NA					NA	NA	NA
Tetrachloroethene	3.05E-03	3.60E-02	24.48	0.01	365	9	3.53E-04	2.99E-05	3.58E-06
Toluene	1.23E-03	1.99E-03	24.48	0.01	365	9	1.95E-05	1.20E-05	NA
Trichloroethene	1.59E-03	7.95E-03	24.48	0.01	365	9	7.78E-05	1.56E-05	1.87E-06
Vinyl Chloride	2.99E-03	9.46E-03	24.48	0.01	365	9	9.26E-05	2.93E-05	3.51E-06

Notes: * Subchronic exposures are based on maximum concentrations.
** Chronic exposures are based on mean concentrations and a 9-year averaging time.
*** Lifetime Average Daily Exposure.
NA - Not available or not applicable

Values used for these parameters for evaluation of adult subchronic noncarcinogenic exposures are as follows:

Parameter	Value
C =	chemical specific maximum values
V =	22.4
ET =	0.33
BW =	70

For evaluation of VOC inhalation exposure from contaminated surface soils for children, the body weight was reduced to 25 kg, the inhalation volume was increased to 24.48 m^3/day, and the exposure time was increased to 16 hours (67 percent) (U.S. EPA, 1989b). The 16-hour exposure time accounts for VOC's inhaled at school and at home nearby.

For adult noncarcinogenic chronic exposure, it is assumed that adults would be exposed to the VOCs escaping from the surface soils for 8 hours per day, 240 work-days per year, for 30 years. The volume of air inhaled is the same as in the subchronic calculations. The chronic averaging time was 30 years (10,950 days) for adults.

To calculate the noncarcinogenic chronic exposure from inhalation of VOCs emitted from surface soils, the following equation is used:

$$CDI = \frac{(C)(V)(ED)(ET)(EF)}{(BW)(AT)}$$

Where:
- CDI = chronic daily exposure (mg/kg/day),
- C = mean concentration in ambient air (mg/m^3),
- V = volume of air inhaled per day (m^3/day),
- ED = exposure duration (years),
- ET = exposure time as percent of day,
- EF = exposure frequency (days/year),
- BW = body weight (kg),
- AT = averaging time (days).

Values used to calculate the adult chronic noncarcinogenic exposures are as follows:

Parameter	Value
C =	chemical specific maximum values
V =	22.4
ED =	30
ET =	0.33
EF =	240
BW =	70
AT =	10,950

For chronic inhalation exposures from VOCs escaping from contaminated surface soils for children, the body weight was reduced to 25 kg, the volume inhaled was increased to 24.48m^3/day the exposure frequency was reduced to 200 days per year.

The carcinogenic exosure calculations use all of the factors discussed for chronic exposure, except the risk is evaluated over a 75-year lifetime. To calculate the lifetime average daily exposure (LADE) for the showering inhalation scenario, the following equation was used:

$$LADE = \frac{(C)(V)(ED)(ET)(EF)}{(BW)(LT)(365\ d/yr)}$$

Where:
- LADE = lifetime average daily exposure (mg/kg/day),
- C = mean concentration in ambient shower air (mg/m^3),
- V = volume of air inhaled per day (m^3/day),
- ED = exposure duration (year),
- ET = exposure time as percent of day
- EF = exposure frequency (days/year),
- BW = body weight (kg),
- LT = lifetime (year).

Values used for these parameters for evaluation of adult carcinogenic exposures are as follows:

Parameter	Value
C =	chemical specific mean values
V =	22.4
ED =	30
ET =	0.33
EF =	365
BW =	70
AT =	75

The carcinogenic exposures for children were calculated with all the same values as chronic noncarcinogenic exposures except that the body weight was reduced to 25 kg, the volume inhaled was increased to 24.48 m^3/day, and the exposure duration was decreased to 9 years. Averaging time is replaced with lifetime (LT).

Tables 3-11a and 3-11b calculate inhalation exposures for VOC emissions from contaminated surface soils on site.

TABLE 3-11a

CALCULATION OF ADULT EXPOSURES DUE TO VOC INHALATION
ON SITE - 10 METERS FROM SOURCE

CHEMICAL	Air Conc. (Mean) (mg/m3)	Air Conc. (Max) (mg/m3)	Inhalation Volume (m3/d)	Exposure Time	Exposure Frequency (day/year)	Exposure Duration (years)	Noncarcinogenic SDI* (mg/kg/day)	Noncarcinogenic CDI** (mg/kg/day)	Carcinogenic LADE*** (mg/kg/day)
Arsenic	NA	NA					NA	NA	NA
Barium	NA	NA					NA	NA	NA
Zinc	NA	NA					NA	NA	NA
Benzene	5.76E-05	2.85E-03	22.4	0.33	240	30	2.15E-04	4.00E-06	1.60E-06
Chlorobenzene	5.63E-04	1.28E-02	22.4	0.33	240	30	9.65E-04	3.91E-05	NA
Chloroform	1.00E-04	2.90E-04	22.4	0.33	240	30	2.19E-05	6.94E-06	2.78E-06
Methylene Chloride	1.69E-04	3.11E-03	22.4	0.33	240	30	2.35E-04	1.17E-05	4.69E-06
Bis(2-Ethylhexyl)Phthalate	NA	NA					NA	NA	NA
Tetrachloroethene	1.93E-04	4.05E-04	22.4	0.33	240	30	3.05E-05	1.34E-05	5.36E-06
Toluene	1.02E-03	4.48E-03	22.4	0.33	240	30	3.38E-04	7.08E-05	NA
Trichloroethene	NA	NA					NA	NA	NA
Vinyl Chloride	4.15E-05	5.07E-03	22.4	0.33	240	30	3.82E-04	2.88E-06	1.15E-06

Notes: * Based on 8-hr work day, 5-day work week, and 70 kg-adult.
** Based on 8-hr work day, 240-day work year, a 30-year work lifetime out of 75 years, and a 70 kg adult.
*** Lifetime Average Daily Exposure.
NA - Not available or not applicable

TABLE 3-11b

CALCULATION OF EXPOSURES FOR CHILDREN DUE TO VOC INHALATION
OFF SITE - 50 METERS FROM SOURCE

CHEMICAL	Air Conc. (Mean) (mg/m3)	Air Conc. (Max) (mg/m3)	Exposure Volume (m3/d)	Exposure Time	Exposure Frequency (day/year)	Exposure Duration (years)	Noncarcinogenic SDI* (mg/kg/day)	Noncarcinogenic CDI** (mg/kg/day)	Carcinogenic LADE*** (mg/kg/day)
Arsenic	NA	NA					NA	NA	NA
Barium	NA	NA					NA	NA	NA
Zinc	NA	NA					NA	NA	NA
Benzene	1.18E-05	5.84E-04	24.48	0.67	200	9	2.74E-04	4.24E-06	5.09E-07
Chlorobenzene	1.15E-04	2.63E-03	24.48	0.67	200	9	1.23E-03	4.13E-05	NA
Chloroform	2.06E-05	5.94E-05	24.48	0.67	200	9	2.78E-05	7.41E-06	8.89E-07
Methylene Chloride	3.47E-05	6.38E-04	24.48	0.67	200	9	2.99E-04	1.25E-05	1.50E-06
Bis(2-Ethylhexyl)Phthalate	NA	NA					NA	NA	NA
Tetrachloroethene	3.95E-05	8.30E-05	24.48	0.67	200	9	3.89E-05	1.42E-05	1.70E-06
Toluene	2.08E-04	9.18E-04	24.48	0.67	200	9	4.30E-04	7.48E-05	NA
Trichloroethene	NA	NA					NA	NA	NA
Vinyl Chloride	8.50E-06	1.04E-03	24.48	0.67	200	9	4.87E-04	3.06E-06	3.67E-07

Notes: * Based on 16-hr school day, 5-day work week and 25-kg child.
** Based on 16-hr school day, 5-day school week, a 200 day school year, a 9-year exposure duration and a 25 kg child.
*** Lifetime Average Daily Exposure.
NA - Not available or not applicable

4.0 TOXICITY ASSESSMENT

The objective of this toxicity assessment is to describe, through the exposure routes identified in Section 3.0 of this report, the nature and extent of potential health and environmental hazards that may be associated with the selected indicator chemicals at the Syosset Landfill site. This section contains information on pharmacokinetics, humah health effects, environmental toxicity, and dose-response assessments for the contaminants of concern.

In the pharmacokinetic sections, the absorption, distribution, metabolism, and excretion of particular chemicals are discussed. Under human health effects, the various human side effects from exposure to a chemical will be listed. These effects may include toxicity, carcinogenicity, mutagenicity, and teratogenicity. The environmental toxicity sections will focus on aquatic toxicity and will provide chemical concentrations known to be toxic to certain aquatic plant and animals. The dose-response sections will discuss the correlation between a particular dose of chemicals and the response in the exposed individual. These sections will also include several human health criteria, such as carcinogenic potency values, and the chemical concentrations associated with specific cancer risk levels.

Throughout this section, various environmental and toxicological criteria are listed for the selected chemicals. These criteria are divided into several categories, such as carcinogenic potency and acute aquatic toxicity. For clarification of the significance of these criteria, the different categories are defined below.

EPA developed water quality criteria to help to protect human health and aquatic life. Human health criteria include toxicity and carcinogenicity protection factors. For carcinogens, EPA established concentrations corresponding to several incremental lifetime cancer risk levels (i.e., 1E-05, 1E-06, and 1E-07). A risk of 1E-05, for example, indicates a probability of one additional case of cancer for every 100,000 people exposed (Federal Register, 1980).

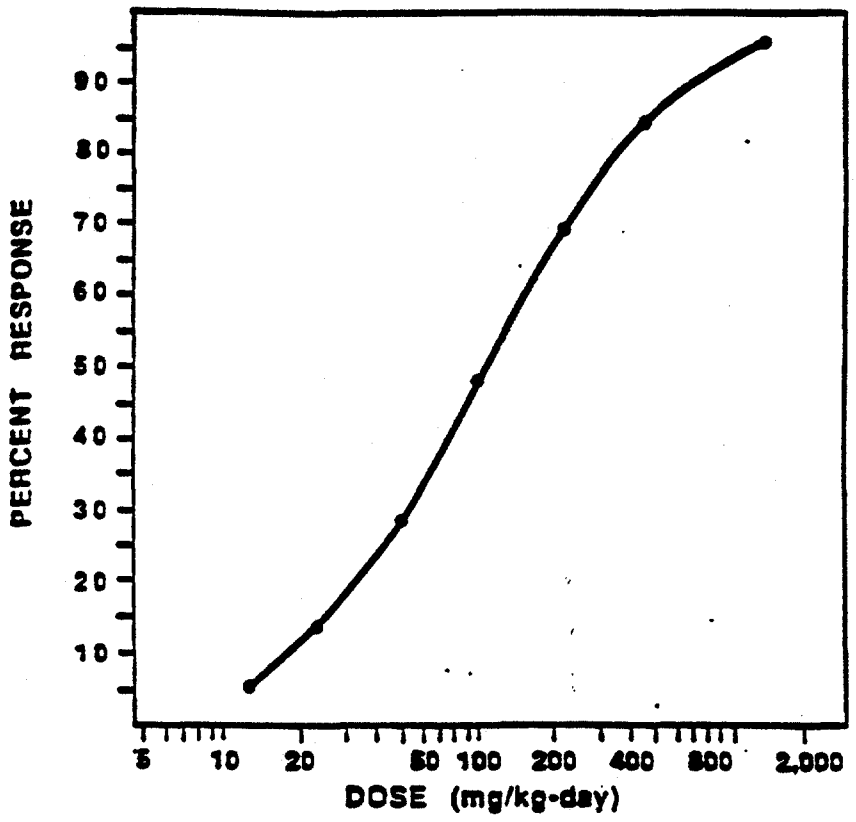
Aquatic life criteria are divided into acute and chronic values for both freshwater and saltwater environments. The values are based on research data for plants and animals occupying various trophic levels. A trophic level is a hierarchial stratum of a food web characterized by organisms that are the same number of steps removed from the primary producers. Acute values are maximum concentrations allowed at any time, and chronic values are maximum 24-hour average concentrations. EPA developed this two-number criteria to describe the highest average ambient water concentration that will produce a suitable water quality, while restricting the extent and duration of the excursions over that average to harmless levels (Federal Register, 1980).

Maximum Contaminant Levels are standards established under the Safe Drinking Water Act and represent the allowable concentrations in public water systems. In general, MCLs are based on lifetime exposure (70 years) to the contaminant of concern for a 70-kilogram adult who consumes 2 liters of water per day. In addition to health factors, EPA's development of MCLs also considered the technological and economic feasibility of removing the contaminant from the water supply (U.S. EPA, 1986a).

EPA is also developing maximum contaminant level goals (MCLGs). Unlike MCLs, the MCLGs are entirely health based. They are, therefore, always less than or equal to MCLs.

Carcinogenic potency values are frequently used to help compare the carcinogenic effects among various chemicals. These values are also used to determine risks to individuals. The potency values (or unit risks) are upper 95-percent confidence limits on the slope of the dose-response curve. Assuming low-dose linearity, the potency value represents the excess lifetime risk due to a continuous lifetime exposure of one unit of carcinogen concentration. A generalized dose-response curve is shown in Figure 4-1. For inhalation and ingestion, typical exposure units are milligrams per kilogram of body weight per day. Table 4-1 lists the carcinogenic potency factors and other toxicity values for the selected chemicals at the Syosset Landfill site (U.S. EPA, 1986a).

FIGURE 4-1. DIAGRAM OF DOSE-RESPONSE RELATIONSHIP



SOURCE: Casarett and Doull, 1986.

TABLE 4-1

CRITICAL TOXICITY VALUES FOR ORAL AND INHALATION EXPOSURES

CHEMICAL	INHALATION RfDs/AIS (mg/kg/day)	RfD/AIC (mg/kg/day)	Carcinogenic Potency Factor 1/(mg/kg/day)	ORAL RfDs/AIS (mg/kg/day)	RfD/AIC (mg/kg/day)	Carcinogenic Potency Factor 1/(mg/kg/day)
Arsenic	NA	NA	5.00E+01 (2)	1.00E-03	1.00E-03	1.80E+00
Barium	1.00E-03	1.00E-04	NA	5.00E-02	5.00E-02	NA
Zinc	NA	NA	NA	2.00E-01	2.00E-01	NA
Benzene	NA	NA	2.90E-02	NA	NA	2.90E-02
Chlorobenzene	5.00E-02	5.00E-03	NA	2.00E-01	2.00E-02	NA
Chloroform	NA	NA	8.10E-02	1.00E-02	1.00E-02	6.10E-03
Methylene Chloride	8.57E-01	8.57E-01 (1)	4.70E-07	6.00E-02	6.00E-02	7.50E-03
Bis(2-Ethylhexyl)Phthalate	NA	NA	NA	2.00E-02	2.00E-02	1.40E-02
Tetrachloroethene	NA	NA	3.30E-03	1.00E-01	1.00E-02	5.10E-02
Toluene	2.00E+00	2.00E+00	NA	4.00E-01	3.00E-01	NA
Trichloroethene	NA	NA	1.70E-02	NA	NA	1.10E-02
Vinyl Chloride	NA	NA	2.95E-01	NA	NA	2.30E+00

Notes:
NA - Not Available
Data from HEA Summary Tables (U.S. EPA, 1989a)
1 - Methylene chloride values derived from 3 mg/m3
i.e., (3 mg/m3 x 20 m3/day)/70 kg = 8.57E-01 mg/kg/d
2 - Arsenic Cpf from Newly Revised Toxicology Data (August, 1988)
(Updates to SPHEM tables)

EPA has also developed acceptable intake toxicity values for noncarcinogens. The acceptable toxicity values are Reference Doses (RfDs) and Acceptable Daily Intakes (ADIs). The RfD is the toxicity value most used in evaluating noncarcinogenic effects resulting from exposure at Superfund sites, and has replaced the ADI as the Agency's preferred value. These values are expressed in units of milligrams per kilogram of body weight per day. Subchronic RfD (RfDs) and Acceptable Intake for Subchronic Exposure (AIS) are estimates of a daily exposure level for the human population, including sensitive subpopulations, that is not expected to present an appreciable risk of deleterious effects if the exposure were to occur for a period of less than 7 years. Chronic RfD and Acceptable Intake for Chronic Exposure (AIC) are estimates of a lifetime daily exposure level that is not expected to present an appreciable risk. The RfDs/AIS and RfD/AIC values for the selected chemicals are listed in Table 4-1.

4.1 Arsenic

4.1.1 Toxicological Profile

Pharmacokinetics

In mice, approximately 90 percent of orally administered trivalent arsenic (As^{3+}) or pentavalent arsenic (As^{5+}) was absorbed through the gastrointestinal (GI) tract (Casarett and Doull, 1986). In humans, up to 95 percent of administered inorganic arsenic is absorbed (U.S. EPA, 1984a). Following absorption into the blood, arsenic was rapidly and widely distributed to all body tissues. The highest percentage of arsenic was found in the liver and kidneys (Clayton and Clayton, 1981).

Arsenic is excreted primarily in urine. The biological half-life of ingested inorganic arsenic is about 10 hours, and the half-life of methylated arsenic in humans is about 30 hours. Arsenic is also excreted through desquamation of skin and in sweat (Casarett and Doull, 1986).

Results of studies indicate that placental transfer of arsenic is possible (Casarett and Doull, 1986).

Human Health Effects

Arsenic poisoning produces a variety of effects in humans. Acute poisoning of humans who have ingested as little as 130 mg of arsenic has been reported. Acute poisoning is characterized by nausea, vomiting, diarrhea, abdominal pain, and severe gastrointestinal damage.

Chronic arsenic poisoning is associated with digestive and nervous system problems, liver damage, and kidney problems. Dermal effects of chronic toxicity include hyperkeratosis and arsenical melanosis. Mucous membrane effects of chronic toxicity include irritation of the nose and pharynx. Arsenic is a recognized carcinogen of the skin, lungs, and liver. It is a cumulative poison in mammals, although a small percentage is considered essential for normal life (Clayton and Clayton, 1981). The NIOSH permissible exposure limit for arsenic is 10 $\mu g/m^3$ (USDHHS, 1985). The time weighted average (TWA) for arsenic is 0.2 mg/m^3.

Environmental Toxicity

A few cases of arsenic poisoning of domestic animals have been reported. The poisoning causes hyperemia and edema of the gastrointestinal tract, hemorrhage of cardiac serosal surfaces and peritoneum, and pulmonary congestion and edema.

Inorganic forms of arsenic seem to be much more toxic to aquatic organisms than organic forms. Arsenic trioxide is acutely toxic to adult freshwater animals at a concentration as low as 812 micrograms per liter ($\mu g/l$). A level as low as 40 $\mu g/l$ can be toxic to the early life stages of aquatic organisms. Acute toxicity to saltwater fish occurs at 508 mg/l. Some saltwater invertebrates are affected at much lower levels (Clement Associates, Inc., 1985).

4.1.2 Dose-response Assessment

Studies discussed in the Arsenic Health Effects Assessment document (U.S. EPA, 1984a) present useful human dose-response information. One study involved 74 individuals who had ingested arsenic-containing antiasthmatic herbal preparations for periods ranging from less than

6 months (intermittent ingestion) to 15 years. Doses were estimated to be 2.5 mg arsenic/day as arsenic oxide (trivalent arsenic) or 10.3 mg arsenic/day as arsenic sulfides. The following systems of the individuals were affected: cutaneous (91.9 percent), neurological (51.3 percent), gastrointestinal (23 percent), hematological (23 percent), and renal and other (19 percent); 5.4 percent of the patients had internal malignancies.

In this study, the major effects in more than 10 percent of the subjects were generalized hyperpigmentation (arsenical melanosis), hyperkeratosis of palms and soles, "raindrop" dipigmentations, palmar and plantar hyperhidrosis, multiple arsenical keratoses, sensorimotor polyneuropathy, fine finger tremors, persistent chronic headache, lethargy, weakness and insomnia, psychosis, gastritis or gastroenteritis, mild iron deficiency anemia as a result of toxic marrow suppression, and transient albuminuria without azotemia. The internal malignancies consisted of two squamous-cell carcinomas of the lungs, one squamous-cell carcinoma of the gall bladder, and one hemangiosarcoma of the liver. Similar neurological effects were observed in people who consumed approximately 3 mg arsenic/day in contaminated soy sauce for 2 to 3 weeks.

Other studies have indicated that airborne arsenic compounds are associated with skin lesions, cardiovascular and respiratory effects, and peripheral neuropathy, but no adequate exposure information is available for any of the studies (U.S. EPA, 1984a).

Chronic inhalation exposure to arsenic compounds results in symptoms similar to those observed following oral exposure (U.S. EPA, 1984a). For example, a direct relationship has been reported between the length and intensity of exposure of smelter workers to airborne arsenic, predominantly as arsenic trioxide, and alterations in peripheral nerve function. No studies were available in which exposure levels are characterized sufficiently for the determination of dose-response relationships (U.S. EPA, 1984a).

Numerous arsenic compounds, particularly trivalent inorganics, have been associated with lung and skin carcinomas in humans. In two studies, (U.S. EPA, 1984a), investigators surveyed 40,421 residents of Taiwan who had consumed artesian well water containing 0.01-1.8 mg/l arsenic for 45 to 60 years. A dose-response relationship (Table 4-2) was established between the prevalence of skin cancer and arsenic consumption, which was based on arsenic concentrations in different wells and length of exposure (age). The overall incidence of skin cancer was 10.6/1,000; the maximum incidence was 209.6/1,000 in males over 70 years of age (U.S. EPA, 1984a). The carcinogenic potency values for arsenic are 50 $(mg/kg/day)^{-1}$ via inhalation (IRIS, 1989) and 18 $(mg/kg/day)^{-1}$ via ingestion. However, the U.S. EPA Risk Assessment Council has recently recommended that the risk associated with ingestion exposure of inorganic arsenic be scaled down by a factor of 10 based on the Council's judgment that exposures by this route are less likely to induce lethal cancers (Moore, 1987, as cited in U.S. EPA, 1984a).

4.2 Barium

4.2.1 Toxicological Profile

Pharmacokinetics

Barium is at least partially absorbed by the human body following ingestion. McCauley and Washington (1983, as cited in U.S. EPA, 1984b) studied the absorption of various barium salts and reported the relative absorption rate to be: barium chloride > barium sulfate > barium carbonate.

Human Health Effects

Acute exposure to barium results in a variety of cardiac, gastrointestinal, and neuromuscular effects (Federal Register, 1985). There are no reports of carcinogenicity, mutagenicity, or teratogenicity associated with barium or its compounds (Clement Associates, Inc., 1985).

TABLE 4-2

DOSE-RESPONSE RELATIONSHIPS BETWEEN PREVALENCE OF SKIN CANCER AND ARSENIC CONSUMPTION BY AGE

Exposure Range (ppm)	Age (Years)		
	20-39 (30)	40-59 (50)	≥ 60 (70)
0-0.29	0.0013	0.0065	0.0481
0.30-0.59	0.0043	0.0477	0.1634
≥ 0.6	0.0224	0.0983	0.2553

Source: U.S. EPA (1984a)

Insoluble forms of barium, particularly barium sulfate, are not toxic by ingestion or inhalation because only minimal amounts are absorbed. However, soluble barium compounds are highly toxic in humans after exposure by either route. The most important effect of acute barium poisoning is a prolonged stimulant action on muscle (Clement Associates, Inc., 1985). Welch, et al., (1983, as cited in U.S. EPA, 1984b) reported that the antinociceptive and lethal effects of barium chloride could be reversed by naloxone or atropine.

Effects on the hematopoietic system and cerebral cortex have also been reported in humans. Accidental ingestion of soluble barium salts has resulted in gastroenteritis, muscular paralysis, and ventricular fibrillation and extra systoles. Potassium deficiency can occur in cases of acute poisoning. Baritosis, a benign pneumoconiosis, is an occupational disease arising from the inhalation of barium sulfate dust, barium oxide dust, and barium carbonate. The radiologic changes produced in the lungs are reversible with cessation of exposure (Clement Associates, Inc., 1985). The TWA limit for barium is 0.5 mg/m^3.

Environmental Toxicity

Although the toxic effects of barium exposure in humans are reinforced by laboratory animal studies, adequate data for characterization of toxicity to wildlife and domestic animals are not available (Clement Associates, Inc., 1985).

4.2.2 Dose-response Assessment

Doses of barium carbonate and barium chloride of 57 mg/kg and 11.4 mg/kg respectively, have been reported to be fatal in humans (Clement Associates, Inc., 1985). Based on a no-observed effect level (NOEL) in animal studies, the RfDs/AIS has been set at 0.0098 mg/kg/day. For chronic exposure, the RfD/AIC for oral exposure to barium has been set at 0.05 mg/kg/day and that for inhalation exposure set at 0.0001 mg/kg/day. The RfDs/AIS for oral exposure is 0.05 mg/kg/day (IRIS, 1988).

4.3 Zinc

4.3.1 Toxicological Profile

Pharmacokinetics

Zinc is considered an essential trace element in human and animal nutrition and deficiency results in severe health consequences (NAS, 1977). The recommended daily dietary allowances (RDA) for zinc recommended by NAS are as follows: adults, 15 mg/day; growing children over a year old, 10 mg/day; and additional supplements during pregnancy and lactation (NAS, 1974). This intake level is generally satisfied by the zinc content of foods (Sandstead, 1974).

About 20 to 30 percent of ingested zinc is absorbed. The mechanism controlling this absorption is thought to be homeostatically controlled and is probably a carrier mediated process (Davies, 1980). It is influenced by prostaglandins E_2 and F_2 and is chelated by picolinic acid - a tryptophan derivative. Deficiencies in tryptophan or pyridoxine depress zinc absorption. Zinc induces metallothionein synthesis, and this induction, after saturation of the system, may serve as a feedback mechanism to depress zinc absorption. In the blood, two-thirds of the available zinc is bound to albumin and the remainder is complexed with β_2-macroglobulin. Zinc enters the gastrointestinal tract as a component of metallothionein secreted by the salivary glands, intestinal mucosa, pancreas, and liver. About 2 g of zinc is filtered by the kidneys each day, and about 300 to 600 μg/day is excreted by normal adults. Renal tubular reabsorption is impaired by commonly prescribed drugs, such as thiazide diuretics, and is further influenced by dietary protein. There is a good correlation between dietary zinc and urinary and fecal zinc excretion (Klaassen et al., 1986). However, in cases of zinc starvation or malnutrition, there has been evidence of an increase in the urinary excretion of zinc. This release of zinc is a result of tissue breakdown and catabolism during starvation. Elevated urinary excretion of zinc persists through the starvation period and sometimes persists after intake levels are back to normal (Spencer et al., 1976).

Zinc tissue concentration varies widely. The liver receives up to 40 percent of a tracer dose, and declines to 25 percent within about 5 days. Liver concentrations are influenced by humoral factors, including adrenocorticotropic hormone, parathyroid hormone, and endotoxin. In the liver, as in other tissues, zinc is bound to metallothionein. The greatest concentration of zinc in the body is in the prostate, and this is probably related to the rich content of zinc-containing enzyme acid phosphatase (Klaassen et al., 1986).

Human Health Effects

Testicular tumors have been produced in rats and chickens when zinc salts are injected intratesticularly, but not when other routes of administration are used. Zinc may be indirectly important with regard to cancer, because its presence seems to be necessary for the growth of tumors. Laboratory studies suggest that although zinc-deficient animals may be more susceptible to chemical induction of cancer, tumor growth is slower in these animals. There is no evidence that zinc deficiency has any etiological role in human cancer. There are no data available to suggest that zinc is mutagenic or teratogenic in animals or humans (Clement Associates, Inc., 1985).

Zinc is an essential trace element that is involved in enzyme functions, protein synthesis, and carbohydrate metabolism. Ingestion of excessive amounts of zinc may cause fever, vomiting, stomach cramps, and diarrhea. Fumes of freshly formed zinc oxide can penetrate deep into the alveoli and cause metal fume fever. Zinc oxide dust does not produce this disorder. Contact with zinc chloride can cause skin and eye irritation. Inhalation of mists or fumes may irritate the respiratory and gastrointestinal tracts. Zinc in excess of 0.25 percent in the diet of rats causes growth retardation, hypochromic anemia, and defective mineralization of bone. No zinc toxicity is observed at dietary levels below 0.25 percent (Clement Associates, Inc., 1985).

Studies with animals and humans indicate that metabolic changes may occur due to the interaction of zinc and other metals in the diet. Exposure to cadmium can cause changes in the distribution of zinc, with increases in the liver and kidneys, organs where cadmium also accumulates. Excessive intake of zinc may cause copper deficiencies and result in anemia. Interaction of zinc with iron or lead may also lead to changes that are not produced when the metals are ingested individually (Clement Associates, Inc., 1985).

Environmental Toxicity

Zinc produces acute toxicity in freshwater organisms over a range of concentrations from 90 to 58,100 µg/l and appears to be less toxic in harder water. Acute toxicity is similar for freshwater fish and invertebrates. Chronic toxicity values range from 47 to 852 µg/l and appear to be relatively unaffected by hardness. A final acute-chronic ratio of 3.0 for freshwater species has been reported. Although most freshwater plants appear to be insensitive to zinc, one species, the alga Selenastrum capricornutum, exhibited toxic effects at concentrations from 30 to 700 µg/l. Reported acute toxicity values range from 2,730 to 83,000 µg/l for saltwater fish and from 166 to 55,000 µg/l for invertebrate saltwater species. Zinc produces chronic toxicity in the mysid shrimp at 166 µg/l. The final acute-chronic ratio for saltwater species is 3.0. Toxic effects are observed in saltwater plant species at zinc concentrations of 50 to 25,000 µg/l. Bioconcentration factors of edible portions of aquatic organisms range from 43 for the soft-shell clam to 16,700 for the oyster (Clement Associates, Inc., 1985).

Zinc poisoning has occurred in cattle. In one outbreak, poisoning was caused by food accidentally contaminated with zinc at a concentration of 20 g/kg. An estimated intake of 140 g of zinc per cow per day for about 2 days was reported. The exposed cows exhibited severe enteritis, and some died or had to be slaughtered. Postmortem findings showed severe pulmonary emphysema with changes in the myocardium, kidneys, and

liver. Zinc concentrations in the liver were extremely high. Based on relatively limited data, some researchers have speculated that exposure to excessive amounts of zinc may constitute a hazard to horses. Laboratory studies and findings in foals living near lead-zinc smelters suggest that excessive exposure to zinc may produce bone changes, joint afflictions, and lameness. In pigs given dietary zinc at concentrations greater than 1,000 mg/kg, decreased food intake and weight gain were observed. At dietary levels greater than 2,000 mg/kg, deaths occurred as soon as 2 weeks after exposure. Severe gastrointestinal changes and brain damage, both of which were accompanied by hemorrhages, were observed, as well as changes in the joints. High concentrations of zinc were found in the liver (Clement Associates, Inc., 1985).

4.3.2 Dose-response Assessment

The U.S. EPA (1973) has recommended an upper limit of 5 mg zinc/l for public water supply sources. For protection of aquatic life, the U.S. EPA (1980a) recognizes different standards depending on salinity. For saltwater, the acute toxicity criteria is 170 μg/l and the chronic toxicity criteria is 58 μg/l. For freshwater, the acute toxicity criteria depends on the hardness of the water as:

$$e^{[0.83 \ln (\text{hardness}) + 1.95]} \ \mu g/l$$

At a representative hardness of 100 μg/l (moderately hard water), the toxicity value is 321 μg/l. The chronic toxicity criteria is 47 μg/l.

Both the OSHA standard time-weighted average (TWA) and NIOSH-recommended standard for zinc oxide in the air are 5 mg/m^3 (Clement Associates, Inc., 1985). The ACGIH (1988) threshold limit values (TLVs) for zinc vary with the form the metal takes:

Zinc chloride fume:	1 mg/m^3	TWA
	2 mg/m^3	short-term exposure limit (STEL)
Zinc oxide fume:	5 mg/m^3	TWA
	10 mg/m^3	STEL
Zinc oxide dust:	10 mg/m^3	TWA (nuisance particulate)
Zinc stearate:	10 mg/m^3	TWA (nuisance particulate)
	20 mg/m^3	STEL

The subchronic acceptable intake (RfDs) for zinc is 0.2 mg/kg/day for oral intake. The chronic acceptable intake (RfD) is 0.2 mg/kg/day for oral intakes. A carcinogenic potency factor has not yet been determined for zinc.

4.4 Benzene

4.4.1 Toxicological Profile

Pharmacokinetics

According to the Health Effects Assessment document for benzene (U.S. EPA, 1984d), quantitative data on the rate and extent of benzene absorption are not available. Absorption can, however, be inferred from various studies. A significant portion of any dose of benzene is exhaled unchanged or is stored in fat in both animals and humans (Casarett and Doull, 1986).

Evidence suggests that benzene toxicity is caused by one or more metabolites of benzene rather than by benzene itself (Synder [1981] cited in Casarett and Doull [1986]). Some of the metabolites resulting from benzene's biotransformation in animals include the following: phenol, catechol, hydroquinone, and 1,2,4-trihydroxybenzene (Parke [1953] cited in Casarett and Doull [1986]).

The metabolites of benzene also covalently bond to cellular macromolecules. Many researchers believe this bonding is related to the mechanism of benzene's toxicity or carcinogenicity or to both (Casarett and Doull, 1986). In mice, benzene metabolites reportedly bind to proteins in the liver, bone marrow, kidney, spleen, blood, and muscle (Longacre [1981] cited in Casarett and Doull [1986]). Other studies have shown covalent bonding to protein in bone marrow preparations (Irons [1980] cited in Casarett and Doull [1986]).

Human Health Effects

Benzene is a volatile aromatic hydrocarbon present in fossil fuels, including gasoline and other petroleum-based products. Humans are most frequently exposed to benzene through inhalation, and therefore, much of

the human health information is based on exposure by this route. Acute exposure to high concentrations of benzene depresses the central nervous system and may cause unconsciousness and death. Acute exposures can also cause fetal cardiac arrhythmias (Synder [1975] cited in Casarett and Doull [1986]). Milder exposures to benzene can produce vertigo, drowsiness, headache, nausea, menstrual irregularities, and unconsciousness. Benzene can also be dermally absorbed, causing blistering, erythema, and dermatitis (Clement Associates, Inc., 1985).

In humans, the primary adverse effect of benzene is hematopoietic toxicity, that is, interference with the formation of blood or blood cells (Casarett and Doull, 1986). Chronic exposure to low levels of benzene is associated with blood disorders including aplastic anemia and leukemia (Synder [1975] cited in Casarett and Doull [1986]). The bone marrow toxicity of benzene is characterized by a progressive decrease in the number of circulating blood cells (i.e., erythrocytes, thrombocytes, and leukocytes). Blood cell depletion correlates to the degree of benzene exposure (Casarett and Doull, 1986). If the depression of the number of blood cells is severe, the condition is called pancytopenia and is characterized by necrosis (death of living tissue) and fatty replacement of bone marrow (Casarett and Doull, 1986).

Many epidemiology studies have associated occupational exposure to benzene (via inhalation) with an increased incidence of leukemia (U.S. EPA, 1984d). The most common leukemia associated with these exposures is acute myelogenous (bone marrow) leukemia. U.S. EPA has classified benzene as a Group A carcinogen (i.e., there is sufficient evidence from epidemiologic studies to support a causal association between exposure and cancer).

Benzene has been thoroughly tested for genotoxic properties; however, it has not been shown to be mutagenic in several bacterial and yeast systems (U.S. EPA, 1984d).

Many people have studied the effect of benzene on the chromosomes of bone marrow cells and peripheral lymphocytes. The results of most of these studies indicate significant increases in chromosomal aberrations in both symptomatic and asymptomatic groups who were exposed at some time to benzene (U.S. EPA, 1984d).

Environmental Toxicity

For freshwater aquatic life, acute toxicity occurs at concentrations as low as 5.3 milligrams per liter (mg/l)(U.S. EPA, 1980a). For saltwater, levels as low as 5.1 mg/l are acutely toxic to aquatic life. Chronic toxicity has been observed at about 0.70 mg/l (U.S. EPA, 1980a).

4.4.2 Dose-response Assessment

Because benzene is a carcinogen, no level of exposure is recognized as safe (nonthreshold concept). The U.S. EPA calculated a range of concentrations for benzene corresponding to cancer risk levels of 1E-05, 1E-06, and 1E-07. In calculating these values, U.S. EPA assumed an intake of 2 liters per day of drinking water, 6.5 grams per day of fish, and a human body weight of 70 kilograms. The corresponding criteria for these levels for various conditions are listed below:

Risk Level	Consumption of Water and Fish (μl)	Consumption of Fish Only (μl)	Consumption of Water Only (μl)
1E-05	6.60	400.0	6.70
1E-06	0.66	40.0	0.67
1E-07	0.066	4.0	0.067

The carcinogenic potency factor for benzene via inhalation is 2.9E-02 $(mg/kg/day)^{-1}$ (IRIS, 1988). This calculation assumes complete absorption and an inhalation rate of 20 cubic meters (m^3) per day for a 70-kg man.

The lower limit of benzene exposure via inhalation that will elicit hematologic effects is thought to be less than 100 parts per million (ppm). Occupational exposure to benzene at 300 to 700 ppm has been linked to blood abnormalities (U.S. EPA, 1984d).

The TLV-TWA for benzene is 10 ppm or 30 mg/m^3 (ACGIH, 1988). U.S. EPA has established an MCL of 0.005 mg/l for benzene (Federal Register, 1985).

4.5 Chlorobenzene

4.5.1 Toxicological Profile

Pharmacokinetics

Chlorobenzene can enter the body through ingestion, inhalation, and skin absorption. According to several animal studies, chlorobenzene is rapidly absorbed into the blood stream from the lungs and gastrointestinal tract (U.S. EPA, 1984e). It has also been reported that the ingestion of fats and oils facilitates the GI absorption of chlorobenzene (U.S. EPA, 1984e).

Human Health Effects

Chlorobenzene is irritating to the skin, eyes, and mucous membranes of the upper respiratory tract, and can cause central nervous system depression. Animals chronically exposed to chlorobenzene have shown histological changes in the liver, kidneys, and lungs (AIHA, 1985).

A 70-year-old woman exposed for 6 years to a glue containing 70-percent chlorobenzene experienced headaches and irritation of the respiratory mucosa, and eventually exhibited reduced marrow development. Workers exposed to chlorobenzene for 1 to 2 years complained of headaches, somnolescene, indigestion, and numbness and stiffness in the extremities (U.S. EPA, 1984e).

Other occupational studies suggest that chronic exposure to chlorobenzene vapor may cause abnormal blood conditions, increased plasma lipids, and cardiac dysfunction (Clement Associates, Inc., 1985). There is currently no evidence indicating that chlorobenzene is a human carcinogen. Animal studies have failed to confirm or deny the carcinogenicity of chlorobenzene in rats or mice (U.S. EPA, 1984e).

Environmental Toxicity

Chlorobenzene was acutely toxic to fish at levels greater than 25 mg/l and to aquatic invertebrates at levels greater than 10 mg/l (Clement Associates, Inc., 1985).

4.5.2 Dose-response Assessment

The RfDs/AIS values for chlorobenzene are 0.05 mg/kg/day through inhalation and 0.2 mg/kg/day through ingestion (U.S. EPA, 1986a). The RfD/AIC values for this compound are 0.005 mg/kg/day through inhalation and 0.02 mg/kg/day through ingestion (IRIS, 1988).

The Water Quality Criteria Document for chlorinated benzenes recommends a maximum concentration for chlorobenzene of 488 μl to protect the public health (Federal Register, 1980).

A chlorobenzene concentration of 75 ppm in the air causes discomfort in humans; at 200 ppm, symptoms of illness begin; and at 400 ppm, severe toxic effects are exhibited (Verschueren, 1983). The TLV-TWA for chlorobenzene is 75 ppm or 350 mg/m^3 (ACGIH, 1988).

4.6 Chloroform

4.6.1 Toxicological Profile

Pharmacokinetics

According to the U.S. EPA Environmental Criteria and Assessment Office's Health Effects Assessment for chloroform, from 49 to 77 percent of the chloroform inhaled is absorbed by the lungs (U.S. EPA, 1984f). Chloroform was widely used as an anesthetic in the past, but because of its toxic effects, this use is being abandoned.

Human Health Effects

Chloroform is a halogenated aliphatic hydrocarbon. This compound is a probable human carcinogen that can produce central nervous system, gastrointestinal system, heart, liver, kidney, and bladder damage. Vapors of chloroform inhaled in large doses cause narcosis and death (U.S. EPA, 1984f). The narcosis is ordinarily preceded by a stage of excitation that is followed by loss of reflexes, sensation, and consciousness. Between 68,000 to 82,000 ppm in air can kill most animals in a few minutes. Approximately 14,000 ppm is dangerous to life after an exposure of from 30 to 60 minutes. Between 5,000 to 6,000 ppm can be tolerated by animals for 1 hour without serious disturbances. The maximum concentration tolerated for several hours or for prolonged exposure with slight symptoms is 2,000 to 2,500 ppm (Sax, 1984). Work place epidemiological studies suggest that humans exposed to levels of chloroform of 22 to 237 ppm suffer depression, gastrointestinal disturbance (flatulence, nausea), headache, and frequent and scalding urination. Possible longer-term subchronic human health effects may include increased incidence of viral hepatitis, splenomegaly, and hepatomegaly (U.S. EPA, 1984f).

Data pertaining to carcinogenicity of chloroform inhalation in humans is unavailable. However, sufficient data from animal experiments exists to characterize chloroform as a probable human carcinogen (U.S. EPA, 1984f).

Environmental Toxicity

Limited information is available concerning the toxicity of chloroform to organisms exposed at known concentrations (U.S. EPA, 1980a). Median effect concentrations for two freshwater and one invertebrate species range from 28,900 to 115,000 $\mu g/l$. Twenty-seven day LC_{50} values of 2,030 and 1,240 $\mu g/l$ were reported for embryo-larval tests with rainbow trout in water at two levels of hardness. The only reliable result concerning the toxicity of chloroform to saltwater aquatic life is a 96-hour LC_{50} value of 81,500 μg/liter for pink shrimp (Clement Associates, Inc., 1985).

An equilibrium bioconcentration factor of six with a tissue half-life of less than 1 day was determined for the bluegill. Although chloroform is not strongly bioaccumulated, it is thought to be widely distributed in the environment and can be detected in fish, water birds, marine mammals, and various crops (Clement Associates, Inc., 1985). The atmospheric half-life for chloroform is 80 days (U.S. EPA, 1986a).

4.6.2 Dose-response Assessment

The carcinogenic potential of chloroform has not been fully evaluated for either the inhalation or oral routes of exposure (U.S. EPA, 1984f).

The chronic acceptable intake (RfD) for chloroform is 1E-2 mg/kg/day for ingestion (IRIS, 1988).

The NIOSH 1-hour ceiling level is 2.8 ppm (9.8 mg/m^3)(Clement Associates, Inc., 1985). The ACGIH Threshold Limit Value for chloroform is 50 ppm with a 10 ppm ceiling level. The ACGIH TWA for chloroform is 10 ppm or 50 mg/m^3. The NIOSH immediately dangerous to life or health (IDLH) level is 1,000 ppm (ACGIH, 1988). The OSHA ceiling level for chloroform is 244 mg/m^3. The inhalation slope factor for chloroform is 8.1E-02 $(mg/kg/day)^{-1}$ (IRIS, 1988).

4.7 Methylene Chloride

4.7.1 Toxicological Profile

Pharmacokinetics

According to the U.S. EPA Environmental Criteria and Assessment Office's Health Effects Assessment for methylene chloride (U.S. EPA, 1984c), a significant amount of research on inhalation through occupational exposure has been done. Table 4-3 shows that chemical retention for inhaled methylene chloride varies from 34 percent to 70 percent, depending on experimental method (e.g., time exposed, concentration, etc.)(U.S. EPA, 1984c). Methylene chloride is decomposed by heat to phosgene and is metabolized in the body to carbon monoxide

TABLE 4-3

ABSORPTION OF METHYLENE CHLORIDE BY HUMAN SUBJECTS*
(SEDENTARY CONDITIONS)

Inhalation Concentration (ppm)	Exposure (hours)	Retention %	Reference**
50	7.5	70	DiVincenzo and Kaplan, 1981
100	7.5	60	
150	7.5	63	
200	7.5	60	
662	0.30	74	Lehmann and Schmidt-Kehl, 1936
806	0.50	75	
1,152	0.50	72	
1,181	0.50	70	
44 to 680	2.00	31	Riley et al., 1966
100	2.00	53	DiVincenzo et al., 1972
100	4.00	41	
200	2.00	51	
250	0.50	55	Astrand et al., 1975
500	0.50	55	
750	1.00	34	Engstrom and Bjurstrom, 1977

*Source: U.S. EPA, 1984c.
**As cited in U.S. EPA, 1984c.

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with release of chloride ion, resulting in acidosis. In one experiment, carboxy hemoglobin level increased 14 percent in 3 hours in one subject exposed to 986 ppm of methylene chloride (Dreisbach, 1977, as cited in U.S. EPA, 1984c).

Human Health Effects

Because exposure to methylene chloride is often an occupational or chronic problem, subchronic exposures are limited to consumer products, such as paint strippers. Animals (mice, rats, dogs, monkeys) exposed to 25 to 100 ppm of methylene chloride for 14 weeks exhibited no overt signs of toxicity or changes in body weights relative to controls. Higher levels (5,000 ppm) of exposure resulted in signs of severe toxicity: narcosis for the first 24 hours and pronounced lethargy for the remainder of the exposure period, reduced food consumption, and high rates of mortality in mice, dogs, and monkeys (U.S. EPA, 1984c). Taken collectively, these studies indicate that subchronic exposure to methylene chloride causes effects on the liver and kidneys of exposed animals. Methylene chloride is also a skin, respiratory system, and eye irritant.

Chronic effects related to occupational inhalation have been studied extensively. In humans, mild intoxication by methylene chloride results in somnolence, lassitude, anorexia, and mild lightheadedness, followed by greater degrees of disturbed central nervous system function and depression. Permanent disability has not been reported. When fatalities occur, the cause has been attributed to cardiac injury or heart failure.

Methylene chloride has been found to be moderately teratogenic in mice and rats in several studies. Development of the fetus was delayed in rats and accelerated in mice (U.S. EPA, 1984c). Although body weight changed, no significant effects on food and water consumption, wheel running activity, or avoidance learning was observed.

Mutagenicity and genetoxicity of methylene chloride has been studied extensively. Chromosomal aberrations were induced in hamster ovary cells and mutagenic effects were observed in Salmonella typhimurium with no metabolic activation required (U.S. EPA, 1984c).

No reports of human carcinogenicity associated with methylene chloride have been located in the available literature. Cancerous effects in lab animals include carcinomas, sarcomas, and tumors in the mammary chain, adrenal gland, lungs, and liver. Lab results indicate that methylene chloride is probably carcinogenic to rats (mammary tumors) and clearly carcinogenic to mice (lung and liver tumors). Applying the criteria for evaluating the overall weight of evidence of carcinogenicity to humans proposed by the Carcinogen Assessment Group of the U.S. EPA (Federal Register, 1980), methylene chloride is most appropriately classified as B2 - probable human carcinogen (U.S. EPA, 1984c).

Environmental Toxicity

Very little information concerning the toxicity of methylene chloride to domestic animals and wildlife exists (U.S. EPA, 1980a). Acute values for the freshwater species Daphnia magna, the fathead minnow, and the bluegill are 224,000, 193,000, and 224,000 $\mu g/l$, respectively. Acute values for the saltwater species, mysid shrimp and sheepshead minnow, are 256,000 and 331,000 $\mu g/l$, respectively. No data concerning chronic toxicity are available. The 96-hour EC_{50} values for both freshwater and saltwater algae are greater than the highest test concentration, 662,000 $\mu g/l$ (Clement Associates, Inc., 1985).

4.7.2 Dose-response Assessment

OSHA transitional limits include permissible exposure limits (PEL) of 500 ppm (1,737 mg/m^3) with a 1,000 ppm (23,474 mg/m^3) ceiling. Permissible peak concentrations allowed are 2,000 ppm (6,948 mg/m^3) for 5 minutes in any 3-hour period (Clement Associates, Inc., 1985).

The NIOSH-recommended standard includes 75 ppm (261 mg/m^3) in the presence of no more than 2.8 ppm (9.9 mg/m^3) and a 15-minute peak concentration of 500 ppm (1,737 mg/m^3). The U.S. EPA CAG Cancer Unit Risk for inhalation of methylene chloride is 4.7E-07 $(mg/kg/day)^{-1}$ and 7.5E-03 $(mg/kg/day)^{-1}$ for ingestion (U.S. EPA, 1989a).

The threshold limit value (TLV) time-weighted average (TWA) is 50 ppm (175 mg/m^3)(ACGIH, 1988). The STEL is 500 ppm (1,740 mg/m^3) (Clement Associates, Inc., 1985).

4.8 bis(2-Ethylhexyl)phthalate (DEHP)

4.8.1 Toxicological Profile

Pharmacokinetics

Phthalate esters such as DEHP are well absorbed from the gastrointestinal tract following oral administration. Hydrolysis to the corresponding monoester metabolite (MEHP), with release of an alcoholic constituent, 2-ethylhexanol, largely occurs prior to intestinal absorption. Once absorbed, DEHP and MEHP are widely distributed in the body, the liver being the major initial respiratory organ. Clearance from the body is rapid, and there is only a slight cumulative potential. DEHP is converted principally to polar deriatives of the monoesters by oxidative metabolism prior to excretion, primarily through the urinary tract (USDHHS, 1987). When administered by the oral, extraperitoned, intravenous and inhalation routes, DEHP has a low order of acute toxicity.

Human Health Effects

DEHP is carcinogenic in rats and mice, causing hepatocellular carcinomas. Teratogenic and reproductive effects have been observed in experimental animals. Chronic exposure to DEHP retarded growth and increased liver and kidney weights in animals. DEHP status as a human carcinogen is considered indeterminate by the International Agency for Research on Cancer (IARC). DEHP appears to have a relatively low

toxicity in experimental animals. DEHP is poorly absorbed through the skin and no irritant response or sensitizing potential from dermal application has been noted in experimental animals or humans (Clement Associates, Inc., 1985).

Studies in rats and mice suggest that DEHP is developmentally toxic. In the rat, a variety of congenital abnormalities have been observed in the offspring of DEHP-treated rats. In the mouse, the developing nervous appears to be the major target site, producing cyencephaly and spina bifida. DEHP is a reproductive toxicant in male and female mice, resulting in reduced fertility and both production of fewer litters by breeding pairs and decreased litter size (USDHHS, 1987).

For the protection of human health from the toxic properties of DEHP ingested through contaminated aquatic organisms alone, the ambient water quality criterion is determined to be 50 mg/l for DEHP and 34 mg/l for diethyl butyl phthalate.

Environmental Toxicity

Acute median effect values ranged from 1,000 to 11,100 µg/liter DEHP for the freshwater cladoceran Daphnia magna. The LC_{50} values for the midge, scud, and bluegill all exceeded the highest concentrations tested, which were 18,000, 32,000, and 770,000 µg/liter, respectively. As these values are greater than the water solubility of the chemicals, it is unlikely that DEHP will be acutely toxic to organisms in natural waters. In a chronic toxicity test with Daphia magna, significant reproductive impairment was found at the lowest concentration tested, 3 µg/liter. A chronic toxicity value of 8.4 µg/liter was reported for the rainbow trout. No acute or chronic values were reported for saltwater invertebrates or vertebrates. Reported bioconcentration factors for DEHP in fish and invertebrates range from 14 to 2,680 (Clement Associates, Inc., 1985).

Although insufficient data were presented to calculate the acute-chronic ratio for DEHP, it is apparently on the order of 100 to 1,000. Therefore, acute exposure to the chemical is unlikely to affect aquatic organisms adversely, but chronic exposure may have detrimental effects on the environment (Clement Associates, Inc., 1985).

4.8.2 Dose-response Assessment

The carcinogenic potency factor for DEHP is 1.4E-02 for ingestion route exposure. The OSHA threshold limit value TWA is 5 mg/m^3. The OSHA STEL for DEHP is 10 mg/m^3 (ACGIH, 1988). The reference dose for DEHP is 2E-02 (IRIS, 1988).

4.9 Tetrachloroethene

4.9.1 Toxicological Profile

Pharmacokinetics

Following ingestion, tetrachloroethene is partially absorbed from the GI tract (U.S. EPA, 1984g). The reference citing this fact does not specify the percentage of chemical absorbed or the species tested. The ingestion of fats and oils facilitates intestinal absorption of tetrachloroethene in dogs (U.S. EPA, 1984g).

Tetrachloroethene exposure to humans has been primarily through inhalation, resulting in pulmonary absorption (U.S. EPA, 1984g). The absorption is rapid, and the quantity absorbed is dependent on the volume of air respired.

In the body, tetrachloroethene undergoes biotransformation to several metabolites. The first reaction is thought to be an (microsomal) oxidation at the cellular level of tetrachloroethene to a metabolite that covalently bonds to nucleic acids, with the eventual result of mutation, or cancer, or both (Henschler [1982] cited in Casarett and Doull [1986]).

Human Health Effects

In general, an acute exposure to tetrachloroethene vapors depresses the central nervous system and can lead to tissue damage and death. Acute occupational exposures to tetrachloroethene can cause an accumulation of fluid in the lungs. Chronic exposures to this chemical can cause bronchitis, fatty infiltraton of the liver (Casarett and Doull, 1986), respiratory tract irritation, nausea, headache, sleeplessness, abdominal pains, constipation, and liver and kidney damage (U.S. EPA, 1984g).

U.S. EPA has classified tetrachloroethene as a B2 carcinogen (i.e., sufficient evidence of carcinogenicity in animals and inadequate evidence of carcinogenicity in humans). Several studies investigating the carcinogenicity of tetrachloroethene in humans have yielded inconclusive results. Bioassay studies, however, have found liver cell carcinomas in mice administered tetrachloroethene into the stomach using a tube. The results from mutagenic bacteria studies have proved inconclusive (U.S. EPA, 1986b).

Environmental Toxicity

Tetrachloroethene is the most toxic of the chloroethenes with respect to aquatic organisms (Clement Associates, Inc., 1985). In freshwater, acute toxicity to aquatic life has been reported to occur at concentrations of 5.3 ppm, and chronic toxicity has been observed at 0.84 ppm (Federal Register, 1980). In saltwater, acute and chronic toxicities to aquatic life have been shown at concentrations of 10.2 ppm and 0.45 ppm, respectively (Federal Register, 1980).

4.9.2 Dose-response Assessment

Tetrachloroethene is a probable human carcinogen; therefore, no level of exposure is recognized as safe. The U.S. EPA calculated a range of concentrations for ingestion of this compound corresponding to cancer risk levels of 1E-05, 1E-06, and 1E-07. The criteria associated with these levels for various conditions are shown below:

Risk Level	Ingesting Water and Organisms (µl)	Ingesting Organisms Only (µl)	Ingesting Water Only (µl)
1E-05	8.0	88.5	8.8
1E-06	0.8	8.85	0.88
1E-07	0.08	0.88	0.08

The carcinogenic potency value for tetrachloroethene is 3.3E-03 $(mg/kg/day)^{-1}$ for inhalation and 5.1E-02 $(mg/kg/day)^{-1}$ for ingestion. The oral acceptable daily intake (chronic) for tetrachloroethene is 1E-02 (IRIS, 1988).

Rowe et al. (1952) demonstrated that humans subjected to 106 ppm of tetrachloroethene in the air noticed an odor immediately, but did not find it objectionable (AIHA, 1965). At 216 ppm, eye irritation developed within 30 minutes. After 2 hours at this same concentration, there was no loss of motor coordination or mental alertness, but some central nervous system effects were noted. At 280 ppm, the subjects' motor coordination was impaired (AIHA, 1965). The ACGIH TLVs for tetrachloroethene are 50 ppm, 385 mg/m^3 (TWA) and 200 ppm, 1,340 mg/m^3 (STEL) (ACGIH, 1988).

4.10 Toluene

4.10.1 Toxicological Profile

Pharmacokinetics

Toluene is absorbed after inhalation, dermal or oral exposure. The toluene concentration in arterial blood in persons continuously inhaling toluene at 100 ppm and 200 ppm was 1 mg/ml and 2 mg/ml, respectively (U.S. EPA, 1980b). The toluene equilibrium concentration in blood was reached after 20 to 30 minutes of exposure. Exercising individuals took up more toluene than resting individuals, and obese individuals took up more toluene than thinner individuals (U.S. EPA, 1980b). The rate of dermal toluene absroption in human subjects was reported to be 14 to 23 $mg/cm^2/hr$ (Dutkiewicz and Tyras, 1968, as cited in U.S. EPA, 1980b). No studies evaluating toluene absorption after oral exposure have been reported (U.S. EPA, 1980b).

Toluene is distributed into the tissues of the body according to their lipid content and blood perfusion: the greater the lipid content or blood perfusion, the greater the amount of toluene deposited and retained there. The relative concentration of toluene in body tissues is as follows: adipose > bone marrow > brain, liver > lung, kidney, heart, muscle (Sato et al., 1974, as cited in U.S. EPA, 1980b).

Toluene is metabolized by the mixed-function-oxidase system to benzyl alcohol, which is subsequently oxidized to benzaldehyde and benzcic acid; benzoic acid is then conjugated to glycine to form hippuric acid (U.S. EPA, 1980b). Inducers of the mixed-function-oxidase system decrease toluene toxicity, whereas inhibitors enhance toluene toxicity. This suggests that toxicity is due to toluene directly and not to its metabolite(s). Toluene is eliminated primarily by urinary excretion of the metabolite, hippuric acid; after inhalation exposure to toluene, a large portion of the absorbed toluene is also exhaled (U.S. EPA, 1980b).

Human Health Effects

Available studies that assess the carcinogenicity or mutagenicity of toluene are not adequate to make conclusions regarding its potential to cause these effects (U.S. EPA, 1980b).

Based on the results of a rat chronic-inhalation study, the U.S. EPA has estimated AIC values of 0.3 mg/kg/day for oral (IRIS, 1988) and 1.0 mg/kg/day for inhalation routes. AIS values for toluene are 0.4 mg/kg/day for oral and 1.0 mg/kg/day for inhalation.

In humans, acute exposure to high levels of toluene causes central nervous system (CNS) depression (U.S. EPA, 1980b). Exposure to 2,050 ppm of toluene caused sudden death due to heart failure. Exposure to lower levels (100 to 700 ppm) produced no significant effects on heart rate (U.S. EPA, 1980a). Carpenter and others (1944, as cited in Sandmeyer, 1981) reported that acute exposures to 800 ppm of toluene caused respiratory irritation, nasal mucous secretion, a metallic taste, and

impaired balance; exposures to 600 ppm, lassitude, hilarity, and slight nausea; exposures to 400 ppm, mild eye lacrimation and hilarity. ACGIH has recommended a TLV for toluene of 100 ppm (375 mg/m^3) and a STEL of 130 ppm (560 mg/m^3)(1988).

Environmental Toxicity

Toluene is highly volatile and slightly soluble in water, approximately 535 mg/l (U.S. EPA, 1986a). The transport and persistence of toluene under environmental conditions is not well known. However, it is readily transferred to the atmosphere from the water surface and may re-enter the hydrosphere in rain. U.S. EPA (1980a) summarizes the toluene exposure experiments performed with marine species. The range of LC_{50} for toluene in marine invertebrates other than the Pacific oyster was 3,700 µg/l (Benville and Korn, 1977) to 56,300 µg/l for mysid shrimp (U.S. EPA, 1978). LeGore (1974) measured very high values for the Pacific oyster, 1,050,000 µg/l. In an admittedly limited data base, marine fish also exhibited a wide range of sensitivities. Striped bass has a LC_{50} value of 6,300 µg/l (Benville and Korn, 1977) while sheepshead minnow were very resistant with LC_{50}s between 277,000 and 485,000 µg/l. However, fish exposed to toluene can eliminate it through their gills relatively rapidly upon exposure to uncontaminated water (Thomas and Rice, 1981).

Potera (1975) examined the relationship of the 24-hour LC_{50} and the variables, temperature, salinity, and life stage of the grass shrimp. His data indicate that the LC_{50} value is not particularly sensitive to these variables.

Sheepshead minnow exhibited chronic effects on hatching and survival of embryo-larvae at 5,000 µg/l (U.S. EPA, 1978).

The response of plants to toluene was variable even within species. Skeletonema costatum, a common estuarine diatom, exhibited effects on growth or photosynthesis at 8,000 µg/l (Dunstan, 1975), and at concentrations greater than 433,000 µg/l (U.S. EPA, 1978). Kelp have exhibited effects on photosynthesis at 10,000 µg/l (U.S. EPA, 1980).

Of five freshwater species tested with toluene, the cladoceran, Daphnia magna was most resistant to any acute effects. The EC_{50} and LC_{50} values ranged from 12,700 to 313,000 µg/l. No chronic tests were available for freshwater species. The freshwater alga tested were relatively insensitive to toluene with EC_{50} of 245,000 or greater (Clement Associates, Inc., 1985).

4.10.2 Dose-response Assessment

No information is available at this time.

4.11 Trichloroethene (TCE)

4.11.1 Toxicological Profile

Pharmacokinetics

Data are not available on the rate of absorption of TCE in humans. However, rats exhale 72 to 85 percent of ingested TCE through the lungs and excrete in the urine an additional 10 to 20 percent of the amount originally ingested (U.S. EPA, 1984h). This indicates that 80 to 100 percent of ingested TCE is absorbed into the blood stream from the GI tract of rats. Absorption of TCE through the lungs occurs quickly and reaches equilibrium in about 2 hours (U.S. EPA, 1984h).

Like other solvents, TCE is biotransformed to various metabolites. The first step in the biotransformation is thought to involve microsomal oxidation leading to an epoxide formation across the double bond (Henschler [1982] cited in Casarett and Doull [1986]). It has been suggested that the resulting metabolites are highly reactive and can, therefore, covalently bond to nucleic acids (Casarett and Doull, 1986).

Human Health Effects

Following acute inhalation exposure to TCE, narcosis and death can occur. Workers exposed to high levels of TCE show signs of central nervous system disturbance. Initial signs include disorientation, euphoria, giddiness, and confusion. Symptoms then progress to unconsciousness, paralysis, convulsion, and ultimately death from respiratory or cardiovascular arrest (Casarett and Doull, 1986).

Separate from TCE's acute central nervous system depressant action is its toxic effect on the liver. Fatty infiltration of the liver and other liver damage can occur following repeated exposures via inhalation to what would otherwise be tolerable levels of TCE. The hepatotoxicity of TCE has been attributed to a reactive metabolite (Casarett and Doull, 1986).

Persons recovering from an acute ingestion of ethanol are more susceptible to liver damage from subsequent exposure to trichloroethene than persons who had not ingested ethanol (Casarett and Doull, 1986).

U.S. EPA has classified trichloroethene as a B2 carcinogen. This classification means there is sufficient evidence of carcinogenicity in animals and inadequate evidence of carcinogenicity in humans. For humans, three cohort studies and two surveys showed no excess cancer risk.

Results from various animal studies are briefly described below:

- Hepatocellular carcinomas in male and female mice via gavage,
- Hepatocellular carcinomas in male and female mice via inhalation,
- Malignant lymphomas in female mice via inhalation, and
- Borderline increases in renal adenocarcinomas in male rats via gavage.

The supporting evidence for the B2 classification is as follows:

- Commercial grade trichloroethene is a weakly active, indirect mutagen (requires metabolic activation) in a number of test systems representing a wide evolutionary range of organisms.
- Trichloroethene caused a positive cell transformation in an in vitro study with rat embryo cells.
- Trichloroethene oxide caused a positive cell transformation in a study with hamster embryo cells.

Environmental Toxicity

The acute toxicity value in freshwater for trichloroethene is 45 mg/l, and the chronic toxicity concentration in freshwater is 21.9 mg/l (U.S. EPA, 1980).

4.11.2 Dose-response Assessment

Because trichloroethene is a probable human carcinogen, no level of exposure is recognized as safe. The U.S. EPA calculated a range of concentrations for trichloroethene corresponding to cancer risk levels of 1E-05, 1E-06, and 1E-07. The criteria associated with these levels for various conditions are shown below:

Risk Level	Ingesting Water and Organisms (μl)	Ingesting Organisms Only (μl)	Ingesting Water Only (μl)
1E-05	27.0	807.0	28.0
1E-06	2.7	80.7	2.8
1E-07	0.27	8.07	0.28

The carcinogenic potency for trichloroethene is 1.7E-02 $(mg/kg/day)^{-1}$ via inhalation and 1.1E-02 $(mg/kg/day)^{-1}$ via ingestion (U.S. EPA, 1986a).

In humans, eye irritation usually begins at a trichloroethene concentration of about 160 ppm; symptoms of illness occur at about 800 ppm; severe toxic effects are manifested at 2,000 ppm; and full narcosis occurs at 2,500 to 6,000 ppm (Verschueren, 1983).

The TLVs for trichloroethene are 50 ppm and 270 mg/m^3 (TWA) and 200 ppm and 1,080 mg/m^3 (STEL)(ACGIH, 1988). U.S. EPA has established an MCL for trichloroethene of 0.005 mg/l (Federal Register, 1985).

4.12 Vinyl Chloride

4.12.1 Toxicological Profile

Pharmacokinetics

The pharmacokinetics of vinyl chloride in humans exposed by inhalation is well understood, but little information is known of oral and dermal pharmacokinetics. The pharmacokinetics of oral vinyl chloride in relevant animal models is well understood, and dermal exposure is not likely to be significant. Metabolism to an epoxide and an aldehyde provides reactive intermediates thought to be responsible for the carcinogenicity and probably the hepatotoxicity of the compound in animals and humans.

Metabolism proceeds via oxidation and subsequent conjugation with sulfhydryl groups. An important oxidative pathway involves mixed-function oxidase and results in reactive electrophilic intermediates, 2-chloroethylene oxide and 2-chloroacetaldehyde, which bind to live macromolecules and may be responsible for the toxicity and oncogenicity associated with vinyl chloride. Excretion of polar metabolites is predominantely through the urine. When metabolic pathways are saturated, substantial amounts of unmetabolized vinyl chloride are exhaled.

Respiratory and gastrointestinal absorption of vinyl chloride appears to be rapid. Humans retain 42 percent of vinyl chloride inhaled at concentrations of 3 to 24 ppm. Animals studies suggest that gastrointestinal absorption is nearly complete. Dermal absorption of vinyl chloride vapors is not likely to result in toxicity. Distribution of absorbed vinyl chloride may be widespread, with highest levels of parent compound located in fat, but metabolism and excretion occur so rapidly that highest levels of excretory products are located in the liver and kidney, the primary organs of metabolism and excretion.

Human Health Effects

The most likely route of exposure for vinyl chloride is through inhalation. Short-term exposures to very high levels in contaminated air can cause dizziness, giddiness, stumbling and uncoordination, headache, unconsciousness, and death. Long-term exposure to lower concentrations, for example, in factories where vinyl chloride was made or processed, has caused "vinyl chloride disease," which is characterized by severe damage to the liver, effects on the lungs, poor circulation in the fingers, changes in the bones at the end of the fingers, thickening of the skin, and changes in the blood, as well as increased risk of cancer of the liver, brain, lungs, and possibly other organs. An increased risk of miscarriage has been associated with breathing air in factories containing vinyl chloride.

Vinyl chloride can be detected in urine and body tissues, but the tests are not a reliable indicator of exposure.

Hepatotoxicity, liver disease, is probably the most common adverse effect associated with exposure to vinyl chloride.

Humans can be exposed to vinyl chloride from environmental and occupational sources. The low levels of vinyl chloride found in the environment are usually more than a thousand times lower than levels found in occupational locations. Highest background levels have been measured in air near vinyl chloride factories or over chemical waste storage areas.

Background levels in drinking water may come from sources such as factories that release wastes into rivers and lakes, from seepage into water in areas where chemical wastes are stored, or from contact with polyvinyl chloride pipes.

Environmental Toxicity

Levels of vinyl chloride in the environmental media are typically low and not likely to result in significant human exposure. The most important medium for human exposure is air. Atmospheric levels in most

places are usually below the level of detection. Levels from trace to 105 μm^3 (0.4 ppm) have been found near vinyl chloride production plants, and levels have ranged from undetectable to 23.4 μm^3 (0.01 ppm) over landfills. It is unlikely that levels in ambient air would result in significant exposure.

Exposure from contact with contaminated soil is likely to be negligible, because dermal absorption is not considered significant.

The level of vinyl chloride in drinking water is expected to be highest in areas where the raw water supplies are contaminated with vinyl chloride. The most probable source of surface water contamination is wastewater from vinyl chloride, PVC, and vinyl chloride copolymer manufacturers. The most common sources of ground-water contamination are landfills.

4.12.2 Dose-response Assessment

From available data in animal studies, the U.S. EPA has estimated that breathing air containing 1 ppm vinyl chloride every day, all day, for 70 years, increases, at the most, the risk of 1,100 persons in a population of 10,000 developing cancer (1E-01). These risk values are upper-limit estimates. Actual risk levels are unlikely to be higher and may be lower.

Oral lethality data are limited to an LD_{50} in rats of 500 mg/kg (Sax, 1984), an effect level of 1.3 (mg/kg/day), and a NOEL of 0.13 mg/kg/day in a lifetime dietary study in rats.

U.S. EPA calculated estimated levels of vinyl chloride in water from the following:

Risk Level	Fish and Shellfish Oil (µl)	Ambient Water Only (µl)	Daily Drinking Water Consumption (µl)
1E-04	--	--	--
1E-05	5246.0	20.0	1.5
1E-06	525.0	2.0	0.15
1E-07	52.5	0.2	0.015

The carcinogenic potency value for vinyl chloride is 2.95E-01 $(mg/kg/day)^{-1}$ via inhalation and 2.3 $(mg/kg/day)^{-1}$ via ingestion. U.S EPA has classified vinyl chloride as a Group A carcinogen in the same group as benzene.

The TLV-TWA for vinyl chloride is 5 ppm and 10 mg/m^3 (ACGIH, 1988).

5.0 RISK EVALUATION

5.1 Human Health

The objective of this risk evaluation is to integrate information in the exposure assessment (Section 3.0) and the toxicity evaluation (Section 4.0) in order to evaluate potential or actual human health risks associated with the Syosset Landfill site. Risk refers to the probability of injury, disease, or death resulting from exposure to the chemicals identified in this study. Risk values are generally expressed in scientific notations. An individual lifetime risk of one in 10,000 is represented as 1×10^{-4} or 1E-04.

Impacts of noncarcinogenic chemicals on human health are evaluated by comparing projected or estimated intakes with reference levels for the chemicals of concern. A reference level represents an estimated exposure level at which, there is not expected to be an appreciable risk of deleterious effects. The impact of carcinogenic chemicals is assessed by comparing predicted risks with target risks for known or suspected carcinogens. Target risks for carcinogens generally range from 1E-04 to 1E-07.

A summary of the subchronic daily intakes (SDIs), chronic daily intakes (CDIs), and lifetime average daily exposure (LADEs) is presented in Tables 5-1, 5-2, and 5-3. Total SDI and CDI are calculated for both the oral exposure pathway and the inhalation exposure pathway. It should be noted that, in order to compare SDIs and CDIs to acceptable levels provided by the EPA, dermal intakes are integrated into the oral exposure pathway. These totals are compared to acceptable levels and carcinogenic potencies to obtain total hazard indices and carcinogenic risks for the overall site. By using the total SDIs and CDIs, the overall site risk is assuming that individuals will be exposed to each and every of the exposure pathways simultaneously. This scenario may be realized if a person lives near the landfill and drinks contaminated ground water, showers with contaminated water, and inhales volatile organic compounds on the site. Scenarios involving children consider a child who lives near the landfill, drinks contaminated water, showers with contaminated water, attends South Grove Elementary School, and inhales volatile organic compounds on that

TABLE 5-1

SUBCHRONIC NONCARCINOGENIC HUMAN INTAKE LEVELS (mg/kg/day)
FOR ADULTS AND CHILDREN

CHEMICAL	Ground-water Ingestion SDI(Adult)	Dermal Absorption SDI(Adult)	Soil VOC Inhalation SDI(Adult)	Shower VOC Inhalation SDI(Adult)	Total Oral SDI(Adult)	Total Inhalation SDI(Adult)	Ground-water Ingestion SDI(Child)	Dermal Absorption SDI(Child)	Soil VOC Inhalation SDI(Child)	Shower VOC Inhalation SDI(Child)	Total Oral SDI(Child	Total Inhalation SDI(Child)
Arsenic	7.49E-04	6.46E-06	NA	NA	7.56E-04	NA	2.10E-03	7.98E-06	NA	NA	2.11E-03	NA
Barium	2.75E-03	2.37E-05	NA	NA	2.77E-03	NA	7.69E-03	2.92E-05	NA	NA	7.72E-03	NA
Zinc	2.16E-02	1.87E-04	NA	NA	2.18E-02	NA	6.06E-02	2.30E-04	NA	NA	6.08E-02	NA
Benzene	1.24E-05	1.07E-07	2.15E-04	6.69E-06	1.26E-05	2.22E-04	3.49E-05	1.33E-07	2.74E-04	2.05E-05	3.50E-05	2.94E-04
Chlorobenzene	1.54E-04	1.33E-06	9.65E-04	5.50E-05	1.56E-04	1.02E-03	4.33E-04	1.64E-06	1.23E-03	1.68E-04	4.34E-04	1.40E-03
Chloroform	7.49E-05	6.46E-07	2.19E-05	2.06E-05	7.55E-05	4.25E-05	2.10E-04	7.97E-07	2.78E-05	6.32E-05	2.10E-04	9.10E-05
Methylene Chloride	1.03E-05	8.93E-08	2.35E-04	2.03E-05	1.04E-05	2.55E-04	2.90E-05	1.10E-07	2.99E-04	6.20E-05	2.91E-05	3.61E-04
Bis(2-Ethylhexyl)Phthalate	1.41E-04	1.22E-06	NA	NA	1.43E-04	NA	3.96E-04	1.51E-06	NA	NA	3.98E-04	NA
Tetrachloroethene	7.90E-05	6.82E-07	3.05E-05	1.15E-04	7.97E-05	1.46E-04	2.21E-04	8.42E-07	3.89E-05	3.53E-04	2.22E-04	3.91E-04
Toluene	1.03E-05	8.93E-08	3.38E-04	6.37E-06	1.04E-05	3.44E-04	2.90E-05	1.10E-07	4.30E-04	1.95E-05	2.91E-05	4.50E-04
Trichloroethene	2.91E-05	2.51E-07	NA	2.54E-05	2.94E-05	2.54E-05	8.15E-05	3.10E-07	NA	7.78E-05	8.18E-05	7.78E-05
Vinyl Chloride	2.08E-05	1.80E-07	3.82E-04	3.03E-05	2.10E-05	4.13E-04	5.84E-05	2.22E-07	4.87E-04	9.26E-05	5.86E-05	5.80E-04

NA - Not available or not applicable

TABLE 5-2

CHRONIC NONCARCINOGENIC HUMAN INTAKE LEVELS (mg/kg/day)
FOR ADULTS AND CHILDREN

CHEMICAL	Ground-water Ingestion CDI(Adult)	Dermal Absorption CDI(Adult)	Soil VOC Inhalation CDI(Adult)	Shower VOC Inhalation CDI(Adult)	Total Oral CDI(Adult)	Total Inhalation CDI(Adult)	Ground-water Ingestion CDI(Child)	Dermal Absorption CDI(Child)	Soil VOC Inhalation CDI(Child)	Shower VOC Inhalation CDI(Child)	Total Oral CDI(Child)	Total Inhalation CDI(Child)
Arsenic	4.16E-05	3.58E-07	NA	NA	4.19E-05	NA	1.16E-04	4.42E-07	NA	NA	1.17E-04	NA
Barium	3.33E-04	2.87E-06	NA	NA	3.36E-04	NA	9.32E-04	3.54E-06	NA	NA	9.36E-04	NA
Zinc	7.91E-04	6.82E-06	NA	NA	7.98E-04	NA	2.21E-03	8.42E-06	NA	NA	2.22E-03	NA
Benzene	4.95E-06	4.27E-08	4.00E-06	2.68E-06	4.99E-06	6.68E-06	1.39E-05	5.27E-08	4.24E-06	8.20E-06	1.39E-05	1.24E-05
Chlorobenzene	7.80E-06	6.73E-08	3.91E-05	2.76E-06	7.87E-06	4.19E-05	2.18E-05	8.30E-08	4.13E-05	8.45E-06	2.19E-05	4.98E-05
Chloroform	6.00E-06	5.18E-08	6.94E-06	1.64E-06	6.05E-06	8.58E-06	1.68E-05	6.39E-08	7.41E-06	5.01E-06	1.69E-05	1.24E-05
Methylene Chloride	6.60E-06	5.69E-08	1.17E-05	1.28E-06	6.66E-06	1.30E-05	1.85E-05	7.03E-08	1.25E-05	3.92E-06	1.86E-05	1.64E-05
Bis(2-Ethylhexyl)Phthalate	2.74E-05	2.37E-07	NA	NA	2.77E-05	NA	7.69E-05	2.92E-07	NA	NA	7.72E-05	NA
Tetrachloroethene	6.75E-06	5.82E-08	1.34E-05	9.76E-06	6.81E-06	2.32E-05	1.89E-05	7.19E-08	1.42E-05	2.99E-05	1.90E-05	4.41E-05
Toluene	6.45E-06	5.56E-08	7.08E-05	3.94E-06	6.51E-06	7.48E-05	1.81E-05	6.87E-08	7.48E-05	1.20E-05	1.81E-05	8.68E-05
Trichloroethene	5.85E-06	5.05E-08	NA	5.09E-06	5.90E-06	5.09E-06	1.64E-05	6.23E-08	NA	1.56E-05	1.64E-05	1.56E-05
Vinyl Chloride	6.60E-06	5.69E-08	2.88E-06	9.57E-06	6.66E-06	1.24E-05	1.85E-05	7.03E-08	3.06E-06	2.93E-05	1.86E-05	3.23E-05

NA - Not available or not applicable

TABLE 5-3

CARCINOGENIC LIFETIME AVERAGE DAILY EXPOSURES (mg/kg/day)
FOR ADULTS AND CHILDREN

CHEMICAL	Ground-water Ingestion LADE(Adult)	Dermal Absorption LADE(Adult)	Soil VOC Inhalation LADE(Adult)	Shower VOC Inhalation LADE(Adult)	Total Oral LADE(Adult)	Total Inhalation LADE(Adult)	Ground-water Ingestion LADE(Child)	Dermal Absorption LADE(Child)	Soil VOC Inhalation LADE(Child)	Shower VOC Inhalation LADE(Child)	Total Oral LADE(Child)	Total Inhalation LADE(Child)
Arsenic	4.99E-06	1.12E-05	NA	NA	1.62E-05	NA	1.09E-05	5.31E-08	NA	NA	1.09E-05	NA
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	5.94E-07	1.33E-06	1.60E-06	3.21E-07	1.93E-06	1.92E-06	1.30E-06	6.32E-09	5.09E-07	9.84E-07	1.30E-06	1.49E-06
Chlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	7.20E-07	1.62E-06	2.78E-06	1.97E-07	2.34E-06	2.97E-06	1.57E-06	7.66E-09	8.89E-07	6.02E-07	1.58E-06	1.49E-06
Methylene Chloride	7.92E-07	1.78E-06	4.69E-06	1.54E-07	2.57E-06	4.85E-06	1.73E-06	8.43E-09	1.50E-06	4.70E-07	1.74E-06	1.97E-06
Bis(2-Ethylhexyl)Phthalate	3.29E-06	7.40E-06	NA	NA	1.07E-05	NA	7.20E-06	3.51E-08	NA	NA	7.23E-06	NA
Tetrachloroethene	8.10E-07	1.82E-06	5.36E-06	1.17E-06	2.63E-06	6.53E-06	1.77E-06	8.62E-09	1.70E-06	3.58E-06	1.78E-06	5.29E-06
Toluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	7.02E-07	1.58E-06	NA	6.11E-07	2.28E-06	6.11E-07	1.53E-06	7.47E-09	NA	1.87E-06	1.54E-06	1.87E-06
Vinyl Chloride	7.92E-07	1.78E-06	1.15E-06	1.15E-06	2.57E-06	2.30E-06	1.73E-06	8.43E-09	3.67E-07	3.51E-06	1.74E-06	3.88E-06

NA - Not available or not applicable

campus. It is expected that one or more of the individual pathways will dominate the total risk, while the remaining pathways will produce insignificant risk.

Noncarcinogenic Effects

Versar evaluated the noncarcinogenic effects of exposures to the indicator chemicals via both the oral route and the inhalation route. Any potential health effects are identified by computing hazard indices derived from subchronic and chronic daily intake levels. The hazard index is a simple means of comparing daily intake levels (SDIs and CDIs) to acceptable daily intake levels: acceptable intake for subchronic exposure (AIS) and acceptable intake for chronic exposure (AIC). The hazard index is computed as follows:

$$\text{Hazard Index} = \frac{DI_1}{AI_1} + \frac{DI_2}{AI_2} + \ldots + \frac{DI_n}{AI_n}$$

Where DI_n = subchronic or chronic daily intake (mg/kg/day)
Where AI_n = subchronic or chronic acceptable intake level (mg/kg/day)

The assumption that the combined effects of the chemicals will be additive may not be accurate. Actual effects may be multiplicative or may not be related at all. However, it is generally agreed that if the hazard index is less than one, deleterious health effects are unlikely. If the hazard index is greater than one, then the individual effects of each chemical should be considered to determine the liklihood of ill effects.

The subchronic hazard index for oral (public wells) and inhalation exposures for adults and children are presented in Tables 5-4a and 5-4b. Tables 5-5a and 5-5b contain chronic hazard indices for oral (public wells and dermal absorption) and inhalation exposure for adults and children. Noncarcinogenic subchronic hazard indices are less than one

TABLE 5-4a

CALCULATION OF ADULT NONCARCINOGENIC SUBCHRONIC HAZARD INDICES

CHEMICAL	INHALATION			ORAL		
	SDI	AIS	SDI:AIS	SDI	AIS	SDI:AIS
Arsenic	NA	NA	NA	7.56E-04	1.00E-03	7.56E-01
Barium	NA	1.00E-03	NA	2.77E-03	5.00E-02	5.54E-02
Zinc	NA	NA	NA	2.18E-02	2.00E-01	1.09E-01
Benzene	2.22E-04	NA	NA	1.26E-05	NA	NA
Chlorobenzene	1.02E-03	5.00E-02	2.04E-02	1.56E-04	2.00E-01	7.79E-04
Chloroform	4.25E-05	NA	NA	7.55E-05	1.00E-02	7.55E-03
Methylene Chloride	2.55E-04	8.57E-01	2.97E-04	1.04E-05	6.00E-02	1.74E-04
Bis(2-Ethylhexyl)Phthalate	NA	NA	NA	1.43E-04	2.00E-02	7.13E-03
Tetrachloroethene	NA	NA	NA	7.97E-05	1.00E-01	7.97E-04
Toluene	3.44E-04	2.00E+00	1.72E-04	1.04E-05	4.00E-01	2.61E-05
Trichloroethene	NA	NA	NA	2.94E-05	NA	NA
Vinyl Chloride	4.13E-04	NA	NA	2.10E-05	NA	NA
	Hazard Index:		2.09E-02	Hazard Index:		1.81E-01

Notes:
NA - Not available or not applicable

TABLE 5-4b

CALCULATION OF NONCARCINOGENIC SUBCHRONIC HAZARD INDEX
SCHOOLCHILDREN

CHEMICAL	INHALATION			ORAL		
	SDI	AIS	SDI:AIS	SDI	AIS	SDI:AIS
Arsenic	NA	NA	NA	2.11E-03	1.00E-03	2.11E+00
Barium	NA	1.00E-03	NA	7.72E-03	5.00E-02	1.54E-01
Zinc	NA	NA	NA	6.08E-02	2.00E-01	3.04E-01
Benzene	2.94E-04	NA	NA	3.50E-05	NA	NA
Chlorobenzene	1.40E-03	5.00E-02	2.80E-02	4.34E-04	2.00E-01	2.17E-03
Chloroform	9.10E-05	NA	NA	2.10E-04	1.00E-02	2.10E-02
Methylene Chloride	3.61E-04	8.57E-01	4.21E-04	2.91E-05	6.00E-02	4.85E-04
Bis(2-Ethylhexyl)Phthalate	NA	NA	NA	3.98E-04	2.00E-02	1.99E-02
Tetrachloroethene	NA	NA	NA	2.22E-04	1.00E-01	2.22E-03
Toluene	4.50E-04	2.00E+00	2.25E-04	2.91E-05	4.00E-01	7.27E-05
Trichloroethene	NA	NA	NA	8.18E-05	NA	NA
Vinyl Chloride	5.80E-04	NA	NA	5.86E-05	NA	NA
	Hazard Index:		2.87E-02	Hazard Index:		2.61E+00

NA - Not available or not applicable

TABLE 5-5a

CALCULATION OF ADULT CHRONIC HAZARD INDEX

CHEMICAL	INHALATION			ORAL		
	CDI	AIC	CDI:AIC	CDI	AIC	CDI:AIC
Arsenic	NA	NA	NA	4.19E-05	1.00E-03	4.19E-02
Barium	NA	1.00E-04	NA	3.36E-04	5.00E-02	6.72E-03
Zinc	NA	NA	NA	7.98E-04	2.00E-01	3.99E-03
Benzene	6.68E-06	NA	NA	4.99E-06	NA	NA
Chlorobenzene	4.19E-05	5.00E-03	8.37E-03	7.87E-06	2.00E-02	3.93E-04
Chloroform	8.58E-06	NA	NA	6.05E-06	1.00E-02	6.05E-04
Methylene Chloride	1.30E-05	8.57E-01	1.52E-05	6.66E-06	6.00E-02	1.11E-04
Bis(2-Ethylhexyl)Phthalate	NA	NA	NA	2.77E-05	2.00E-02	1.38E-03
Tetrachloroethene	NA	NA	NA	6.81E-06	1.00E-02	6.81E-04
Toluene	7.48E-05	2.00E+00	3.74E-05	6.51E-06	3.00E-01	2.17E-05
Trichloroethene	NA	NA	NA	5.90E-06	NA	NA
Vinyl Chloride	1.24E-05	NA	NA	6.66E-06	NA	NA
	Hazard Index:		8.42E-03	Hazard Index:		5.58E-02

Notes: NA - Not available or not applicable

TABLE 5-5b

CALCULATION OF CHRONIC HAZARD INDEX
SCHOOLCHILDREN

CHEMICAL	INHALATION			ORAL		
	CDI	AIC	CDI:AIC	CDI	AIC	CDI:AIC
Arsenic	NA	NA	NA	1.17E-04	1.00E-03	1.17E-01
Barium	NA	1.00E-04	NA	9.36E-04	5.00E-02	1.87E-02
Zinc	NA	NA	NA	2.22E-03	2.00E-01	1.11E-02
Benzene	1.24E-05	NA	NA	1.39E-05	NA	NA
Chlorobenzene	4.98E-05	5.00E-03	9.96E-03	2.19E-05	2.00E-02	1.10E-03
Chloroform	1.24E-05	NA	NA	1.69E-05	1.00E-02	1.69E-03
Methylene Chloride	1.64E-05	8.57E-01	1.91E-05	1.86E-05	6.00E-02	3.09E-04
Bis(2-Ethylhexyl)Phthalate	NA	NA	NA	7.72E-05	2.00E-02	3.86E-03
Tetrachloroethene	NA	NA	NA	1.90E-05	1.00E-02	1.90E-03
Toluene	8.68E-05	2.00E+00	4.34E-05	1.81E-05	3.00E-01	6.04E-05
Trichloroethene	NA	NA	NA	1.64E-05	NA	NA
Vinyl Chloride	3.23E-05	NA	NA	1.86E-05	NA	NA
	Hazard Index:		1.00E-02	Hazard Index:		1.56E-01

NA - Not available or not applicable

for adults in both oral and inhalation scenarios. For children, the subchronic hazard index for inhalation is less than one, but the oral hazard Index is 2.61E+00. This value dominantly comes from arsenic ingestion. Noncarcinogenic chronic hazard indices are less than one for all receptors and exposure scenarios.

Carcinogenic Effects

For potential carcinogens, risks are estimated by the probability of increased cancer incidence. A carcinogenic potency factor represents the upper 95-percent confidence limit of the probability of response per unit intake of the contaminant over a lifetime, and converts estimated intakes directly to incremental risk (U.S. EPA, 1986a). Because all inputs into the exposure assessments are conservatively based, the resulting risks identified for the Syosset Landfill site represent upper-bound risk estimates, and may overestimate the actual risk from exposure to the indicator chemicals studied. Additional data would be required to derive a statistically valid estimate of error in the exposure and risk calculations.

The carcinogenic risk via exposure pathways for the Syosset Landfill were calculated as:

Risk = LADE x CPF

Where LADE = chronic daily intakes (mg/kg/day)
CPF = carcinogenic potency factor 1/(mg/kg/day)

The acceptable target total individual carcinogenic risk resulting from exposures at a Superfund site may range anywhere between 1E-4 to 1E-7. The acceptable risk for this site has not been established, but will be within this range.

Of the twelve indicator chemicals for the Syosset Landfill site, DEHP is recognized as a potential carcinogen via the oral pathway only, while arsenic, benzene, chloroform, methylene chloride, tetrachloroethene, trichloroethene, and vinyl chloride are recognized as carcinogens via both inhalation and oral pathways.

The total carcinogenic risk for adults through both oral and inhalation exposure is 3.65E-05 (Table 5-6). The two major influences on this figure are oral exposures to arsenic and vinyl chloride.

Risks evaluated for children attending South Grove Elementary School were lower than the adult values (Table 5-7). The total upper bound risk is 2.53E-05 with vinyl chloride and arsenic ingestion making up over 90 percent of the risk.

There are a number of uncertainties associated with the carcinogenic risk estimate discussed above. These uncertainties are introduced because of (1) the need to extrapolate below the dose range of experimental tests using animals, (2) the variability of the receptor population, (3) assumed equivalency of dose-response relationship between animals and humans, and (4) differences in exposure routes in test animals versus routes expected on site. In addition to contaminant concentration, route, and duration of exposure, there are many other factors that may influence the likelihood of developing cancer. These include differences between individual nutritional and health status, age and sex, and inherited characteristics that may affect susceptability (USDHHS, 1985). Risk calculations also assume that intake levels will be small, without synergistic or antagonistic chemical effects, and that individuals will be exposed to each of the indicator chemicals and elicit a carcinogenic response.

5.2 Environmental Impacts

The environmental effects of releases from the Syosset Landfill are expected to be negligible. The site offers minimal wildlife habitat, with no streams, ponds, or established wetlands present. Standing water observed on site is likely to be ephemeral and therefore incapable of sustaining ecologically sensitive plants or animals. Off-site risks from surface water runoff are not possible because the site lies in a 10- to 20-foot deep depression. No streams, wetlands, or other sensitive environments are located in the vicinity of the landfill.

TABLE 5-6

RISK ESTIMATES FOR CARCINOGENS
ADULTS

CHEMICAL	Exposure Route	LADE (mg/kg/day)	Carcinogenic Potency Factor 1/(mg/kg/day)	Route-Specific Risk	Total Chemical-specific Risk
Arsenic	Oral	1.62E-05	1.80E+00	2.91E-05	2.91E-05
	Inhalation	NA	5.00E+01	NA	
Barium	Oral	NA	NA	NA	NA
	Inhalation	NA	NA	NA	
Zinc	Oral	NA	NA	NA	NA
	Inhalation	NA	NA	NA	
Benzene	Oral	1.93E-06	2.90E-02	5.59E-08	1.12E-07
	Inhalation	1.92E-06	2.90E-02	5.57E-08	
Chlorobenzene	Oral	NA	NA	NA	NA
	Inhalation	NA	NA	NA	
Chloroform	Oral	2.34E-06	6.10E-03	1.43E-08	2.55E-07
	Inhalation	2.97E-06	8.10E-02	2.41E-07	
Methylene Chloride	Oral	2.57E-06	7.50E-03	1.93E-08	1.93E-08
	Inhalation	4.85E-06	4.70E-07	2.28E-12	
Bis(2-Ethylhexyl)Phthalate	Oral	1.07E-05	1.40E-02	1.50E-07	1.50E-07
	Inhalation	NA	NA	NA	
Tetrachloroethene	Oral	2.63E-06	5.10E-02	1.34E-07	1.56E-07
	Inhalation	6.53E-06	3.30E-03	2.16E-08	
Toluene	Oral	NA	NA	NA	NA
	Inhalation	NA	NA	NA	
Trichloroethene	Oral	2.28E-06	1.10E-02	2.51E-08	3.55E-08
	Inhalation	6.11E-07	1.70E-02	1.04E-08	
Vinyl Chloride	Oral	2.57E-06	2.30E+00	5.91E-06	6.59E-06
	Inhalation	2.30E-06	2.95E-01	6.79E-07	
			Total Upper Bound Risk =		3.65E-05

Notes: NA - Not available or not applicable

TABLE 5-7

RISK ESTIMATES FOR CARCINOGENS
SCHOOLCHILDREN

CHEMICAL	Exposure Route	LADE (mg/kg/day)	Carcinogenic Potency Factor 1/(mg/kg/day)	Route-Specific Risk	Total Chemical-specific Risk
Arsenic	Oral	1.09E-05	1.80E+00	1.97E-05	1.97E-05
	Inhalation	NA	5.00E+01	NA	
Barium	Oral	NA	NA	NA	NA
	Inhalation	NA	NA	NA	
Zinc	Oral	NA	NA	NA	NA
	Inhalation	NA	NA	NA	
Benzene	Oral	1.30E-06	2.90E-02	3.78E-08	8.11E-08
	Inhalation	1.49E-06	2.90E-02	4.33E-08	
Chlorobenzene	Oral	NA	NA	NA	NA
	Inhalation	NA	NA	NA	
Chloroform	Oral	1.58E-06	6.10E-03	9.64E-09	1.30E-07
	Inhalation	1.49E-06	8.10E-02	1.21E-07	
Methylene Chloride	Oral	1.74E-06	7.50E-03	1.30E-08	1.30E-08
	Inhalation	1.97E-06	4.70E-07	9.24E-13	
Bis(2-Ethylhexyl)Phthalate	Oral	7.23E-06	1.40E-02	1.01E-07	1.01E-07
	Inhalation	NA	NA	NA	
Tetrachloroethene	Oral	1.78E-06	5.10E-02	9.07E-08	9.07E-08
	Inhalation	NA	3.30E-03	NA	
Toluene	Oral	NA	NA	NA	NA
	Inhalation	NA	NA	NA	
Trichloroethene	Oral	1.54E-06	1.10E-02	1.70E-08	1.70E-08
	Inhalation	NA	1.70E-02	NA	
Vinyl Chloride	Oral	1.74E-06	2.30E+00	4.00E-06	5.14E-06
	Inhalation	3.88E-06	2.95E-01	1.14E-06	
			Total Upper Bound Risk =		2.53E-05

NA - Not available or not applicable

Risk to migratory birds, which may temporarily inhabit shallow pools on site, may exist but was not evaluated due to lack of surface water analytical data. According to the New York Natural Heritage Program (NYNHP) of the New York Department of Environmental Conservation (NY-DEC), no endangered, threatened, or rare plant or animal species are located within 1 mile of the site. Additionally, no rare breeding bird species were identified in the immediate vicinity of the landfill (NYNHP, 1989).

6.0 CONCLUSIONS

Contaminant screening was performed on analytical results from Geraghty & Miller's soil gas, soil, and water samples. The contaminant screening process identified 12 indicator chemicals: 3 metals, 8 volatile organic compounds, and one semivolatile compound. The indicator chemicals used in this Endangerment Assessment were arsenic, barium, zinc, benzene, chlorobenzene, chloroform, methylene chloride, vinyl chloride, tetrachloroethene, toluene, trichloroethene, and bis(2-ethylhexyl)phthalate. These compounds or elements were selected because of their toxicological properties, potentially critical exposure routes, and higher concentrations present in comparison to other contaminants.

Environmental fate and transport mechanisms were evaluated for each of the indicator chemicals based on an assessment of the site's environmental setting and chemical and physical properties of each contaminant. Predominant transport mechanisms identified include leachate percolation through soils to ground-water public supply wells and gas migration through fill dirt and into the air in the vicinity of the site. Additional routes of exposure could not be evaluated due to insufficient or inadequate data.

Exposed populations include workers at the Town of Oyster Bay, Department of Public Works facility on the southern margin of the landfill, South Grove Elementary school children and other residents of the neighboring community. Trespassers onto the site are also potentially at risk of exposure.

Four major routes of exposure were identified: (1) ingestion of contaminated ground water from the public water supply system, (2) direct contact (dermal) exposure to contaminated ground water, (3) inhalation of volatile organic compounds while showering, and (4) inhalation of volatile organic compounds emitted from contaminated surface soils. Ingestion and dermal contact from exposure to surface soils and surface water should be evaluated if samples from these media are collected in the future.

Total body burden rates were computed based on all potential exposure routes using an average body mass of 70 kilograms (adult) or 25 kilograms (child) and an average 75-year lifetime. It was assumed that ingestion exposure (public water) would occur in 9 years out of a 75-year average lifetime for adults and 7 years out of a 75-year lifetime for children; dermal and inhalation exposures from showering would occur in 9 years out of the 75-year average lifetime for adults and 7 years out of a 75-year lifetime for children; and inhalation exposures from site soil would occur over a 30-year work lifetime for adults and a 7-year school attendance span for children.

Average time-weighted average doses for the indicator chemicals varied considerably. The lowest subchronic daily intake for adults was for methylene chloride and toluene via dermal absorption at 8.93E-08 mg/kg/day, while the highest SDI was for zinc via ground-water ingestion at 2.16E-02 mg/kg/day. The range of chronic daily intakes was not as great with a maximum for ingestion of ground water for zinc at 7.91E-04 mg/kg/day, and a minimum of 4.27E-08 mg/kg/day for dermal absorption of benzene. Maximum and minimum values for lifetime average daily exposure are the same as for chronic daily exposure.

For children, the high subchronic daily intake was for ingestion of zinc in ground water at 6.06E-02 mg/kg/day. The minimum SDI was for methylene chloride and toluene dermal exposures at 1.10E-07 mg/kg/day. For chronic daily exposures, the high value was 2.21E-03 mg/kg/day for zinc ingestion from ground water and the low was 5.27E-08 mg/kg/day for dermal contact with benzene.

Lifetime average daily exposures (LADEs) for adults and children varied greatly. For adults, the maximum LADE was 1.12E-05 mg/kg/day for dermal absorption of arsenic from site soils. The minimum value was 1.54E-07 mg/kg/day for the inhalation of methylene chloride during showering. For children, the minimum value was from dermal absorption of benzene at 6.32E-09 mg/kg/day. The maximum LADE for children was 1.09E-05 mg/kg/day for arsenic ingestion from ground water.

Toxicity profiles were developed for each of the indicator chemicals based on current U.S. EPA accepted health effects documents. Toxicological evaluation included pharmacokinetics, human and environmental health effects, and a dose-response assessment. Toxicity information is dependent to a large extent on animal models upon which any potential adverse human health effects must be extrapolated.

Risk characterization included an assessment of risk associated with exposures to noncarcinogens and carcinogens. Noncarcinogenic risks were assessed using a hazard index computed from expected daily intake levels (subchronic and chronic) and reference levels (representing acceptable intakes).

Most of the hazard indices for subchronic and chronic intakes for the exposure scenarios are less than one; however, the subchronic hazard index for children for oral exposures was 2.61. This value comes mostly from ingestion of arsenic, and is only marginally above the EPA guidance level of one. The generally low chronic and subchronic hazard indices indicate a low likelihood of adverse human health impacts from noncarcinogenic compounds on site.

Potential carcinogenic risks were computed by multiplying lifetime average daily exposure levels with respective carcinogenic potency factors. The cumulative upper bound risk for adults for all carcinogens was 3.65E-05. This was derived predominantly from oral exposures, with a minor contribution from inhalation exposures.

The cumulative upper bound risk for children for all carcinogens was 2.53E-05. Oral exposures contributed approximately 90 percent of the total risk.

Upon evaluation of all available information on the site and the most recent analytical data collected from the site, potential threat to human health exists. This conclusion is based on an evaluation of the site history and operations, the overall environmental setting, and on recent chemical analyses.

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APPENDIX A

ANALYTICAL DATA/SAMPLING RESULTS

Table 9. Concentrations of Volatile Organic Compounds in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, May and June 1988, Syosset Landfill, Syosset, New York.

Well:	SY-1	SY-1	SY-1D	SY-1D	SY-2R	SY-2R
Date Sampled:	5/3/88	6/6/88	5/3/88	6/6/88	5/4/88	6/7/88
Parameter						
Acetone	7 J	NA	<10	NA	<10	NA
Carbon disulfide	<5	NA	<5	NA	<5	NA
Chloromethane	<10	<1	<10	<1	<10	<1
Bromomethane	<10	<1	<10	<1	<10	<1
Dichlorodifluoromethane	NA	<1	NA	<1	NA	<1
Vinyl chloride	<10	<1	<10	<1	<10	<1
Chloroethane	<10	<1	<10	<1	<10	<1
Methylene chloride	<5	<2	<5	<2	<5	<2
Trichlorofluoromethane	NA	<2	NA	<2	NA	<2
1,1-Dichloroethene	<5	<2	<5	<2	<5	<2
1,1-Dichloroethane	<5	<2	<5	<2	<5	<2
1,2-Dichloroethene	<5	<2	<5	<2	<5	<2
Chloroform	<5	<1	18 J	15	<5	<1
1,2-Dichloroethane	<5	<2	<5	<2	<5	<2
1,1,1-Trichloroethane	<5	<1	<5	<1	<5	<1
Carbon tetrachloride	<5	<1	<5	<1	<5	<1
Bromodichloromethane	<5	<1	<5	<1	<5	<1
1,2-Dichloropropane	<5	<2	<5	<2	<5	<2
trans-1,3-Dichloropropene	<5	<2	<5	<2	<5	<2
Trichloroethylene	<5	<1	<5	<1	<5	<1
Chlorodibromomethane	NA	<1	NA	<1	NA	<1
1,1,2-Trichloroethane	<5	<2	<5	<2	<5	<2
cis-1,3-Dichloropropene	<5	<2	<5	<2	<5	<2
2-Chloroethyl vinyl ether	NA	<2	NA	<2	NA	<2
Bromoform	<5	<2	<5	<2	<5	<2
1,1,2,2-Tetrachloroethane	<5	<2	<5	<2	<5	<2
Tetrachloroethene	<5	<1	<5	<1	<5	<1
Chlorobenzene	<5	<1	4 J	3	<5	<1
1,3-Dichlorobenzene	NA	<2	NA	<2	NA	<2
1,2-Dichlorobenzene	NA	<2	NA	<2	NA	<2
1,4-Dichlorobenzene	NA	<2	NA	<2	NA	<2
Benzene	<5	<1	<5	<1	<5	<1
Toluene	2 J	<2	<5	<2	<5	<2
2-Butanone	R	NA	R	NA	R	NA
Vinyl acetate	<10	NA	<10	NA	<10	NA
Dibromochloromethane	<5	NA	<5	NA	<5	NA
4-Methyl-2-pentanone	<10	NA	<10	NA	<10	NA
2-Hexanone	<10	NA	<10	NA	<10	NA
Styrene	<5	NA	<5	NA	<5	NA
Ethyl benzene	<5	<1	<5	<1	<5	<1
m Xylene	NA	<2	NA	<2	NA	<2
o + p Xylene	NA	<4	NA	<4	NA	<4
Total xylenes	<5	NA	<5	NA	<5	NA
Total VOCs	9	0	22	18	0	0

All results reported in micrograms per liter (ug/L).
Samples collected in May 1988 were analyzed using CLP Method for Volatile Organic Compounds by York Laboratories, Inc., Monroe, Connecticut. Samples collected in June 1988 were analyzed using USEPA Methods 601, 602 by EcoTest Laboratories, Inc., North Babylon, New York.

NA Not analyzed.
J Estimated value.
R Data unuseable: response factor too low during initial calibration.
UJ Estimated detection limit.

Table 9. Concentrations of Volatile Organic Compounds in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, May and June 1988, Syosset Landfill, Syosset, New York.

Well:	SY-6	SY-6	SY-6D	SY-6D	SY-7	SY-7
Date Sampled:	5/2/88	6/6/88	5/2/88	6/6/88	5/2/88	6/6/88
Parameter						
Acetone	<10	NA	<10	NA	<10	NA
Carbon disulfide	<5	NA	<5	NA	<5	NA
Chloromethane	<10	<1	<10	<1	<10	<1
Bromomethane	<10	<1	<10	<1	<10	<1
Dichlorodifluoromethane	NA	<1	NA	<1	NA	<1
Vinyl chloride	<10	<1	<10	<1	<10	1
Chloroethane	<10	<1	<10	<1	<10	<1
Methylene chloride	<5	<2	<5	<2	<5	<2
Trichlorofluoromethane	NA	<2	NA	<2	NA	<2
1,1-Dichloroethene	<5	<2	<5	<2	<5	<2
1,1-Dichloroethane	<5	<2	<5	<2	<5	2
1,2-Dichloroethene	<5	<2	<5	<2	7	9
Chloroform	<5	<1	6	7	<5	2
1,2-Dichloroethane	<5	<2	<5	<2	<5	<2
1,1,1-Trichloroethane	2 J	1	<5	<1	<5	<1
Carbon tetrachloride	<5	<1	<5	<1	<5	<1
Bromodichloromethane	<5	<1	<5	<1	<5	<1
1,2-Dichloropropane	<5	<2	<5	<2	<5	<2
trans-1,3-Dichloropropene	<5	<2	<5	<2	<5	<2
Trichloroethylene	<5	<1	<5	<1	2 J	<1
Chlorodibromomethane	NA	<1	NA	<1	NA	<1
1,1,2-Trichloroethane	<5	<2	<5	<2	<5	<2
cis-1,3-Dichloropropene	<5	<2	<5	<2	<5	<2
2-Chloroethyl vinyl ether	NA	<2	NA	<2	NA	<2
Bromoform	<5	<2	<5	<2	<5	<2
1,1,2,2-Tetrachloroethane	<5	<2	<5	<2	<5	<2
Tetrachloroethene	<5	<1	<5	<1	3 J	3
Chlorobenzene	<5	<1	<5	<1	<5	<1
1,3-Dichlorobenzene	NA	<2	NA	<2	NA	<2
1,2-Dichlorobenzene	NA	<2	NA	<2	NA	<2
1,4-Dichlorobenzene	NA	<2	NA	<2	NA	<2
Benzene	<5	<1	<5	<1	1 J	<1
Toluene	<5	<2	2 J	<2	<5	<2
2-Butanone	R	NA	R	NA	R	NA
Vinyl acetate	<10	NA	<10	NA	<10	NA
Dibromochloromethane	<5	NA	<5	NA	<5	NA
4-Methyl-2-pentanone	<10	NA	<10	NA	<10	NA
2-Hexanone	<10	NA	<10	NA	<10	NA
Styrene	<5	NA	<5	NA	<5	NA
Ethyl benzene	<5	<1	<5	<1	<5	<1
m Xylene	NA	<2	NA	<2	NA	<2
o + p Xylene	NA	<4	NA	<4	NA	<4
Total xylenes	<5	NA	<5	NA	<5	NA
Total VOCs	2	1	8	7	13	17

All results reported in micrograms per liter (ug/L).
Samples collected in May 1988 were analyzed using CLP Method for Volatile Organic Compounds by York Laboratories, Inc., Monroe, Connecticut. Samples collected in June 1988 were analyzed using USEPA Methods 601, 602 by EcoTest Laboratories, Inc., North Babylon, New York.

NA Not analyzed.
J Estimated value.
R Data unuseable: response factor too low during initial calibration.
UJ Estimated detection limit.

Table 9. Concentrations of Volatile Organic Compounds in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, May and June 1988, Syosset Landfill, Syosset, New York.

Well:	SY-8	SY-8	SY-9	SY-9	W-3	W-3
Date Sampled:	5/3/88	6/8/88	5/2/88	6/8/88	5/5/88	6/7/88
Parameter						
Acetone	<10	NA	<10	NA	<10	NA
Carbon disulfide	<5	NA	<5	NA	<5	NA
Chloromethane	<10	<1	<10	<1	<10	<1
Bromomethane	<10	<1	<10	<1	<10	<1
Dichlorodifluoromethane	NA	<1	NA	<1	NA	<1
Vinyl chloride	<10	<1	<10	<1	<10	<1
Chloroethane	<10	<1	<10	<1	<10	<1
Methylene chloride	<5	<2	<5	<2	<5	<2
Trichlorofluoromethane	NA	<2	NA	<2	NA	<2
1,1-Dichloroethene	<5	<2	<5	<2	<5	<2
1,1-Dichloroethane	4 J	2	<5	<2	<5	<2
1,2-Dichloroethene	<5	<2	<5	<2	<5	<2
Chloroform	<5	<1	<5	<1	<5	<1
1,2-Dichloroethane	<5	<2	<5	<2	<5	<2
1,1,1-Trichloroethane	<5	<1	<5	<1	<5	<1
Carbon tetrachloride	<5	<1	<5	<1	<5	<1
Bromodichloromethane	<5	<1	<5	<1	<5	<1
1,2-Dichloropropane	<5	<2	<5	<2	<5	<2
trans-1,3-Dichloropropene	<5	<2	<5	<2	<5	<2
Trichloroethylene	7 J	4	<5	<1	<5	<1
Chlorodibromomethane	NA	<1	NA	<1	NA	<1
1,1,2-Trichloroethane	<5	<2	<5	<2	<5	<2
cis-1,3-Dichloropropene	<5	<2	<5	<2	<5	<2
2-Chloroethyl vinyl ether	NA	<2	NA	<2	NA	<2
Bromoform	<5	<2	<5	<2	<5	<2
1,1,2,2-Tetrachloroethane	<5	<2	<5	<2	<5	<2
Tetrachloroethene	19 J	15	<5	<1	<5	<1
Chlorobenzene	<5	<1	<5	<1	<5	<1
1,3-Dichlorobenzene	NA	<2	NA	<2	NA	<2
1,2-Dichlorobenzene	NA	<2	NA	<2	NA	<2
1,4-Dichlorobenzene	NA	<2	NA	<2	NA	<2
Benzene	<5	<1	<5	<1	<5	<1
Toluene	<5	<2	<5	<2	<5	<2
2-Butanone	R	NA	R	NA	R	NA
Vinyl acetate	<10	NA	<10	NA	<10	NA
Dibromochloromethane	<5	NA	<5	NA	<5	NA
4-Methyl-2-pentanone	<10	NA	<10	NA	<10	NA
2-Hexanone	<10	NA	<10	NA	<10	NA
Styrene	<5	NA	<5	NA	<5	NA
Ethyl benzene	<5	<1	<5	<1	<5	<1
m Xylene	NA	<2	NA	<2	NA	<2
o + p Xylene	NA	<4	NA	<4	NA	<4
Total xylenes	<5	NA	<5	NA	<5	NA
Total VOCs	30	21	0	0	0	0

All results reported in micrograms per liter (ug/L).
Samples collected in May 1988 were analyzed using CLP Method for Volatile Organic Compounds by York Laboratories, Inc., Monroe, Connecticut. Samples collected in June 1988 were analyzed using USEPA Methods 601, 602 by EcoTest Laboratories, Inc., North Babylon, New York.

NA Not analyzed.
J Estimated value.
R Data unuseable; response factor too low during initial calibration.
UJ Estimated detection limit.

Table 9. Concentrations of Volatile Organic Compounds in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, May and June 1988, Syosset Landfill, Syosset, New York.

Well:	W-4	W-4	Field Blank 1	Field Blank 2	Field Blank 3	Field Blank 4
Date Sampled:	5/3/88	6/7/88	5/2/88	5/3/88	5/4/88	5/5/88
Parameter						
Acetone	<10	NA	<10	<10	<10	<10
Carbon disulfide	<5	NA	<5	<5	<5	<5
Chloromethane	<10	<1 UJ	<10	<10	<10	<10
Bromomethane	<10	<1 UJ	<10	<10	<10	<10
Dichlorodifluoromethane	NA	<1 UJ	NA	NA	NA	NA
Vinyl chloride	<10	<1 UJ	<10	<10	<10	<10
Chloroethane	<10	<1 UJ	<10	<10	<10	<10
Methylene chloride	<5	<2 UJ	<5	<5	<5	<5
Trichlorofluoromethane	NA	<2 UJ	NA	NA	NA	NA
1,1-Dichloroethene	<5	<2 UJ	<5	<5	<5	<5
1,1-Dichloroethane	<5	<2 UJ	<5	<5	<5	<5
1,2-Dichloroethene	<5	<2 UJ	<5	<5	<5	<5
Chloroform	<5	<1 UJ	<5	<5	<5	<5
1,2-Dichloroethane	<5	<2 UJ	<5	<5	<5	NA
1,1,1-Trichloroethane	<5	<1 UJ	<5	<5	<5	<5
Carbon tetrachloride	<5	<1 UJ	<5	<5	<5	<5
Bromodichloromethane	<5	<1 UJ	<5	<5	<5	<5
1,2-Dichloropropane	<5	<2 UJ	<5	<5	<5	<5
trans-1,3-Dichloropropene	<5	<2 UJ	<5	<5	<5	<5
Trichloroethylene	<5	<1 UJ	<5	<5	<5	<5
Chlorodibromomethane	NA	<1 UJ	NA	NA	NA	NA
1,1,2-Trichloroethane	<5	<2 UJ	<5	<5	<5	<5
cis-1,3-Dichloropropene	<5	<2 UJ	<5	<5	<5	<5
2-Chloroethyl vinyl ether	NA	<2 UJ	NA	NA	NA	NA
Bromoform	<5	<2 UJ	<5	<5	<5	<5
1,1,2,2-Tetrachloroethane	<5	<2 UJ	<5	<5	<5	<5
Tetrachloroethene	<5	<1 UJ	<5	<5	<5	<5
Chlorobenzene	<5	37	<5	<5	<5	<5
1,3-Dichlorobenzene	NA	<2 UJ	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	<2 UJ	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	3	NA	NA	NA	NA
Benzene	<5	<1 UJ	<5	<5	<5	<5
Toluene	2 J	<2 UJ	<5	<5	<5	<5
2-Butanone	R	NA	R	R	R	R
Vinyl acetate	<10	NA	<10	<10	<10	<10
Dibromochloromethane	<5	NA	<5	<5	<5	<5
4-Methyl-2-pentanone	<10	NA	<10	<10	<10	<10
2-Hexanone	<10	NA	<10	<10	<10	<10
Styrene	<5	NA	<5	<5	<5	<5
Ethyl benzene	<5	<1 UJ	<5	<5	<5	<5
m Xylene	NA	<2 UJ	NA	NA	NA	NA
o + p Xylene	NA	<4 UJ	NA	NA	NA	NA
Total xylenes	<5	NA	<5	<5	<5	<5
Total VOCs	2	40	0	0	0	0

All results reported in micrograms per liter (ug/L).
Samples collected in May 1988 were analyzed using CLP Method for Volatile Organic Compounds by York Laboratories, Inc., Monroe, Connecticut. Samples collected in June 1988 were analyzed using USEPA Methods 601, 602 by EcoTest Laboratories, Inc., North Babylon, New York.

NA Not analyzed.
J Estimated value.
R Data unuseable; response factor too low during initial calibration.
UJ Estimated detection limit.

Table 9. Concentrations of Volatile Organic Compounds in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, May and June 1988, Syosset Landfill, Syosset, New York.

Well:	Field Blank 1	Field Blank 2	Field Blank 3	Trip Blank 1	Trip Blank 2	Trip Blank 3
Date Sampled:	6/6/88	6/7/88	6/8/88	5/2/88	5/3/88	5/4/88
Parameter						
Acetone	NA	NA	NA	<10	<10	<10
Carbon disulfide	NA	NA	NA	<5	<5	<5
Chloromethane	<1	<1 UJ	<1	<10	<10	<10
Bromomethane	<1	<1 UJ	<1	<10	<10	<10
Dichlorodifluoromethane	<1	<1 UJ	<1	NA	NA	NA
Vinyl chloride	<1	<1 UJ	<1	<10	<10	<10
Chloroethane	<1	<1 UJ	<1	<10	<10	<10
Methylene chloride	<2	<2 UJ	<2	<5	<5	<5
Trichlorofluoromethane	<2	<2 UJ	<2	NA	NA	NA
1,1-Dichloroethene	<2	<2 UJ	<2	<5	<5	<5
1,1-Dichloroethane	<2	<2 UJ	<2	<5	<5	<5
1,2-Dichloroethene	<2	<2 UJ	<2	<5	<5	<5
Chloroform	<1	<1 UJ	<1	<5	<5	<5
1,2-Dichloroethane	<2	<2 UJ	<2	<5	<5	<5
1,1,1-Trichloroethane	<1	<1 UJ	<1	<5	<5	<5
Carbon tetrachloride	<1	<1 UJ	<1	<5	<5	<5
Bromodichloromethane	<1	<1 UJ	<1	<5	<5	<5
1,2-Dichloropropane	<2	<2 UJ	<2	<5	<5	<5
trans-1,3-Dichloropropene	<2	<2 UJ	<2	<5	<5	<5
Trichloroethylene	<1	<1 UJ	<1	<5	<5	<5
Chlorodibromomethane	<1	<1 UJ	<1	NA	NA	NA
1,1,2-Trichloroethane	<2	<2 UJ	<2	<5	<5	<5
cis-1,3-Dichloropropene	<2	<2 UJ	<2	<5	<5	<5
2-Chloroethyl vinyl ether	<2	<2 UJ	<2	NA	NA	NA
Bromoform	<2	<2 UJ	<2	<5	<5	<5
1,1,2,2-Tetrachloroethane	<2	<2 UJ	<2	<5	<5	<5
Tetrachloroethene	<1	<1 UJ	<1	<5	<5	<5
Chlorobenzene	<1	<1 UJ	<1	<5	<5	<5
1,3-Dichlorobenzene	<2	<2 UJ	<2	NA	NA	NA
1,2-Dichlorobenzene	<2	<2 UJ	<2	NA	NA	NA
1,4-Dichlorobenzene	<2	<2 UJ	<2	NA	NA	NA
Benzene	<1	<1 UJ	<1	<5	<5	<5
Toluene	<2	<2 UJ	<2	<5	<5	<5
2-Butanone	NA	NA	NA	R	R	R
Vinyl acetate	NA	NA	NA	<10	<10	<10
Dibromochloromethane	NA	NA	NA	<5	<5	<5
4-Methyl-2-pentanone	NA	NA	NA	<10	<10	<10
2-Hexanone	NA	NA	NA	<10	<10	<10
Styrene	NA	NA	NA	<5	<5	<5
Ethyl benzene	<1	<1 UJ	<1	<5	<5	<5
m Xylene	<2	<2 UJ	<2	NA	NA	NA
o + p Xylene	<4	<4 UJ	<4	NA	NA	NA
Total xylenes	NA	NA	NA	<5	<5	<5
Total VOCs	0	0	0	0	0	0

All results reported in micrograms per liter (ug/L).
Samples collected in May 1988 were analysed using CLP Method for Volatile Organic Compounds by York Laboratories, Inc., Monroe, Connecticut. Samples collected in June 1988 were analysed using USEPA Methods 601, 602 by EcoTest Laboratories, Inc., North Babylon, New York.

NA Not analysed.
J Estimated value.
R Data unuseable: response factor too low during initial calibration.
UJ Estimated detection limit.

Table 9. Concentrations of Volatile Organic Compounds in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, May and June 1988, Syosset Landfill, Syosset, New York.

Well:	Trip Blank 4	Trip Blank 1	Trip Blank 2	Trip Blank 3
Date Sampled:	5/5/88	6/6/88	6/7/88	6/8/88
Parameter				
Acetone	<10	NA	NA	NA
Carbon disulfide	<5	NA	NA	NA
Chloromethane	<10	<1	<1 UJ	<1
Bromomethane	<10	<1	<1 UJ	<1
Dichlorodifluoromethane	NA	<1	<1 UJ	<1
Vinyl chloride	<10	<1	<1 UJ	<1
Chloroethane	<10	<1	<1 UJ	<1
Methylene chloride	<5	<2	<2 UJ	<2
Trichlorofluoromethane	NA	<2	<2 UJ	<2
1,1-Dichloroethene	<5	<2	<2 UJ	<2
1,1-Dichloroethane	<5	<2	<2 UJ	<2
1,2-Dichloroethene	<5	<2	<2 UJ	<2
Chloroform	<5	<1	<1 UJ	<1
1,2-Dichloroethane	<5	<2	<2 UJ	<2
1,1,1-Trichloroethane	<5	<1	<1 UJ	<1
Carbon tetrachloride	<5	<1	<1 UJ	<1
Bromodichloromethane	<5	<1	<1 UJ	<1
1,2-Dichloropropane	<5	<2	<2 UJ	<2
trans-1,3-Dichloropropene	<5	<2	<2 UJ	<2
Trichloroethylene	<5	<1	<1 UJ	<1
Chlorodibromomethane	NA	<1	<1 UJ	<1
1,1,2-Trichloroethane	<5	<2	<2 UJ	<2
cis-1,3-Dichloropropene	<5	<2	<2 UJ	<2
2-Chloroethyl vinyl ether	NA	<2	<2 UJ	<2
Bromoform	<5	<2	<2 UJ	<2
1,1,2,2-Tetrachloroethane	<5	<2	<2 UJ	<2
Tetrachloroethene	<5	<1	<1 UJ	<1
Chlorobenzene	<5	<1	<1 UJ	<1
1,3-Dichlorobenzene	NA	<2	<2 UJ	<2
1,2-Dichlorobenzene	NA	<2	<2 UJ	<2
1,4-Dichlorobenzene	NA	<2	<2 UJ	<2
Benzene	<5	<1	<1 UJ	<1
Toluene	<5	<2	<2 UJ	<2
2-Butanone	R	NA	NA	NA
Vinyl acetate	<10	NA	NA	NA
Dibromochloromethane	<5	NA	NA	NA
4-Methyl-2-pentanone	<10	NA	NA	NA
2-Hexanone	<10	NA	NA	NA
Styrene	<5	NA	NA	NA
Ethyl benzene	<5	<1	<1 UJ	<1
m Xylene	NA	<2	<2 UJ	<2
o + p Xylene	NA	<4	<4 UJ	<4
Total xylenes	<5	NA	NA	NA
Total VOCs	0	0	0	0

All results reported in micrograms per liter (ug/L).
Samples collected in May 1988 were analyzed using CLP Method for Volatile Organic Compounds by York Laboratories, Inc., Monroe, Connecticut. Samples collected in June 1988 were analyzed using USEPA Methods 601, 602 by EcoTest Laboratories, Inc., North Babylon, New York.

NA Not analyzed.
J Estimated value.
R Data unuseable; response factor too low during initial calibration.
UJ Estimated detection limit.

Table 10. Concentrations of PCBs in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Well:	SY-1	SY-1	SY-1D	SY-1D	SY-2R	SY-2R
Date Sampled:	5/3/88	6/6/88	5/3/88	6/6/88	5/4/88	6/7/88
Parameter						
Aroclor 1016	<1	<1	<1	<1	<1	<1
Aroclor 1221	<1	<1	<1	<1	<1	<1
Aroclor 1232	<1	<1	<1	<1	<1	<1
Aroclor 1242	<1	<1	<1	<1	<1	<1
Aroclor 1248	<1	<1	<1	<1	<1	<1
Aroclor 1254	<1	<1	<1	<1	<1	<1
Aroclor 1260	<1	<1	<1	<1	<1	<1

All results reported in micrograms per liter (ug/L).
Samples analyzed using USEPA Method 608 by EcoTest Laboratories, Inc., North Babylon, New York.
NA Not analyzed.

Table 10. Concentrations of PCBs in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Well:	SY-2D	SY-2D	SY-3	SY-3	Replicates SY-3D	SY-A
Date Sampled:	5/4/88	6/7/88	5/4/88	6/7/88	5/4/88	5/4/88
Parameter						
Aroclor 1016	<1	<1	<1	<1	<1	<1
Aroclor 1221	<1	<1	<1	<1	<1	<1
Aroclor 1232	<1	<1	<1	<1	<1	<1
Aroclor 1242	<1	<1	<1	<1	<1	<1
Aroclor 1248	<1	<1	<1	<1	<1	<1
Aroclor 1254	<1	<1	<1	<1	<1	<1
Aroclor 1260	<1	<1	<1	<1	<1	<1

All results reported in micrograms per liter (ug/L).
Samples analyzed using USEPA Method 608 by EcoTest Laboratories, Inc., North Babylon, New York.
NA Not analyzed.

Table 10. Concentrations of PCBs in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

		Replicates					
	Well:	SY-3D	SY-A	SY-4	SY-4	SY-5	SY-5
	Date Sampled:	6/8/88	6/8/88	5/5/88	6/8/88	5/3/88	6/7/88
Parameter							
Aroclor 1016		<1	<1	<1	<1	<1	<1
Aroclor 1221		<1	<1	<1	<1	<1	<1
Aroclor 1232		<1	<1	<1	<1	<1	<1
Aroclor 1242		<1	<1	<1	<1	<1	<1
Aroclor 1248		<1	<1	<1	<1	<1	<1
Aroclor 1254		<1	<1	<1	<1	<1	<1
Aroclor 1260		<1	<1	<1	<1	<1	<1

All results reported in micrograms per liter (ug/L).
Samples analyzed using USEPA Method 608 by EcoTest Laboratories, Inc., North Babylon, New York.
NA Not analyzed.

Table 10. Concentrations of PCBs in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Well:	SY-6	SY-6	SY-6D	SY-6D	SY-7	SY-7
Date Sampled:	5/2/88	6/6/88	5/2/88	6/6/88	5/2/88	6/6/88
Parameter						
Aroclor 1016	<1	<1	<1	<1	<1	<1
Aroclor 1221	<1	<1	<1	<1	<1	<1
Aroclor 1232	<1	<1	<1	<1	<1	<1
Aroclor 1242	<1	<1	<1	<1	<1	<1
Aroclor 1248	<1	<1	<1	<1	<1	<1
Aroclor 1254	<1	<1	<1	<1	<1	<1
Aroclor 1260	<1	<1	<1	<1	<1	<1

All results reported in micrograms per liter (ug/L).
Samples analyzed using USEPA Method 608 by EcoTest Laboratories, Inc., North Babylon, New York.
NA Not analyzed.

Table 10. Concentrations of PCBs in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Well:	SY-8	SY-8	SY-9	SY-9	W-3	W-3
Date Sampled:	5/3/88	6/8/88	5/3/88	6/10/88	5/5/88	6/7/88
Parameter						
Aroclor 1016	<1	<1	<1	<1	<1	<1
Aroclor 1221	<1	<1	<1	<1	<1	<1
Aroclor 1232	<1	<1	<1	<1	<1	<1
Aroclor 1242	<1	<1	<1	<1	<1	<1
Aroclor 1248	<1	<1	<1	<1	<1	<1
Aroclor 1254	<1	<1	<1	<1	<1	<1
Aroclor 1260	<1	<1	<1	<1	<1	<1

All results reported in micrograms per liter (ug/L).
Samples analyzed using USEPA Method 608 by EcoTest Laboratories, Inc., North Babylon, New York.
NA Not analyzed.

Table 10. Concentrations of PCBs in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Well:	W-4	W-4
Date Sampled:	5/3/88	6/7/88
Parameter		
Aroclor 1016	<1	<1
Aroclor 1221	<1	<1
Aroclor 1232	<1	<1
Aroclor 1242	<1	<1
Aroclor 1248	<1	<1
Aroclor 1254	<1	<1
Aroclor 1260	<1	<1

All results reported in micrograms per liter (ug/L).
Samples analyzed using USEPA Method 608 by EcoTest Laboratories, Inc., North Babylon, New York.
NA Not analyzed.

Table 11. Concentrations of Base/Neutral Compounds in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Well:	SY-1	SY-1	SY-1D	SY-1D	SY-2R
Date Sampled:	5/3/88	6/6/88	5/3/88	6/6/88	5/4/88
Parameter					
bis(2-Chloroethyl)ether	<10	<10	<10	<10	<10
1,3-Dichlorobenzene	<10	<10	<10	<10	<10
1,4-Dichlorobenzene	<10	<10	1 J	<10	<10
Benzyl alcohol	<10	<10	<10	<10	<10
1,2-Dichlorobenzene	<10	<10	0.5 J	<10	<10
bis(2-Chloroisopropyl)ether	<10	<10	<10	<10	<10
n-Nitroso-di-n-propylamine	<10	<10	<10	<10	<10
Hexachloroethane	<10	<10	<10	<10	<10
Nitrobenzene	<10	<10	<10	<10	<10
Isophorone	<10	<10	<10	<10	<10
Benzoic acid	<50	<50	<50	<50	<50
bis(2-Chloroethoxy)methane	<10	<10	<10	<10	<10
1,2,4-Trichlorobenzene	<10	<10	<10	<10	<10
Naphthalene	<10	<10	<10	<10	<10
4-Chloroaniline	<10	<10	<10	<10	<10
Hexachlorobutadiene	<10	<10	<10	<10	<10
2-Methylnaphthalene	<10	<10	<10	<10	<10
Hexachlorocyclopentadiene	<10	<10	<10	<10	<10
2-Chloronaphthalene	<10	<10	<10	<10	<10
2-Nitroaniline	<50	<50	<50	<50	<50
Dimethyl phthalate	<10	<10	<10	<10	<10
Acenaphthylene	<10	<10	<10	<10	<10
3-Nitroaniline	<50	<50	<50	<50	<50
Acenaphthene	<10	<10	<10	<10	<10
Dibenzofuran	<10	<10	<10	<10	<10
2,4-Dinitrotoluene	<10	<10	<10	<10	<10
2,6-Dinitrotoluene	<10	<10	<10	<10	<10
Diethylphthalate	0.3 J	<10	<10	<10	<10
4-Chlorophenyl-phenylether	<10	<10	<10	<10	<10

All results reported in micrograms per liter (ug/L).
Samples analyzed using CLP Method for Base Neutrals and Acid Extractables by York Laboratories, Inc., Monroe, Connecticut.

J Estimated value.

B Analyte detected in the blank as well as in the sample.

R Data unuseable: response factor too low during initial calibration.

Table 11. Concentrations of Base/Neutral Compounds in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Well:	SY-1	SY-1	SY-1D	SY-1D	SY-2R
Date Sampled:	5/3/88	6/6/88	5/3/88	6/6/88	5/4/88
Parameter					
Fluorene	<10	<10	<10	<10	<10
4-Nitroaniline	<50	<50	<50	<50	R
n-Nitrosodiphenylamine	<10	<10	<10	<10	<10
4-Bromophenyl-phenylether	<10	<10	<10	<10	<10
Hexachlorobenzene	<10	<10	<10	<10	<10
Phenanthrene	<10	<10	<10	<10	<10
Anthracene	<10	<10	<10	<10	<10
di-n-Butylphthalate	<10	<10	<10	<10	<10
Fluoranthene	<10	<10	<10	<10	<10
Pyrene	<10	<10	<10	<10	<10
Butylbenzylphthalate	<10	<10	<10	<10	<10
3,3'-Dichlorobenzidine	<20	<20	<10	<20	<20
Benzo(a)anthracene	<10	<10	<10	<10	<10
bis(2-Ethylhexyl)phthalate	<10	1 JB	<10	18 B	<10
Chrysene	<10	<10	<10	<10	<10
di-n-Octyl phthalate	<10	<10	<10	<10	<10
Benzo(b)fluoranthene	<10	<10	<10	<10	<10
Benzo(k)fluoranthene	<10	<10	<10	<10	<10
Benzo(a)pyrene	<10	<10	<10	<10	<10
Indeno(1,2,3-cd)pyrene	<10	<10	<10	<10	<10
Dibenzo(a,h)anthracene	<10	<10	<10	<10	<10
Benzo(g,h,i)perylene	<10	<10	<10	<10	<10

All results reported in micrograms per liter (ug/L).
Samples analyzed using CLP Method for Base Neutrals and Acid Extractables by York Laboratories, Inc., Monroe, Connecticut.

J Estimated value.

B Analyte detected in the blank as well as in the sample.

R Data unusable; response factor too low during initial calibration.

Table 11. Concentrations of Base/Neutral Compounds in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Well:	SY-2R	SY-2D	SY-2D	SY-3	SY-3
Date Sampled:	6/7/88	5/4/88	6/7/88	5/4/88	6/7/88
Parameter					
bis(2-Chloroethyl)ether	<10	<10	<10	<10	<10
1,3-Dichlorobenzene	<10	<10	<10	<10	<10
1,4-Dichlorobenzene	<10	1 J	<10	<10	<10
Benzyl alcohol	<10	<10	<10	<10	<10
1,2-Dichlorobenzene	<10	<10	<10	<10	<10
bis(2-Chloroisopropyl)ether	<10	<10	<10	<10	<10
n-Nitroso-di-n-propylamine	<10	<10	<10	<10	<10
Hexachloroethane	<10	<10	<10	<10	<10
Nitrobenzene	<10	<10	<10	<10	<10
Isophorone	<10	<10	<10	<10	<10
Benzoic acid	<50	<50	<50	<50	<50
bis(2-Chloroethoxy)methane	<10	<10	<10	<10	<10
1,2,4-Trichlorobenzene	<10	<10	<10	<10	<10
Naphthalene	<10	<10	<10	<10	<10
4-Chloroaniline	<10	<10	<10	<10	<10
Hexachlorobutadiene	<10	<10	<10	<10	<10
2-Methylnaphthalene	<10	<10	<10	<10	<10
Hexachlorocyclopentadiene	<10	<10	<10	<10	<10
2-Chloronaphthalene	<10	<10	<10	<10	<10
2-Nitroaniline	<50	<50	<50	<50	<50
Dimethyl phthalate	<10	<10	<10	<10	<10
Acenaphthylene	<10	<10	<10	<10	<10
3-Nitroaniline	<50	<50	<50	<50	<50
Acenaphthene	<10	<10	<10	<10	<10
Dibenzofuran	<10	<10	<10	<10	<10
2,4-Dinitrotoluene	<10	<10	<10	<10	<10
2,6-Dinitrotoluene	<10	<10	<10	<10	<10
Diethylphthalate	<10	8.4 J	<10	<10	<10
4-Chlorophenyl-phenylether	<10	<10	<10	<10	<10

All results reported in micrograms per liter (ug/L).
Samples analyzed using CLP Method for Base Neutrals and Acid Extractables by York Laboratories, Inc., Monroe, Connecticut.
J Estimated value.
B Analyte detected in the blank as well as in the sample.
R Data unuseable: response factor too low during initial calibration.

Table 11. Concentrations of Base/Neutral Compounds in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Well:	SY-2R	SY-2D	SY-2D	SY-3	SY-3
Date Sampled:	6/7/88	5/4/88	6/7/88	5/4/88	6/7/88
Parameter					
Fluorene	<10	<10	<10	0.4 J	<10
4-Nitroaniline	<50	R	<50	R	<50
n-Nitrosodiphenylamine	<10	2 J	2 J	<10	<10
4-Bromophenyl-phenylether	<10	<10	<10	<10	<10
Hexachlorobenzene	<10	<10	<10	<10	<10
Phenanthrene	<10	<10	<10	<10	<10
Anthracene	<10	<10	<10	<10	<10
di-n-Butylphthalate	<10	<10	<10	<10	<10
Fluoranthene	<10	<10	<10	<10	<10
Pyrene	<10	<10	<10	<10	<10
Butylbenzylphthalate	<10	0.3 J	<10	0.2 J	<10
3,3'-Dichlorobenzidine	<20	<20	<20	<20	<20
Benzo(a)anthracene	<10	<10	<10	<10	<10
bis(2-Ethylhexyl)phthalate	5 JB	<10	3 JB	<10	6 B
Chrysene	<10	<10	<10	<10	<10
di-n-Octyl phthalate	<10	<10	<10	24 B	4 J
Benzo(b)fluoranthene	<10	<10	<10	<10	<10
Benzo(k)fluoranthene	<10	<10	<10	<10	<10
Benzo(a)pyrene	<10	<10	<10	<10	<10
Indeno(1,2,3-cd)pyrene	<10	<10	<10	<10	<10
Dibenzo(a,h)anthracene	<10	<10	<10	<10	<10
Benzo(g,h,i)perylene	<10	<10	<10	<10	<10

All results reported in micrograms per liter (ug/L).
Samples analyzed using CLP Method for Base Neutrals and Acid Extractables by York Laboratories, Inc., Monroe, Connecticut.
J Estimated value.
B Analyte detected in the blank as well as in the sample.
R Data unusable: response factor too low during initial calibration.

Table 11. Concentrations of Base/Neutral Compounds in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

	Replicates		Replicates		
Well:	SY-2D	SY-4	SY-2D	SY-4	SY-4
Date Sampled:	5/4/88	5/4/88	6/8/88	6/8/88	5/5/88
Parameter					
bis(2-Chloroethyl)ether	<10	<10	<10	<10	<10
1,3-Dichlorobenzene	0.5 J	0.4 J	<10	<10	<10
1,4-Dichlorobenzene	3 J	3 J	3 J	3 J	<10
Benzyl alcohol	<10	<10	<10	<10	<10
1,2-Dichlorobenzene	1 J	1 J	<10	<10	<10
bis(2-Chloroisopropyl)ether	<10	<10	<10	<10	<10
n-Nitroso-di-n-propylamine	<10	<10	<10	<10	<10
Hexachloroethane	<10	<10	<10	<10	<10
Nitrobenzene	<10	<10	<10	<10	<10
Isophorone	<10	<10	<10	<10	<10
Benzoic acid	5 J	<50	5 J	8 J	<50
bis(2-Chloroethoxy)methane	<10	<10	<10	<10	<10
1,2,4-Trichlorobenzene	<10	<10	<10	<10	<10
Naphthalene	<10	<10	<10	<10	<10
4-Chloroaniline	<10	<10	<10	<10	<10
Hexachlorobutadiene	<10	<10	<10	<10	<10
2-Methylnaphthalene	<10	<10	<10	<10	<10
Hexachlorocyclopentadiene	<10	<10	<10	<10	<10
2-Chloronaphthalene	<10	<10	<10	<10	<10
2-Nitroaniline	<50	<50	<50	<50	<50
Dimethyl phthalate	<10	<10	<10	<10	<10
Acenaphthylene	<10	<10	<10	<10	<10
3-Nitroaniline	<50	<50	<50	<50	<50
Acenaphthene	<10	<10	<10	<10	<10
Dibenzofuran	<10	<10	<10	<10	<10
2,4-Dinitrotoluene	<10	<10	<10	<10	<10
2,6-Dinitrotoluene	<10	<10	<10	<10	<10
Diethylphthalate	<10	<10	<10	<10	<10
4-Chlorophenyl-phenylether	<10	<10	<10	<10	<10

All results reported in micrograms per liter (ug/L).

Samples analyzed using CLP Method for Base Neutrals and Acid Extractables by York Laboratories, Inc., Monroe, Connecticut.

J Estimated value.

B Analyte detected in the blank as well as in the sample.

R Data unuseable: response factor too low during initial calibration.

Table 11. Concentrations of Base/Neutral Compounds in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

	Replicates		Replicates		
Well:	SY-3D	SY-A	SY-3D	SY-A	SY-4
Date Sampled:	5/4/88	5/4/88	6/8/88	6/8/88	6/8/88
Parameter					
Fluorene	<10	<10	<10	<10	<10
4-Nitroaniline	R	R	<50	<50	R
n-Nitrosodiphenylamine	8.7 J	8.6 J	<10	<10	<10
4-Bromophenyl-phenylether	<10	<10	<10	<10	<10
Hexachlorobenzene	<10	<10	<10	<10	<10
Phenanthrene	<10	<10	<10	<10	<10
Anthracene	<10	<10	<10	<10	<10
di-n-Butylphthalate	<10	<10	<10	<10	<10
Fluoranthene	0.2 J	<10	<10	<10	<10
Pyrene	0.3 J	<10	<10	<10	<10
Butylbenzylphthalate	1 J	0.3 J	3 J	1 J	<10
3,3'-Dichlorobenzidine	<20	<20	<20	<20	<20
Benzo(a)anthracene	<10	<10	<10	<10	<10
bis(2-Ethylhexyl)phthalate	<10	<10	9 JB	12 B	<10
Chrysene	<10	<10	<10	<10	<10
di-n-Octyl phthalate	39 B	22 B	2 J	8.7 J	<10
Benzo(b)fluoranthene	<10	<10	<10	<10	<10
Benzo(k)fluoranthene	<10	<10	<10	<10	<10
Benzo(a)pyrene	<10	<10	<10	<10	<10
Indeno(1,2,3-cd)pyrene	<10	<10	<10	<10	<10
Dibenzo(a,h)anthracene	<10	<10	<10	<10	<10
Benzo(g,h,i)perylene	<10	<10	<10	<10	<10

All results reported in micrograms per liter (ug/L).
Samples analyzed using CLP Method for Base Neutrals and Acid Extractables by York Laboratories, Inc., Monroe, Connecticut.
J Estimated value.
B Analyte detected in the blank as well as in the sample.
R Data unusable; response factor too low during initial calibration.

Table 11. Concentrations of Base/Neutral Compounds in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Well:	SY-4	SY-5	SY-5	SY-6	SY-6
Date Sampled:	6/8/88	5/3/88	6/7/88	5/2/88	6/6/88
Parameter					
bis(2-Chloroethyl)ether	<10	<10	<10	<10	<10
1,3-Dichlorobenzene	<10	<10	<10	<10	<10
1,4-Dichlorobenzene	<10	<10	<10	<10	<10
Benzyl alcohol	<10	<10	<10	<10	<10
1,2-Dichlorobenzene	<10	<10	<10	<10	<10
bis(2-Chloroisopropyl)ether	<10	<10	<10	<10	<10
n-Nitroso-di-n-propylamine	<10	<10	<10	<10	<10
Hexachloroethane	<10	<10	<10	<10	<10
Nitrobenzene	<10	<10	<10	<10	<10
Isophorone	<10	<10	<10	<10	<10
Benzoic acid	<50	6 J	<50	<50	<50
bis(2-Chloroethoxy)methane	<10	<10	<10	<10	<10
1,2,4-Trichlorobenzene	<10	<10	<10	<10	<10
Naphthalene	<10	<10	<10	<10	<10
4-Chloroaniline	<10	<10	<10	<10	<10
Hexachlorobutadiene	<10	<10	<10	<10	<10
2-Methylnaphthalene	<10	<10	<10	<10	<10
Hexachlorocyclopentadiene	<10	<10	<10	<10	<10
2-Chloronaphthalene	<10	<10	<10	<10	<10
2-Nitroaniline	<50	<50	<50	<50	<50
Dimethyl phthalate	<10	<10	<10	<10	<10
Acenaphthylene	<10	<10	<10	<10	<10
3-Nitroaniline	<50	<50	<50	<50	<50
Acenaphthene	<10	<10	<10	<10	<10
Dibenzofuran	<10	<10	<10	<10	<10
2,4-Dinitrotoluene	<10	<10	<10	<10	<10
2,6-Dinitrotoluene	<10	<10	<10	<10	<10
Diethylphthalate	<10	<10	<10	<10	<10
4-Chlorophenyl-phenylether	<10	<10	<10	<10	<10

All results reported in micrograms per liter (ug/L).
Samples analyzed using CLP Method for Base Neutrals and Acid Extractables by York Laboratories, Inc., Monroe, Connecticut.

J Estimated value.

B Analyte detected in the blank as well as in the sample.

R Data unuseable; response factor too low during initial calibration.

Table 11. Concentrations of Base/Neutral Compounds in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Well:	SY-6D	SY-6D	SY-7	SY-7	SY-8
Date Sampled:	5/2/88	6/6/88	5/2/88	6/6/88	5/5/88
Parameter					
bis(2-Chloroethyl)ether	<10	<10	<10	<10	<10
1,3-Dichlorobenzene	<10	<10	<10	<10	<10
1,4-Dichlorobenzene	<10	<10	<10	<10	<10
Benzyl alcohol	<10	<10	<10	<10	<10
1,2-Dichlorobenzene	<10	<10	2 J	<10	<10
bis(2-Chloroisopropyl)ether	<10	<10	<10	<10	<10
n-Nitroso-di-n-propylamine	<10	<10	<10	<10	<10
Hexachloroethane	<10	<10	<10	<10	<10
Nitrobenzene	<10	<10	<10	<10	<10
Isophorone	<10	<10	<10	<10	<10
Benzoic acid	<50	<50	<50	<50	<50
bis(2-Chloroethoxy)methane	<10	<10	<10	<10	<10
1,2,4-Trichlorobenzene	<10	<10	<10	<10	<10
Naphthalene	<10	<10	0.8 J	<10	<10
4-Chloroaniline	<10	<10	<10	<10	<10
Hexachlorobutadiene	<10	<10	<10	<10	<10
2-Methylnaphthalene	<10	<10	0.4 J	<10	<10
Hexachlorocyclopentadiene	<10	<10	<10	<10	<10
2-Chloronaphthalene	<10	<10	<10	<10	<10
2-Nitroaniline	<50	<50	<50	<50	<50
Dimethyl phthalate	<10	<10	<10	<10	<10
Acenaphthylene	<10	<10	<10	<10	<10
3-Nitroaniline	<50	<50	<50	<50	<50
Acenaphthene	<10	<10	<10	<10	<10
Dibenzofuran	<10	<10	<10	<10	<10
2,4-Dinitrotoluene	<10	<10	<10	<10	<10
2,6-Dinitrotoluene	<10	<10	<10	<10	<10
Diethylphthalate	<10	<10	<10	<10	<10
4-Chlorophenyl-phenylether	<10	<10	<10	<10	<10

All results reported in micrograms per liter (ug/L).
Samples analyzed using CLP Method for Base Neutrals and Acid Extractables by York Laboratories, Inc., Monroe, Connecticut.

J Estimated value.

B Analyte detected in the blank as well as in the sample.

R Data unuseable; response factor too low during initial calibration.

Table 11. Concentrations of Base/Neutral Compounds in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Well:	SY-6D	SY-6D	SY-7	SY-7	SY-8
Date Sampled:	5/2/88	6/6/88	5/2/88	6/6/88	5/3/88
Parameter					
Fluorene	<10	<10	<10	<10	<10
4-Nitroaniline	<50	<50	<50	<50	<50
n-Nitrosodiphenylamine	<10	<10	<10	<10	<10
4-Bromophenyl-phenylether	<10	<10	<10	<10	<10
Hexachlorobenzene	<10	<10	<10	<10	<10
Phenanthrene	<10	<10	<10	<10	<10
Anthracene	<10	<10	<10	<10	<10
di-n-Butylphthalate	<10	<10	<10	<10	<10
Fluoranthene	<10	<10	<10	<10	<10
Pyrene	<10	<10	<10	<10	<10
Butylbenzylphthalate	<10	<10	<10	<10	<10
3,3'-Dichlorobenzidine	<20	<20	<20	<20	<20
Benzo(a)anthracene	<10	<10	<10	<10	<10
bis(2-Ethylhexyl)phthalate	<10	2 JB	<10	2 JB	<10
Chrysene	<10	<10	<10	<10	<10
di-n-Octyl phthalate	<10	<10	<10	<10	<10
Benzo(b)fluoranthene	<10	<10	<10	<10	<10
Benzo(k)fluoranthene	<10	<10	<10	<10	<10
Benzo(a)pyrene	<10	<10	<10	<10	<10
Indeno(1,2,3-cd)pyrene	<10	<10	<10	<10	<10
Dibenzo(a,h)anthracene	<10	<10	<10	<10	<10
Benzo(g,h,i)perylene	<10	<10	<10	<10	<10

All results reported in micrograms per liter (ug/L).
Samples analyzed using CLP Method for Base Neutrals and Acid Extractables by York Laboratories, Inc., Monroe, Connecticut.

J Estimated value.

B Analyte detected in the blank as well as in the sample.

R Data unusable: response factor too low during initial calibration.

Table 11. Concentrations of Base/Neutral Compounds in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Well:	SY-6	SY-9	SY-9	W-3	W-3
Date Sampled:	6/8/88	5/4/88	6/10/88	5/5/88	6/7/88
Parameter					
bis(2-Chloroethyl)ether	<10	<10	<10	<10	<10
1,3-Dichlorobenzene	<10	<10	<10	<10	<10
1,4-Dichlorobenzene	<10	0.5 J	<10	<10	<10
Benzyl alcohol	<10	<10	<10	<10	<10
1,2-Dichlorobenzene	<10	<10	<10	<10	<10
bis(2-Chloroisopropyl)ether	<10	<10	<10	<10	<10
n-Nitroso-di-n-propylamine	<10	<10	<10	<10	<10
Hexachloroethane	<10	<10	<10	<10	<10
Nitrobenzene	<10	<10	<10	<10	<10
Isophorone	<10	<10	<10	<10	<10
Benzoic acid	<50	<50	<50	<50	<50
bis(2-Chloroethoxy)methane	<10	<10	<10	<10	<10
1,2,4-Trichlorobenzene	<10	<10	<10	<10	<10
Naphthalene	<10	<10	<10	<10	<10
4-Chloroaniline	<10	<10	<10	<10	<10
Hexachlorobutadiene	<10	<10	<10	<10	<10
2-Methylnaphthalene	<10	<10	<10	<10	<10
Hexachlorocyclopentadiene	<10	<10	<10	<10	<10
2-Chloronaphthalene	<10	<10	<10	<10	<10
2-Nitroaniline	<50	<50	<50	<50	<50
Dimethyl phthalate	<10	<10	<10	<10	<10
Acenaphthylene	<10	<10	<10	<10	<10
3-Nitroaniline	<50	<50	<50	<50	<50
Acenaphthene	<10	<10	<10	<10	<10
Dibenzofuran	<10	<10	<10	<10	<10
2,4-Dinitrotoluene	<10	<10	<10	<10	<10
2,6-Dinitrotoluene	<10	<10	<10	<10	<10
Diethylphthalate	<10	<10	<10	<10	<10
4-Chlorophenyl-phenylether	<10	<10	<10	<10	<10

All results reported in micrograms per liter (ug/L).
Samples analyzed using CLP Method for Base Neutrals and Acid Extractables by York Laboratories, Inc., Monroe, Connecticut.

J Estimated value.

B Analyte detected in the blank as well as in the sample.

R Data unuseable; response factor too low during initial calibration.

Table 11. Concentrations of Base/Neutral Compounds in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Well:	SY-8	SY-9	SY-9	M-3	M-3
Date Sampled:	6/8/88	5/4/88	6/10/88	5/5/88	6/7/88
Parameter					
Fluorene	<10	<10	<10	8.4 J	<10
4-Nitroaniline	<50	R	<50	R	<50
n-Nitrosodiphenylamine	<10	<10	<10	8.5 J	<10
4-Bromophenyl-phenylether	<10	<10	<10	<10	<10
Hexachlorobenzene	<10	<10	<10	<10	<10
Phenanthrene	<10	<10	<10	<10	<10
Anthracene	<10	<10	<10	<10	<10
di-n-Butylphthalate	<10	<10	<10	<10	<10
Fluoranthene	<10	0.2 J	<10	<10	<10
Pyrene	<10	<10	<10	<10	<10
Butylbenzylphthalate	<10	<10	<10	<10	<10
3,3'-Dichlorobenzidine	<20	<20	<20	<10	<20
Benzo(a)anthracene	<10	<10	<10	<10	<10
bis(2-Ethylhexyl)phthalate	4 JB	<10	3 JB	<10	6 JB
Chrysene	<10	<10	<10	<10	<10
di-n-Octyl phthalate	<10	<10	32	<10	<10
Benzo(b)fluoranthene	<10	<10	<10	<10	<10
Benzo(k)fluoranthene	<10	<10	<10	<10	<10
Benzo(a)pyrene	<10	<10	<10	<10	<10
Indeno(1,2,3-cd)pyrene	<10	<10	<10	<10	<10
Dibenzo(a,h)anthracene	<10	<10	<10	<10	<10
Benzo(g,h,i)perylene	<10	<10	<10	<10	<10

All results reported in micrograms per liter (ug/L).
Samples analyzed using CLP Method for Base Neutrals and Acid Extractables by York Laboratories, Inc., Monroe, Connecticut.

J Estimated value.
B Analyte detected in the blank as well as in the sample.
R Data unusable; response factor too low during initial calibration.

Table 11. Concentrations of Base/Neutral Compounds in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Well:	W-4	W-4
Date Sampled:	5/3/88	6/7/88
Parameter		
bis(2-Chloroethyl)ether	<10	<10
1,3-Dichlorobenzene	0.6 J	<10
1,4-Dichlorobenzene	3 J	<10
Benzyl alcohol	<10	<10
1,2-Dichlorobenzene	1 J	<10
bis(2-Chloroisopropyl)ether	<10	<10
n-Nitroso-di-n-propylamine	<10	<10
Hexachloroethane	<10	<10
Nitrobenzene	<10	<10
Isophorone	<10	<10
Benzoic acid	<50	<50
bis(2-Chloroethoxy)methane	<10	<10
1,2,4-Trichlorobenzene	<10	<10
Naphthalene	2 J	<10
4-Chloroaniline	<10	<10
Hexachlorobutadiene	<10	<10
2-Methylnaphthalene	<10	<10
Hexachlorocyclopentadiene	<10	<10
2-Chloronaphthalene	<10	<10
2-Nitroaniline	<50	<50
Dimethyl phthalate	<10	<10
Acenaphthylene	<10	<10
3-Nitroaniline	<50	<50
Acenaphthene	<10	<10
Dibenzofuran	<10	<10
2,4-Dinitrotoluene	<10	<10
2,6-Dinitrotoluene	<10	<10
Diethylphthalate	<10	<10
4-Chlorophenyl-phenylether	<10	<10

All results reported in micrograms per liter (ug/L).
Samples analyzed using CLP Method for Base Neutrals and Acid Extractables by York Laboratories, Inc., Monroe, Connecticut.

J Estimated value.

B Analyte detected in the blank as well as in the sample.

R Data unusable; response factor too low during initial calibration.

Table 11. Concentrations of Base/Neutral Compounds in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Well:	W-4	W-4
Date Sampled:	5/3/88	6/7/88
Parameter		
Fluorene	<10	<10
4-Nitroaniline	<50	<50
n-Nitrosodiphenylamine	<10	<10
4-Bromophenyl-phenylether	<10	<10
Hexachlorobenzene	<10	<10
Phenanthrene	<10	<10
Anthracene	<10	<10
di-n-Butylphthalate	<10	<10
Fluoranthene	<10	<10
Pyrene	<10	<10
Butylbenzylphthalate	<10	<10
3,3'-Dichlorobenzidine	<10	<20
Benzo(a)anthracene	<10	<10
bis(2-Ethylhexyl)phthalate	<10	11 B
Chrysene	<10	<10
di-n-Octyl phthalate	<10	<10
Benzo(b)fluoranthene	<10	<10
Benzo(k)fluoranthene	<10	<10
Benzo(a)pyrene	<10	<10
Indeno(1,2,3-cd)pyrene	<10	<10
Dibenzo(a,h)anthracene	<10	<10
Benzo(g,h,i)perylene	<10	<10

All results reported in micrograms per liter (ug/L).
Samples analyzed using CLP Method for Base Neutrals and Acid Extractables by York Laboratories, Inc., Monroe, Connecticut.

J Estimated value.

B Analyte detected in the blank as well as in the sample.

R Data unusable; response factor too low during initial calibration.

Table 12. Concentrations of Acid Extractable Compounds in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Well:	SY-1	SY-1	SY-1D	SY-1D	SY-2R
Date Sampled:	5/3/88	6/6/88	5/3/88	6/6/88	5/6/88
Parameter					
Phenol	<10	<10	<10	<10	<10
2-Chlorophenol	<10	<10	<10	<10	<10
2-Methylphenol	<10	<10	<10	<10	<10
4-Methylphenol	<10	<10	<10	<10	<10
2-Nitrophenol	<10	<10	<10	<10	<10
2,4-Dimethylphenol	<10	<10	<10	<10	<10
2,4-Dichlorophenol	<10	<10	<10	<10	<10
4-Chloro-3-methylphenol	<10	<10	<10	<10	<10
2,4,6-Trichlorophenol	<10	<10	<10	<10	<10
2,4,5-Trichlorophenol	<50	<50	<50	<50	<50
2,4-Dinitrophenol	<50	<50	<50	<50	<50
4-Nitrophenol	<50	<50	<50	<50	<50
4,6-Dinitro-2-methylphenol	<50	<50	<50	<50	<50
Pentachlorophenol	<50	<50	<50	<50	<50

All results reported in micrograms per liter (ug/L).
Samples analyzed using CLP Method for Base Neutrals and Acid Extractables by York Laboratories, Inc., Monroe, Connecticut.
J Estimated value.
B Analyte detected in the blank as well as in the sample.

Table 12. Concentrations of Acid Extractable Compounds in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Well:	SY-2R	SY-2D	SY-2D	SY-3	SY-3
Date Sampled:	6/7/88	5/4/88	6/7/88	5/4/88	6/7/88
Parameter					
Phenol	<10	<10	<10	<10	<10
2-Chlorophenol	<10	<10	<10	<10	<10
2-Methylphenol	<10	<10	<10	<10	<10
4-Methylphenol	<10	<10	<10	<10	<10
2-Nitrophenol	<10	<10	<10	<10	<10
2,4-Dimethylphenol	<10	<10	<10	<10	<10
2,4-Dichlorophenol	<10	<10	<10	<10	<10
4-Chloro-3-methylphenol	<10	<10	<10	<10	<10
2,4,6-Trichlorophenol	<10	<10	<10	<10	<10
2,4,5-Trichlorophenol	<50	<50	<50	<50	<50
2,4-Dinitrophenol	<50	<50	<50	<50	<50
4-Nitrophenol	<50	<50	<50	<50	<50
4,6-Dinitro-2-methylphenol	<50	<50	<50	<50	<50
Pentachlorophenol	<50	<50	<50	<50	<50

All results reported in micrograms per liter (ug/L).
Samples analysed using CLP Method for Base Neutrals and Acid Extractables by York Laboratories, Inc., Monroe, Connecticut.
J Estimated value.
B Analyte detected in the blank as well as in the sample.

Table 12. Concentrations of Acid Extractable Compounds in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

		Replicates		Replicates		
Well:	SY-3D	SY-A	SY-3D	SY-A	SY-A
Date Sampled:	5/4/88	5/4/88	6/8/88	6/8/88	7/5/88
Parameter					
Phenol	<10	<10	<10	<10	<10
2-Chlorophenol	<10	<10	<10	<10	<10
2-Methylphenol	<10	<10	<10	<10	<10
4-Methylphenol	<10	<10	<10	<10	<10
2-Nitrophenol	<10	<10	<10	<10	<10
2,4-Dimethylphenol	<10	<10	<10	<10	<10
2,4-Dichlorophenol	<10	<10	<10	<10	<10
4-Chloro-3-methylphenol	<10	<10	<10	<10	<10
2,4,6-Trichlorophenol	<10	<10	<10	<10	<10
2,4,5-Trichlorophenol	<50	<50	<50	<50	<50
2,4-Dinitrophenol	<50	<50	<50	<50	<50
4-Nitrophenol	<50	<50	<50	<50	<50
4,6-Dinitro-2-methylphenol	<50	<50	<50	<50	<50
Pentachlorophenol	<50	<50	<50	<50	<50

All results reported in micrograms per liter (ug/L).
Samples analyzed using CLP Method for Base Neutrals and Acid Extractables by York Laboratories, Inc., Monroe, Connecticut.
J Estimated value.
B Analyte detected in the blank as well as in the sample.

Table 12. Concentrations of Acid Extractable Compounds in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Well:	SY-4	SY-5	SY-5	SY-6	SY-6
Date Sampled:	6/8/88	5/3/88	6/7/88	5/2/88	5/6/88
Parameter					
Phenol	<10	<10	<10	<10	<10
2-Chlorophenol	<10	<10	<10	<10	<10
2-Methylphenol	<10	<10	<10	<10	<10
4-Methylphenol	<10	2 J	<10	<10	<10
2-Nitrophenol	<10	<10	<10	<10	<10
2,4-Dimethylphenol	<10	<10	<10	<10	<10
2,4-Dichlorophenol	<10	<10	<10	<10	<10
4-Chloro-3-methylphenol	<10	<10	<10	<10	<10
2,4,6-Trichlorophenol	<10	<10	<10	<10	<10
2,4,5-Trichlorophenol	<50	<50	<50	<50	<50
2,4-Dinitrophenol	<50	<50	<50	<50	<50
4-Nitrophenol	<50	<50	<50	<50	<50
4,6-Dinitro-2-methylphenol	<50	<50	<50	<50	<50
Pentachlorophenol	<50	<50	<50	<50	<50

All results reported in micrograms per liter (ug/l).
Samples analyzed using CLP Method for Base Neutrals and Acid Extractables by York Laboratories, Inc., Monroe, Connecticut.
J Estimated value.
B Analyte detected in the blank as well as in the sample.

Table 12. Concentrations of Acid Extractable Compounds in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Well:	SY-6D	SY-6D	SY-7	SY-7	SY-8
Date Sampled:	5/2/88	6/6/88	5/2/88	6/6/88	5/3/88
Parameter					
Phenol	<10	<10	<10	<10	<10
2-Chlorophenol	<10	<10	<10	<10	<10
2-Methylphenol	<10	<10	<10	<10	<10
4-Methylphenol	<10	<10	1J	<10	<10
2-Nitrophenol	<10	<10	<10	<10	<10
2,4-Dimethylphenol	<10	<10	<10	<10	<10
2,4-Dichlorophenol	<10	<10	<10	<10	<10
4-Chloro-3-methylphenol	<10	<10	<10	<10	<10
2,4,6-Trichlorophenol	<10	<10	<10	<10	<10
2,4,5-Trichlorophenol	<50	<50	<50	<50	<50
2,4-Dinitrophenol	<50	<50	<50	<50	<50
4-Nitrophenol	<50	<50	<50	<50	<50
4,6-Dinitro-2-methylphenol	<50	<50	<50	<50	<50
Pentachlorophenol	<50	<50	<50	<50	<50

All results reported in micrograms per liter (ug/l).
Samples analyzed using CLP Method for Base Neutrals and Acid Extractables by York Laboratories, Inc., Monroe, Connecticut.
J Estimated value.
B Analyte detected in the blank as well as in the sample.

Table 12. Concentrations of Acid Extractable Compounds in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Well:	SY-8	SY-9	SY-9	U-3	[illegible]
Date Sampled:	6/8/88	5/4/88	6/10/88	5/5/88	[illegible]
Parameter					
Phenol	<10	<10	<10	<10	<10
2-Chlorophenol	<10	<10	<10	<10	<10
2-Methylphenol	<10	<10	<10	<10	<10
4-Methylphenol	<10	<10	<10	<10	<10
2-Nitrophenol	<10	<10	<10	<10	<10
2,4-Dimethylphenol	<10	<10	<10	<10	<10
2,4-Dichlorophenol	<10	<10	<10	<10	<10
4-Chloro-3-methylphenol	<10	<10	<10	<10	<10
2,4,6-Trichlorophenol	<10	<10	<10	<10	<10
2,4,5-Trichlorophenol	<50	<50	<50	<50	<50
2,4-Dinitrophenol	<50	<50	<50	<50	<50
4-Nitrophenol	<50	<50	<50	<50	<50
4,6-Dinitro-2-methylphenol	<50	<50	<50	<50	<50
Pentachlorophenol	<50	<50	<50	<50	<50

All results reported in micrograms per liter (ug/l).
Samples analyzed using CLP Method for Base Neutrals and Acid Extractables by York Laboratories, Inc., Monroe, Connecticut.
J Estimated value.
B Analyte detected in the blank as well as in the sample.

Table 12. Concentrations of Acid Extractable Compounds in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Well:	W-4	W-4
Date Sampled:	5/3/88	6/7/88
Parameter		
Phenol	<10	<10
2-Chlorophenol	<10	<10
2-Methylphenol	<10	<10
4-Methylphenol	<10	<10
2-Nitrophenol	<10	<10
2,4-Dimethylphenol	<10	<10
2,4-Dichlorophenol	<10	<10
4-Chloro-3-methylphenol	<10	<10
2,4,6-Trichlorophenol	<10	<10
2,4,5-Trichlorophenol	<50	<50
2,4-Dinitrophenol	<50	<50
4-Nitrophenol	<50	<50
4,6-Dinitro-2-methylphenol	<50	<50
Pentachlorophenol	<50	<50

All results reported in micrograms per liter (ug/L).
Samples analyzed using CLP Method for Base Neutrals and Acid Extractables by York Laboratories, Inc., Monroe, Connecticut.
J Estimated value.
B Analyte detected in the blank as well as in the sample.

Table 13. Concentrations of Metals (Filtered and Unfiltered) in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Well:	SY-1 *	SY-1	SY-1	SY-1D	SY-1D *	SY-1D
Date Sampled:	5/3/88	5/3/88	6/6/88	5/3/88	5/3/88	6/6/88
Parameter						
Antimony as Sb	<0.005	0.005 J	<0.005	0.006 J	0.010 J	0.015
Arsenic as As	0.17 J	0.060 J	0.040 J	<0.002	<0.002	<0.002 UJ
Beryllium as Be	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium as Cd	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium as Cr	0.010 J	<0.005 UJ	<0.005 UJ	<0.005 UJ	<0.005 UJ	<0.005 UJ
Copper as Cu	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Lead as Pb	<0.005	<0.005	<0.005	<0.005	0.005 J	<0.005
Mercury as Hg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Nickel as Ni	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Selenium as Se	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silver as Ag	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium as Tl	<0.005	<0.005	<0.005	<0.005	<0.005	0.027 J
Zinc as Zn	0.04	0.03	<0.02	0.02	0.03	<0.02
Sodium as Na	32 J	35 J	39 J	250 J	270 J	300 J
Potassium as K	8.9 J	8.8 J	10	23 J	22 J	25
Barium as Ba	0.05	0.17	0.17 J	0.07	<0.05	0.09 J
Iron as Fe	88 J	28 J	28 J	<0.05 UJ	0.06 J	<0.05

All results reported in milligrams per liter (mg/L).
Samples analyzed by EcoTest Laboratories, Inc., North Babylon, New York.
* Unfiltered sample.
J Estimated value.
UJ Estimated detection limit.

Table 13. Concentrations of Metals (Filtered and Unfiltered) in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Well:	SY-2R *	SY-2R	SY-2R	SY-2D *	SY-2D	SY-2D
Date Sampled:	5/4/88	5/4/88	6/7/88	5/4/88	5/4/88	6/7/88
Parameter						
Antimony as Sb	<0.005	<0.005	0.010	<0.005	0.006 J	0.010
Arsenic as As	<0.002	<0.002	<0.002 UJ	<0.002	<0.002	<0.002 UJ
Beryllium as Be	0.003 J	0.002 J	0.0035	<0.001	<0.001	<0.001
Cadmium as Cd	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium as Cr	<0.005 UJ	<0.005 UJ	<0.005 UJ	<0.005 UJ	<0.005 UJ	<0.005 UJ
Copper as Cu	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Lead as Pb	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Mercury as Hg	<0.0002	<0.00025	<0.0002	<0.0002	<0.0002	<0.0002
Nickel as Ni	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Selenium as Se	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silver as Ag	0.002 J	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium as Tl	<0.005	<0.005	<0.005	<0.005	<0.005	0.005 J
Zinc as Zn	0.09	0.09	<0.02	<0.02	<0.02	<0.02
Sodium as Na	44 J	48 J	51 J	180 J	190 J	160 J
Potassium as K	3.8	4.0	6.3	29	32	32
Barium as Ba	0.09	0.11	0.25 J	<0.05	0.06	0.08 J
Iron as Fe	0.20 J	<0.05 UJ	<0.05	0.45 J	<0.05 UJ	0.06 J

All results reported in milligrams per liter (mg/L).
Samples analyzed by EcoTest Laboratories, Inc., North Babylon, New York.
* Unfiltered sample.
J Estimated value.
UJ Estimated detection limit.

Table 13. Concentrations of Metals (Filtered and Unfiltered) in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Well:	SY-3 *	SY-3	SY-3	SY-3D *	SY-3D	SY-A *	SY-A
Date Sampled:	5/4/88	5/4/88	6/7/88	5/4/88	5/4/88	5/4/88	5/4/88
Parameter							
Antimony as Sb	0.012 J	0.009 J	<0.005	<0.005	<0.005	<0.005	0.006 J
Arsenic as As	0.18	0.020	0.012 J	0.004	0.003	0.004	0.003 J
Beryllium as Be	0.002 J	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium as Cd	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium as Cr	0.018 J	<0.005 UJ	<0.005	<0.005 UJ	<0.005 UJ	<0.005 UJ	<0.005 UJ
Copper as Cu	0.06	<0.02	<0.02	0.12	0.03	0.09	0.03 J
Lead as Pb	0.13 J	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Mercury as Hg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Nickel as Ni	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Selenium as Se	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silver as Ag	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium as Tl	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc as Zn	0.50	0.15	<0.02	0.08	0.02	0.08	0.02
Sodium as Na	83 J	150 J	150 J	260 J	270 J	260 J	280 J
Potassium as K	89 J	92 J	95	140 J	150 J	140 J	150.0 J
Barium as Ba	0.19	3.8	0.29 J	0.12	0.18	0.10	0.19
Iron as Fe	190 J	0.06 J	0.45 J	1.1 J	0.12 J	1.1 J	0.10 J

All results reported in milligrams per liter (mg/L).
Samples analyzed by EcoTest Laboratories, Inc., North Babylon, New York.
* Unfiltered sample.
J Estimated value.
UJ Estimated detection limit.

Table 13. Concentrations of Metals (Filtered and Unfiltered) in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Well:	SY-3D	SY-A	SY-4 *	SY-4	SY-4
Date Sampled:	6/8/88	6/8/88	5/5/88	5/5/88	6/8/88
Parameter					
Antimony as Sb	0.007 J	0.010 J	0.006 J	0.006 J	0.007
Arsenic as As	0.004 J	0.003 J	0.006	<0.002	<0.002 UJ
Beryllium as Be	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium as Cd	<0.001	<0.001	0.001	<0.001	<0.001
Chromium as Cr	<0.005 UJ	<0.005 UJ	0.017 J	<0.005 UJ	<0.005 UJ
Copper as Cu	0.12 J	0.13 J	0.05	<0.02	<0.02
Lead as Pb	<0.005	<0.005	0.13 J	<0.002	<0.005
Mercury as Hg	<0.0002	<0.0002	<0.00025	<0.00025	<0.0002
Nickel as Ni	<0.10	<0.10	<0.10	<0.10	<0.10
Selenium as Se	<0.002	<0.002	0.002 J	<0.002	<0.002
Silver as Ag	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium as Tl	0.01 J	0.009 J	<0.005	<0.005	0.005 J
Zinc as Zn	<0.02	<0.02	0.21	<0.02	<0.02
Sodium as Na	300 J	280 J	66 J	110 J	180 J
Potassium as K	210	170	9.3 J	9.0 J	6.1
Barium as Ba	0.12 J	0.16 J	<0.05	0.06	0.08 J
Iron as Fe	<0.05	0.06 J	75 J	<0.05 UJ	<0.05

All results reported in milligrams per liter (mg/L).
Samples analyzed by EcoTest Laboratories, Inc., North Babylon, New York.
* Unfiltered sample.
J Estimated value.
UJ Estimated detection limit.

Table 13. Concentrations of Metals (Filtered and Unfiltered) in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Well:	SY-5 *	SY-5	SY-5	SY-6 *	SY-6	SY-6
Date Sampled:	5/3/88	5/3/88	6/7/88	5/2/88	5/2/88	6/6/88
Parameter						
Antimony as Sb	0.008 J	0.005 J	0.010	0.009 J	0.010 J	0.013
Arsenic as As	0.015	0.002	<0.002 UJ	0.005	<0.002	<0.002 UJ
Beryllium as Be	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium as Cd	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium as Cr	<0.005 UJ	<0.005 UJ	<0.005 UJ	0.006 J	<0.005 UJ	<0.005 UJ
Copper as Cu	<0.02	<0.02	<0.02	0.06	<0.02	<0.02
Lead as Pb	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Mercury as Hg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Nickel as Ni	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Selenium as Se	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silver as Ag	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium as Tl	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc as Zn	3.0	0.04	<0.02	0.13	<0.02	<0.02
Sodium as Na	110 J	120 J	130 J	32 J	34 J	28 J
Potassium as K	4.0 J	4.3 J	10	2.1 J	2.5 J	2.3
Barium as Ba	<0.05	0.13	0.12 J	0.05	0.32	<0.05
Iron as Fe	110 J	3.1 J	4.0 J	13 J	<0.05 J	0.10 J

All results reported in milligrams per liter (mg/L).
Samples analyzed by EcoTest Laboratories, Inc., North Babylon, New York.
* Unfiltered samples.
J Estimated value.
UJ Estimated detection limit.

Table 13. Concentrations of Metals (Filtered and Unfiltered) in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Well:	SY-6D *	SY-6D	SY-6D	SY-7 *	SY-7	SY-7
Date Sampled:	5/2/88	5/2/88	6/6/88	5/2/88	5/2/88	6/6/88
Parameter						
Antimony as Sb	0.005 J	0.010 J	<0.005	<0.005	0.010 J	<0.005
Arsenic as As	<0.002	<0.002	<0.002 UJ	0.004	0.002	<0.002 UJ
Beryllium as Be	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium as Cd	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium as Cr	<0.005 UJ	<0.005 UJ	<0.005 UJ	0.007 J	<0.005 UJ	<0.005 UJ
Copper as Cu	0.06	<0.02	<0.02	0.03	<0.02	<0.02
Lead as Pb	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Mercury as Hg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Nickel as Ni	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Selenium as Se	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silver as Ag	<0.001	<0.001	<0.001	0.002 J	<0.001	<0.001
Thallium as Tl	<0.005	<0.005	<0.005	<0.005	<0.005	0.015 J
Zinc as Zn	0.06	0.02	<0.02	0.66	0.03	<0.02
Sodium as Na	49 J	50 J	51 J	58 J	75 J	74 J
Potassium as K	2.0 J	2.0 J	2.8	2.2 J	2.3 J	3.5
Barium as Ba	0.05	0.06	0.05 J	1.0	0.20	0.24 J
Iron as Fe	0.24 J	0.20 J	0.20 J	66 J	58 J	55 J

All results reported in milligrams per liter (mg/L).
Samples analyzed by EcoTest Laboratories, Inc., North Babylon, New York.
* Unfiltered samples.
J Estimated value.
UJ Estimated detection limit.

Table 13. Concentrations of Metals (Filtered and Unfiltered) in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Well:	SY-8 *	SY-8	SY-8	SY-9	SY-9 *	SY-9
Date Sampled:	5/3/88	5/3/88	6/8/88	5/3/88	5/4/88	6/10/88
Parameter						
Antimony as Sb	0.006 J	<0.005	0.012 J	0.010 J	0.005 J	0.015
Arsenic as As	<0.002	<0.002	<0.002 UJ	<0.002	0.060	<0.002 UJ
Beryllium as Be	<0.001	<0.001	<0.001	<0.001	0.001 J	<0.001
Cadmium as Cd	<0.001	<0.001	<0.001	<0.001	<0.001	0.0025
Chromium as Cr	<0.005 UJ	<0.005 UJ	<0.005 UJ	<0.005 UJ	0.012 J	<0.005 UJ
Copper as Cu	<0.02	<0.02	<0.02	0.02	0.31	0.04 J
Lead as Pb	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Mercury as Hg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Nickel as Ni	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Selenium as Se	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silver as Ag	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium as Tl	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc as Zn	5.2	3.2	4.0	0.19	0.60	0.15
Sodium as Na	36 J	38 J	36 J	35 J	26 J	28 J
Potassium as K	8.1 J	8.8 J	11	3.1 J	3.5 J	4.0
Barium as Ba	0.05	0.07	0.10 J	0.22	0.10	0.14 J
Iron as Fe	0.12 J	0.08 J	0.18 J	<0.05 UJ	27 J	0.18 J

All results reported in milligrams per liter (mg/L).
Samples analyzed by EcoTest Laboratories, Inc., North Babylon, New York.
* Unfiltered samples.
J Estimated value.
UJ Estimated detection limit.

Table 13. Concentrations of Metals (Filtered and Unfiltered) in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Well:	M-3 *	M-3	M-3	M-4 *	M-4	M-4
Date Sampled:	5/5/88	5/5/88	6/7/88	5/5/88	5/5/88	6/7/88
Parameter						
Antimony as Sb	0.016 J	0.010 J	0.010	0.018 J	<0.005	0.009
Arsenic as As	0.15	0.030	0.024 J	0.080	<0.002	<0.002 UJ
Beryllium as Be	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium as Cd	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium as Cr	0.038 J	<0.005 UJ	<0.005 UJ	0.012 J	<0.005 UJ	<0.005 UJ
Copper as Cu	0.31	<0.02	<0.02	0.040	0.02	<0.02
Lead as Pb	0.074 J	<0.005	<0.005	<0.005	<0.005	<0.005
Mercury as Hg	<0.00025	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Nickel as Ni	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Selenium as Se	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silver as Ag	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium as Tl	<0.005	<0.005	<0.005	<0.005	<0.005	<0.010
Zinc as Zn	0.26	0.05	<0.02	0.14	0.03	<0.02
Sodium as Na	120 J	160 J	200 J	330 J	770 J	600 J
Potassium as K	80 J	67 J	150	23 J	33 J	35
Barium as Ba	0.66	0.70	0.92 J	0.08	0.20	0.13 J
Iron as Fe	63 J	0.60 J	0.68 J	26 J	<0.05 UJ	0.40 J

All results reported in milligrams per liter (mg/L).
Samples analyzed by EcoTest Laboratories, Inc., North Babylon, New York.
* Unfiltered samples.
J Estimated value.
UJ Estimated detection limit.

Table 14. Concentrations of Selected Inorganic Compounds in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study and the Landfill Dimension Study, Syosset Landfill, Syosset, New York.

Well:	SY-1	SY-1	SY-1D	SY-1D	SY-2R	SY-2R
Date Sampled:	5/3/88	6/6/88	5/3/88	6/6/88	5/4/88	6/7/88
Parameter						
Total dissolved solids	200	220	1,200	1,100	210	230
Specific conductance (umho/cm)	400	390	1,880	1,800	390	360
pH (units)	5.8	6.3	6.1	6.4	5.6	5.3
Chloride as Cl	45	60	460	400	52	57
Nitrate as N	0.6	<0.5	13.8	15	2.4	1.9
Ammonia as N	3.2	3.2	16.4	16	<0.05	<0.05
Hardness as CaCO3	70	86	290	280	50	54
Bicarb. Alk CaCO3	120	110	190	140	26	26
Carbonate Alk CaCO3	0	0	0	0	0	0
Sulfate as SO4	22	11	230	240	50	70
Alkalinity tot CaCO3	120	110	150	140	26	26
Phenols as Phenol	<0.001	0.001	0.001	<0.001	<0.001	<0.001
Cyanide as CN	<0.02	<0.02 UJ	<0.02	<0.02 UJ	<0.02	<0.02 UJ

All results reported in milligrams per liter (mg/L).
Samples analyzed by EcoTest Laboratories, Inc., North Babylon, New York.
J Estimated value.
UJ Estimated detection limit.

Table 14. Concentrations of Selected Inorganic Compounds in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study and the Landfill Dimension Study, Syosset Landfill, Syosset, New York.

Parameter	Well: / Date Sampled:	SY-2D 5/4/88	SY-2D 6/7/88	SY-3 5/4/88	SY-3 6/7/88	SY-3D 5/4/88	SY-A 5/4/88
Total dissolved solids		670	630	820	830	1,400	1,300
Specific conductance (umho/cm)		1,440	1,100	1,930	1,900	3,220	3,220
pH (units)		6.2	6.4	6.8	6.7	6.8	6.6
Chloride as Cl		220	200	99	110	340	330
Nitrate as N		<0.5	<0.5	0.5	<0.5	<0.5	<0.5
Ammonia as N		18	17	91	90	130	130
Hardness as CaCO3		150	120	330	370	440	440
Bicarb. Alk CaCO3		270	280	880	890	1,300	1,200
Carbonate Alk CaCO3		0	0	0	0	0	0
Sulfate as SO4		47	68	42	16	22	23
Alkalinity tot CaCO3		270	280	880	890	1,300	1,200
Phenols as Phenol		<0.001	<0.001	0.002	0.006	0.004	0.006
Cyanide as CN		<0.02	<0.02 UJ	<0.02	<0.02 UJ	<0.02	<0.02

All results reported in milligrams per liter (mg/L).
Samples analyzed by EcoTest Laboratories, Inc., North Babylon, New York.
J Estimated value.
UJ Estimated detection limit.

Table 14. Concentrations of Selected Inorganic Compounds in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study and the Landfill Dimension Study, Syosset Landfill, Syosset, New York.

Well:	SY-3D	SY-A	SY-4	SY-4	SY-5	SY-5
Date Sampled:	6/8/88	6/8/88	5/5/88	6/8/88	5/5/88	6/7/88
Parameter						
Total dissolved solids	1,400	1,400	490	680	540	540
Specific conductance (umho/cm)	2,800	2,800	890	1,000	880	900
pH (units)	6.8	6.9	7.7	8.0	6.5	6.7
Chloride as Cl	330	330	120	170	120	120
Nitrate as N	<0.5	<0.5	4.3	12.8	2.0	1.0
Ammonia as N	130	130	3.2	4.4	1.8	1.6
Hardness as CaCO3	460	450	110	190	170	210
Bicarb. Alk CaCO3	1,200	1,200	38	40	120	190
Carbonate Alk CaCO3	0	0	0	0	0	0
Sulfate as SO4	14	14	150	230	100	90
Alkalinity tot CaCO3	1,200	1,200	38	40	120	190
Phenols as Phenol	0.003	0.006	0.006	<0.001	0.001	<0.001
Cyanide as CN	<0.02 UJ	<0.02 UJ	<0.02	<0.02 UJ	<0.02	<0.02 UJ

All results reported in milligrams per liter (mg/L).
Samples analyzed by EcoTest Laboratories, Inc., North Babylon, New York.
J Estimated value.
UJ Estimated detection limit.

Table 14. Concentrations of Selected Inorganic Compounds in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study and the Landfill Dimension Study, Syosset Landfill, Syosset, New York.

Well:	SY-6	SY-6	SY-6D	SY-6D	SY-7	SY-7
Date Sampled:	5/2/88	6/6/88	5/2/88	6/6/88	5/2/88	6/6/88
Parameter						
Total dissolved solids	210	180	240	250	350	490
Specific conductance (umho/cm)	350	260	420	410	850	820
pH (units)	6.9	7.2	5.8	5.6	6.2	6.3
Chloride as Cl	30	20	68	71	170	190
Nitrate as N	3.7	2.1	5.0	5.2	1.6	1.1
Ammonia as N	<0.05	<0.05	0.5	0.52	0.5	0.5
Hardness as CaCO3	100	80	78	86	220	180
Bicarb. Alk CaCO3	72	66	8	10	180	190
Carbonate Alk CaCO3	0	0	0	0	0	0
Sulfate as SO4	50	40	68	72	12	19
Alkalinity tot CaCO3	72	66	8	10	180	190
Phenols as Phenol	<0.001	<0.001	<0.001	<0.001	0.006	0.003
Cyanide as CN	0.14	0.07 J	<0.02	<0.02 UJ	<0.02	<0.02 UJ

All results reported in milligrams per liter (mg/L).
Samples analyzed by EcoTest Laboratories, Inc., North Babylon, New York.
J Estimated value.
UJ Estimated detection limit.

Table 14. Concentrations of Selected Inorganic Compounds in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study and the Landfill Dimension Study, Syosset Landfill, Syosset, New York.

Well:	SY-8	SY-8	SY-9	SY-9	W-3	W-3
Date Sampled:	5/3/88	6/8/88	5/3/88	6/10/88	5/5/88	6/7/88
Parameter						
Total dissolved solids	250	310	330	250	1,200	1,200
Specific conductance (umho/cm)	380	350	510	480	2,780	2,600
pH (units)	5.6	5.6	6.1	6.3	6.6	6.7
Chloride as Cl	39	32	40	44	85	95
Nitrate as N	<0.5	<0.5	0.7	1.8	<0.5	<0.5
Ammonia as N	2.8	3.6	0.38	0.44	130	140
Hardness as CaCO3	140	140	230	180	600	580
Bicarb. Alk CaCO3	100	100	166	120	1,400	1,400
Carbonate Alk CaCO3	0	0	0	0	0	0
Sulfate as SO4	110	120	75	66	20	20
Alkalinity tot CaCO3	100	200	160	120	1,400	1,400
Phenols as Phenol	<0.001	<0.001	<0.001	<0.001	0.006	0.003
Cyanide as CN	<0.02	<0.02 UJ	<0.02	<0.02 UJ	<0.02	<0.02 UJ

All results reported in milligrams per liter (mg/L).
Samples analyzed by EcoTest Laboratories, Inc., North Babylon, New York.
J Estimated value.
UJ Estimated detection limit.

Table 14. Concentrations of Selected Inorganic Compounds in Water Samples Collected from Monitoring Wells during the On-Site Ground-Water Study and the Landfill Dimension Study, Syosset Landfill, Syosset, New York.

Well:	W-4	W-4
Date Sampled:	5/3/88	6/7/88
Parameter		
Total dissolved solids	2,200	1,900
Specific conductance (umhos/cm)	3,350	3,200
pH (units)	6.2	6.1
Chloride as Cl	990	900
Nitrate as N	<0.5	<0.5
Ammonia as N	16	15
Hardness as CaCO3	420	380
Bicarb. Alk CaCO3	320	330
Carbonate Alk CaCO3	0	0
Sulfate as SO4	190	180
Alkalinity tot CaCO3	320	330
Phenols as Phenol	0.003	<0.001
Cyanide as CN	<0.02	<0.02 UJ

All results reported in milligrams per liter (mg/L).
Samples analyzed by EcoTest Laboratories, Inc., North Babylon, New York.
J Estimated value.
UJ Estimated detection limit.

Table 21. Summary of Gas Well Monitoring Data at Syosset Landfill, Syosset, New York.

Well Number	5-8-87 Total Non-Methane VOCs (a)	5-8-87 Methane (b)	5-8-87 Barometric Pressure (c)	5-14-87 Total Non-Methane VOCs (a)	5-14-87 Methane (b)	5-14-87 Barometric Pressure (c)	5-18-87 Total Non-Methane VOCs (a)	5-18-87 Methane (b)	5-18-87 Barometric Pressure (c)	5-29-87 Total Non-Methane VOCs (a)	5-29-87 Methane (b)	5-29-87 Barometric Pressure (c)
G-1	>1000	>1000	30.02	0	0	30.36	24	22	29.82	1.5	0	29.98
G-2	>1000	>1000		>1000	>1000		0	0		0	0	
G-3	0	0		0	0		>1000	>1000		0	0	
G-4	0	12		0	2.2		0	0		0	0	
G-5	0	10		0	2.2		0	0.6		0	0	
G-6	0	5		0	3.6		0	0		0	0	
G-7	>1000	>1000		>1000	>1000		>1000	>1000		0	0	
G-8	>1000	>1000		2.6	7		>1000	>1000		18	260	
G-9	>1000	>1000		0	0		>1000	>1000		>1000	>1000	
G-10	11	28		0	0		0	0		0	0	
G-11	5	7		0	0		0	0		0	0	
G-12	0	4		0	3.8		0	0.6		0	0	
G-13	100	220		0	0		0	0		0	0	
G-14	0	0		0	0		0	0		0	0	
G-15	>1000	>1000		>1000	>1000		>1000	>1000		>1000	>1000	
G-16	>1000	>1000		0	3.8		20	12		>1000	>1000	
G-17	>1000	>1000		>1000	>1000		>1000	>1000		>1000	>1000	
G-18	>1000	>1000		>1000	>1000		>1000	>1000		24	380	
G-19	>1000	>1000		>1000	>1000		>1000	>1000		>1000	>1000	

All results reported in parts per million (ppm).

Measurements conducted in the field with a Century Systems Model 118 (upper detection limit 1,000 ppm) or 88 (upper detection limit 100,000 ppm) Organic Vapor Analyzer (OVA). Instruments were calibrated using a methane standard.

(a) Measurements made using standard OVA probe.

(b) Measurements made using activated charcoal filter probe to absorb non-methane volatile organic compounds.

(c) Inches of mercury. Readings obtained from local weather service (Compu Weather, Inc., Flushing, New York, or Newsday) before sampling, or from New York Flight Service, Islip, New York at 5 pm on the day of sampling, or from Long Island Weather observers, Mineola, New York at 6 pm on the day of sampling.

* Gas well destroyed.

Table 21. Summary of Gas Well Monitoring Data at Syosset Landfill, Syosset, New York.

Well Number	6-15-87 Total Non-Methane VOCs (a)	6-15-87 Methane (b)	6-15-87 Barometric Pressure (c)	6-23-87 Total Non-Methane VOCs (a)	6-23-87 Methane (b)	6-23-87 Barometric Pressure (c)	7-2-87 Total Non-Methane VOCs (a)	7-2-87 Methane (b)	7-2-87 Barometric Pressure (c)	8-21-87 Total Non-Methane VOCs (a)	8-21-87 Methane (b)	8-21-87 Barometric Pressure (c)
G-1	0	0	29.70	0	0	30.00	0	0	29.80	0		30.14
G-2	0	0		>1000	>1000		100	100		0		
G-3	0	0		0	0		0	0		0		
G-4	0	0		0	0		0	0		0		
G-5	0	0		0	0		0	0		0		
G-6	0	0		0	0		0	0		>1000		
G-7	>1000	>1000		>1000	>1000		250	200		0		
G-8	>1000	>1000		14	14		0	0		0		
G-9	>1000	>1000		65	75		*	*		*		
G-10	200	200		0	0		0	0		0		
G-11	60	40		0	0		0	0		0		
G-12	60	65		0	0		0	0		0		
G-13	0	0		0	0		0	0		*		
G-14	0	0		0	0		0	0		0		
G-15	>1000	>1000		>1000	>1000		>1000	>1000		0		
G-16	450	450		3	3		20	15		0		
G-17	>1000	>1000		>1000	>1000		>1000	>1000		>1000		
G-18	250	250		0	0		100	100		0		
G-19	6	20		>1000	>1000		>1000	>1000		>1000		

All results reported in parts per million (ppm).

Measurements conducted in the field with a Century Systems Model 118 (upper detection limit 1,000 ppm) or 88 (upper detection limit 100,000 ppm) Organic Vapor Analyzer (OVA). Instruments were calibrated using a methane standard.

(a) Measurements made using standard OVA probe.

(b) Measurements made using activated charcoal filter probe to absorb non-methane volatile organic compounds.

(c) Inches of mercury. Readings obtained from local weather service (Compu Weather, Inc., Flushing, New York, or *Newsday*) before sampling, or from New York Flight Service, Islip, New York at 5 pm on the day of sampling, or from Long Island Weather observers, Mineola, New York at 6 pm on the day of sampling.

* Gas well destroyed.

Table 21. Summary of Gas Well Monitoring Data at Syosset Landfill, Syosset, New York.

Well Number	8-25-87 Total Non-Methane VOCs (a)	8-25-87 Methane (b)	8-25-87 Barometric Pressure (c)	9-8-87 Total Non-Methane VOCs (a)	9-8-87 Methane (b)	9-8-87 Barometric Pressure (c)	10-15-87 Total Non-Methane VOCs (a)	10-15-87 Methane (b)	10-15-87 Barometric Pressure (c)	10-22-87 Total Non-Methane VOCs (a)	10-22-87 Methane (b)	10-22-87 Barometric Pressure (c)
G-1	0		30.20	0	0	29.90	0	0	30.17	0		29.95
G-2	0			>1000	>1000		0	0		1000		
G-3	0			0	0		0	0		0		
G-4	0			0	0		0	0		0		
G-5	0			0	0		0	0		0		
G-6	0			0	0		3	3		0		
G-7	>1000			>1000	>1000		>1000	>1000		20000		
G-8	0			>1000	>1000		20	15		5		
G-9	*			*	*		*	*		*		
G-10	0			0	0		0	0		0		
G-11	*			*	*		*	*		*		
G-12	0			0	0		0	0		0		
G-13	*			*	*		*	*		*		
G-14	0			0	0		0	0		5		
G-15	0			70	60		0	0		30		
G-16	0			0	0		0	0		*		
G-17	0			0	0		0	0		1000		
G-18	0			0	0		0	0		0		
G-19	0			>1000	>1000		0	0		*		

All results reported in parts per million (ppm).

Measurements conducted in the field with a Century Systems Model 110 (upper detection limit 1,000 ppm) or 88 (upper detection limit 100,000 ppm) Organic Vapor Analyzer (OVA). Instruments were calibrated using a methane standard.

(a) Measurements made using standard OVA probe.

(b) Measurements made using activated charcoal filter probe to absorb non-methane volatile organic compounds.

(c) Inches of mercury. Readings obtained from local weather service (Compu Weather, Inc., Flushing, New York, or Newsday) before sampling, or from New York Flight Service, Islip, New York at 5 pm on the day of sampling, or from Long Island Weather observers, Mineola, New York at 6 pm on the day of sampling.

* Gas well destroyed.

** Gas well re-established.

Table 21. Summary of Gas Well Monitoring Data at Syosset Landfill, Syosset, New York.

Well Number	12-3-87 Total Non-Methane VOCs (a)	12-3-87 Methane (b)	12-3-87 Barometric Pressure (c)	12-14-87 Total Non-Methane VOCs (a)	12-14-87 Methane (b)	12-14-87 Barometric Pressure (c)	12-23-87 Total Non-Methane VOCs (a)	12-23-87 Methane (b)	12-23-87 Barometric Pressure (c)	12-29-87 Total Non-Methane VOCs (a)	12-29-87 Methane (b)	12-29-87 Barometric Pressure (c)
G-1	0		29.90	0		29.50	0		30.36	30		29.77
G-2	>100000			>100000			>100000			>100000		
G-3	0			0			0			0		
G-4	0			0			0			0		
G-5	0			0			0			0		
G-6	0			0			0			0		
G-7	>100000			50			>100000			>100000		
G-8	>100000			0			>100000			>100000		
G-9	**	20000		*			**	>100,000		>100000		
G-10	0			0			0			0		
G-11	*			*			**			0		
G-12	0			0			0			0		
G-13	*			*			**			0		
G-14	0			0			0			0		
G-15	40			0			0			40000		
G-16	*			*			*			*		
G-17	>100000			22000			>100000			1000		
G-18	45			50			2000			1000		
G-19	*			*			*			*		

All results reported in parts per million (ppm).

Measurements conducted in the field with a Century Systems Model 110 (upper detection limit 1,000 ppm) or 88 (upper detection limit 100,000 ppm) Organic Vapor Analyzer (OVA). Instruments were calibrated using a methane standard.

(a) Measurements made using standard OVA probe.

(b) Measurements made using activated charcoal filter probe to absorb non-methane volatile organic compounds.

(c) Inches of mercury. Readings obtained from local weather service (Compu Weather, Inc., Flushing, New York, or Newsday) before sampling, or from New York Flight Service, Islip, New York at 5 pm on the day of sampling, or from Long Island Weather observers, Mineola, New York at 6 pm on the day of sampling.

* Gas well destroyed.

** Gas well re-established.

Table 21. Summary of Gas Well Monitoring Data at Syosset Landfill, Syosset, New York.

Well Number	1-5-88 Total Non-Methane VOCs (a)	1-5-88 Methane (b)	1-5-88 Barometric Pressure (c)	1-13-88 Total Non-Methane VOCs (a)	1-13-88 Methane (b)	1-13-88 Barometric Pressure (c)	1-18-88 Total Non-Methane VOCs (a)	1-18-88 Methane (b)	1-18-88 Barometric Pressure (c)	1-27-88 Total Non-Methane VOCs (a)	1-27-88 Methane (b)	1-27-88 Barometric Pressure (c)
G-1	0		30.28	0		30.12	>100000		29.95	0	0	30.40
G-2	>100000			>100000			>100000			0	0	
G-3	0			0			0			0	0	
G-4	0			5			0			0	0	
G-5	0			5			0			0	0	
G-6	0			50			0			0	0	
G-7	>100000			>100000			>100000			15	5	
G-8	>100000			200			>100000			15	7	
G-9	>100000			>100000			>100000			>100000	>100000	
G-10	0			0			0			0	0	
G-11	0			0			0			0	0	
G-12	0			0			0			45	0	
G-13	0			5			0			20	3	
G-14	0			15			0			0	3	
G-15	>100000			60			>100000			5	0	
G-16	*			*			*			*	*	
G-17	1000			15000			>100000			0	30	
G-18	1000			400			50			0	30	
G-19	*			*			*			*	*	

All results reported in parts per million (ppm).
Measurements conducted in the field with a Century Systems Model 110 (upper detection limit 1,000 ppm) or 88 (upper detection limit 100,000 ppm) Organic Vapor Analyzer (OVA). Instruments were calibrated using a methane standard.

(a) Measurements made using standard OVA probe.

(b) Measurements made using activated charcoal filter probe to absorb non-methane volatile organic compounds.

(c) Inches of mercury. Readings obtained from local weather service (Compu Weather, Inc., Flushing, New York, or Newsday) before sampling, or from New York Flight Service, Islip, New York at 5 pm on the day of sampling, or from Long Island Weather observers, Mineola, New York at 6 pm on the day of sampling.

* Gas well destroyed.

Table 21. Summary of Gas Well Monitoring Data at Syosset Landfill, Syosset, New York.

Well Number	2-18-88 Total Non-Methane VOCs (a)	2-18-88 Methane (b)	2-18-88 Barometric Pressure (c)	2-24-88 Total Non-Methane VOCs (a)	2-24-88 Methane (b)	2-24-88 Barometric Pressure (c)	3-1-88 Total Non-Methane VOCs (a)	3-1-88 Methane (b)	3-1-88 Barometric Pressure (c)	3-10-88 Total Non-Methane VOCs (a)	3-10-88 Methane (b)	3-10-88 Barometric Pressure (c)
G-1	0	0	30.22	0	0	30.01	0	0	30.20	180	180	29.67
G-2	>100000	>100000		>100000	>100000		>100000	<100000		<100000	<100000	
G-3	0	0		0	0		0	0		0	0	
G-4	0	0		0	0		0	0		0	0	
G-5	0	0		0	0		0	0		0	0	
G-6	0	0		0	0		0	0		0	0	
G-7	8,000	8000		4000	2000		16000	1800		<100000	<100000	
G-8	0	0		4	4		700	700		<100000	<100000	
G-9	*	*		*	*		*	*		*	*	
G-10	0	0		0	0		0	0		<100000	<100000	
G-11	0	0		0	0		0	0		0	0	
G-12	*	*		*	*		*	*		*	*	
G-13	0	0		0	0		0	0		100	50	
G-14	0	0		0	0		0	0		0	0	
G-15	10000	10000		150	70		0	0		15	10	
G-16	*	*		*	*		*	*		*	*	
G-17	>100000	>100000		500	400		35000	25000		>100000	<100000	
G-18	0	0		100000	1800		>100000	>100000		>100000	<100000	
G-19	*	*		*	*		*	*		*	*	

All results reported in parts per million (ppm).

Measurements conducted in the field with a Century Systems Model 118 (upper detection limit 1,000 ppm) or 88 (upper detection limit 100,000 ppm) Organic Vapor Analyzer (OVA). Instruments were calibrated using a methane standard.

(a) Measurements made using standard OVA probe.

(b) Measurements made using activated charcoal filter probe to absorb non-methane volatile organic compounds.

(c) Inches of mercury. Readings obtained from local weather service (Compu Weather, Inc., Flushing, New York, or Newsday) before sampling, or from New York Flight Service, Islip, New York at 5 pm on the day of sampling, or from Long Island Weather observers, Mineola, New York at 6 pm on the day of sampling.

* Gas well destroyed.

Table 21. Summary of Gas Well Monitoring Data at Syosset Landfill, Syosset, New York.

Well Number	4-14-88 Total Non-Methane VOCs (a)	4-14-88 Methane (b)	4-14-88 Barometric Pressure (c)	4-22-88 Total Non-Methane VOCs (a)	4-22-88 Methane (b)	4-22-88 Barometric Pressure (c)	5-16-88 Total Non-Methane VOCs (a)	5-16-88 Methane (b)	5-16-88 Barometric Pressure (c)	6-15-88 Total Non-Methane VOCs (a)	6-15-88 Methane (b)	6-15-88 Barometric Pressure (c)
*												
G-1	0		30.05	0	0	29.72	7	7	30.00	0	0	30.00
G-2	>1000			>100000	>100000		>100000	>100000		>100000	>100000	
G-3	0			0	0		0	0		0	0	
G-4	0			0	0		0	0		0	0	
G-5	0			0	0		0	0		0	0	
G-6	0			0	0		0	0		0	0	
G-7	>1000			1200	1200		>100000	>100000		>100000	>100000	
G-8	>1000			1500	300		0	0		0	0	
G-9	*			*	*		*	*		*	*	
G-10	0			0	0		200	0		0	0	
G-11	0			0	0		0	0		0	0	
G-12	*			*	*		*	*		*	*	
G-13	5			0	0		0	0		0	0	
G-14	0			0	0		0	0		0	0	
G-15	0			0	100		0	0		0	0	
G-16	*			*	*		*	*		*	*	
G-17	0			450	450		>100000	>100000		>100000	>100000	
G-18	0			1200	1200		>100000	>100000		>100000	>100000	
G-19	*			*	*		*	*		*	*	

All results reported in parts per million (ppm).

Measurements conducted in the field with a Century Systems Model 118 (upper detection limit 1,000 ppm) or 88 (upper detection limit 100,000 ppm) Organic Vapor Analyzer (OVA). Instruments were calibrated using a methane standard.

(a) Measurements made using standard OVA probe.

(b) Measurements made using activated charcoal filter probe to absorb non-methane volatile organic compounds.

(c) Inches of mercury. Readings obtained from local weather service (Compu Weather, Inc., Flushing, New York, or Newsday) before sampling, or from New York Flight Service, Islip, New York at 5 pm on the day of sampling, or from Long Island Weather observers, Mineola, New York at 6 pm on the day of sampling.

* Gas well destroyed.

Table 21. Summary of Gas Well Monitoring Data at Syosset Landfill, Syosset, New York.

Well Number	7-20-88 Total Non-Methane VOCs (a)	7-20-88 Methane (b)	7-20-88 Barometric Pressure (c)	8-18-88 Total Non-Methane VOCs (a)	8-18-88 Methane (b)	8-18-88 Barometric Pressure (c)	9-23-88 Total Non-Methane VOCs (a)	9-23-88 Methane (b)	9-23-88 Barometric Pressure (c)	11-4-88**** Total Non-Methane VOCs (a)	11-4-88**** Methane (b)	11-4-88**** Barometric Pressure (c)
G-1	0	0	30.07	*	*	29.84	*	*	29.78	*	*	29.94
G-2	5000	300		0	0		>1000	>1000		>2000	>2000	
G-3	0	0		0	0		0	0		0	0	
G-4	0	0		0	0		0	0		0	0	
G-5	*	*		*	*		*	*		*	*	
G-6	0	0		0	0		0	0		9	6	
G-7	2000	1500		20	10		>1000	>1000		>2000	>2000	
G-8	0	0		0	0		>1000	>1000		>2000	>2000	
G-9	*	*		*	*		*	*		*	*	
G-10	0	0		0	0		0	0		0	0	
G-11	0	0		0	0		0	0		0	0	
G-12	*	*		*	*		*	*		*	*	
G-13	0	0		0	0		5.0	2.0		0	0	
G-14	0	0		0	0		60	28		0	0	
G-15	25	35		0	-		52	52		3	3	
G-16	*	*		*	*		*	*		*	*	
G-17	0	0		0	0		0	0		>2000	>2000	
G-18	***	***		***	***		>1000	>1000		>2000	>2000	
G-19	*	*		*	*		*	*		*	*	

All results reported in parts per million (ppm).

Measurements conducted in the field with a Century Systems Model 110 (upper detection limit 1,000 ppm) or 88 (upper detection limit 100,000 ppm) Organic Vapor Analyzer (OVA). Instruments were calibrated using a methane standard.

(a) Measurements made using standard OVA probe.

(b) Measurements made using activated charcoal filter probe to absorb non-methane volatile organic compounds.

(c) Inches of mercury. Readings obtained from local weather service (Compu Weather, Inc., Flushing, New York, or Newsday) before sampling, or from New York Flight Service, Islip, New York at 5 pm on the day of sampling, or from Long Island Weather observers, Mineola, New York at 6 pm on the day of sampling.

* Gas well destroyed.

*** Could not locate monitor gas well.

**** On 11/4/88 the OVA meter would not give accurate readings above 2000 ppm.

Table 22. Concentrations of Volatile Organic Compounds in Gas Samples Collected from Selected Gas Monitoring Wells during the Subsurface Gas Study, Syosset Landfill, Syosset, New York.

Sample Designation:	G-2	G-2	G-3	G-3	G-4	G-4
Date Sampled:	7/7/87	8/26/88	7/87	9/1/88	7/87	9/1/88
*** Barometric Pressure:	30.02	29.88		30.34		30.34
Parameter						
Chloromethane	<2	<1	*	<1	*	<1
Bromomethane	<2	<1	*	<1	*	<1
Dichlorodifluoromethane	<100	<1	*	<1	*	<1
Vinyl chloride	>400	<1	*	<1	*	<1
Chloroethane	>400	<2	*	<2	*	<2
Methylene chloride	180	6	*	20	*	32
Trichlorofluoromethane	+	<3	*	29	*	18
1,1-Dichloroethene	6	<3	*	<3	*	<3
1,1-Dichloroethane	55	<3	*	<3	*	<3
1,2-Dichloroethene	18	<3	*	<3	*	<3
Chloroform	9	3	*	7	*	<2
1,2-Dichloroethane	<4	<3	*	<3	*	<3
1,1,1-Trichloroethane	2	<2	*	<2	*	<2
Carbon tetrachloride	<2	<2	*	<2	*	<2
Bromodichloromethane	<2	<2	*	<2	*	2
1,2-Dichloropropane	<4	<3	*	<3	*	<3
trans-1,3-Dichloropropene	<4	<3	*	<3	*	<3
Trichloroethylene	7	4	*	<2	*	<2
Chlorodibromomethane	<2	<2	*	<2	*	<2
1,1,2-Trichloroethane	<4	<2	*	<2	*	<2
cis-1,3-Dichloropropene	<4	<3	*	<3	*	<3
2-Chloroethyl vinyl ether	<4	<3	*	<3	*	<3
Bromoform	<4	<2	*	<2	*	<2
1,1,2,2-Tetrachloroethane	<4	<2	*	<2	*	<2
Tetrachloroethene	6	11	*	4	*	6
Chlorobenzene	<2	<2	*	<2	*	<2
1,3-Dichlorobenzene	<4	<2	*	<2	*	<2
1,2-Dichlorobenzene	<4	<2	*	<2	*	<2
1,4-Dichlorobenzene	<4	<2	*	<2	*	<2
Benzene	89	180	*	<2	*	<2
Toluene	110	190	*	32	*	56
Ethyl benzene	52	<2	*	<2	*	<2
m Xylene	23	38	*	3	*	8
o + p Xylene	8	<5	*	6	*	6
Total VOCs	>1335	432	*	101	*	128

All results reported in parts per billion (ppb).
Samples analyzed using USEPA Methods 601, 602 by EcoTest Laboratories, Inc., North Babylon, New York.

* Not analyzed: gas well was not sampled during the first sampling round (July 1987). Samples were collected from wells during the second round (April 1988) to replace wells destroyed since the first sampling round.

** Wells destroyed between first and second sampling rounds.

\+ Sample contained a small amount of trichlorofluoromethane. No standard was run so this compound could not be quantified.

*** Barometric pressures were obtained from the Long Island Weather Observers, Mineola, New York: measured in inches of mercury at about 6 pm each day.

Table 22. Concentrations of Volatile Organic Compounds in Gas Samples Collected from Selected Gas Monitoring Wells during the Subsurface Gas Study, Syosset Landfill, Syosset, New York.

Sample Designation:	G-7	G-7	G-8	G-8	G-12	G-12
Date Sampled:	7/8/87	8/26/88	7/8/87	9/1/88	7/8/87	8/88
*** Barometric Pressure:	29.88	29.88	29.88	30.34	29.88	
Parameter						
Chloromethane	<2	<1	<2	<1	<2	**
Bromomethane	<2	<1	<2	<1	<2	**
Dichlorodifluoromethane	<100	<1	<2	<1	<2	**
Vinyl chloride	>400	<1	<2	<1	<2	**
Chloroethane	<2	<2	<2	<2	<2	**
Methylene chloride	110	6	<4	18	<4	**
Trichlorofluoromethane	<4	<3	<4	18	<4	**
1,1-Dichloroethene	<4	<3	<4	<3	<4	**
1,1-Dichloroethane	<4	<3	<4	<3	<4	**
1,2-Dichloroethene	<4	<3	<4	<3	<4	**
Chloroform	11	<2	<2	6	5	**
1,2-Dichloroethane	<4	3	<4	<3	<4	**
1,1,1-Trichloroethane	<2	<2	<2	<2	<2	**
Carbon tetrachloride	<2	<2	<2	<2	<2	**
Bromodichloromethane	<2	<2	<2	<2	<2	**
1,2-Dichloropropane	<4	<3	<4	<3	<4	**
trans-1,3-Dichloropropene	<4	<3	<4	<3	<4	**
Trichloroethylene	<2	2	<2	<2	<2	**
Chlorodibromomethane	<2	<2	<2	<2	<2	**
1,1,2-Trichloroethane	<4	<2	<4	<2	<4	**
cis-1,3-Dichloropropene	<4	<3	<4	<3	<4	**
2-Chloroethyl vinyl ether	<4	<3	<4	<3	<4	**
Bromoform	<4	<2	<4	<2	<4	**
1,1,2,2-Tetrachloroethane	<4	<2	<4	<2	<4	**
Tetrachloroethene	5	10	2	3	3	**
Chlorobenzene	<2	<2	<2	<2	<2	**
1,3-Dichlorobenzene	<4	<2	<4	<2	<4	**
1,2-Dichlorobenzene	<4	<2	<4	<2	<4	**
1,4-Dichlorobenzene	<4	<2	<4	<2	<4	**
Benzene	86	<2	<2	<2	<2	**
Toluene	78	48	23	27	30	**
Ethyl benzene	5	250	<2	<2	<2	**
m Xylene	230	24	20	<3	12	**
o + p Xylene	<8	<5	<8	<5	<8	**
Total VOCs	>925	343	45	72	50	**

All results reported in parts per billion (ppb).
Samples analyzed using USEPA Methods 601, 602 by EcoTest Laboratories, Inc., North Babylon, New York.

* Not analyzed; gas well was not sampled during the first sampling round (July 1987). Samples were collected from wells during the second round (April 1988) to replace wells destroyed since the first sampling round.

** Wells destroyed between first and second sampling rounds.

*** Barometric pressures were obtained from the Long Island Weather Observers, Mineola, New York: measured in inches of mercury at about 6 pm each day.

Table 22. Concentrations of Volatile Organic Compounds in Gas Samples Collected from Selected Gas Monitoring Wells during the Subsurface Gas Study, Syosset Landfill, Syosset, New York.

Sample Designation:	G-13	G-13	G-14	G-14	G-15	G-15
Date Sampled:	7/8/87	8/26/88	7/87	8/26/88	7/9/87	8/26/88
*** Barometric Pressure:	30.13	29.88		29.88	29.87	29.88
Parameter						
Chloromethane	<2	<1	*	<1	<2	<1
Bromomethane	<2	<1	*	<1	<2	<1
Dichlorodifluoromethane	<2	<1	*	<1	<2	<1
Vinyl chloride	<2	<1	*	<1	30	<1
Chloroethane	<2	<2	*	<2	<2	<2
Methylene chloride	<4	<3	*	9	14	12
Trichlorofluoromethane	<4	<3	*	<3	<4	<3
1,1-Dichloroethene	<4	<3	*	<3	<4	<3
1,1-Dichloroethane	<4	<3	*	<3	<4	<3
1,2-Dichloroethene	<4	<3	*	<3	<4	<3
Chloroform	8	<2	*	12	<2	10
1,2-Dichloroethane	<4	<3	*	<3	<4	<3
1,1,1-Trichloroethane	<2	<2	*	4	<2	<2
Carbon tetrachloride	<2	<2	*	<2	<2	<2
Bromodichloromethane	<2	<2	*	<2	<2	<2
1,2-Dichloropropane	<4	<3	*	<3	<4	<3
trans-1,3-Dichloropropene	<4	<3	*	<3	<4	<3
Trichloroethylene	<2	<2	*	<2	<2	<2
Chlorodibromomethane	<2	<2	*	<2	<2	<2
1,1,2-Trichloroethane	<4	<2	*	<2	<4	<2
cis-1,3-Dichloropropene	<4	<3	*	<3	<4	<3
2-Chloroethyl vinyl ether	<4	<3	*	<3	<4	<3
Bromoform	<4	<2	*	<2	<4	<2
1,1,2,2-Tetrachloroethane	<4	<2	*	<2	<4	<2
Tetrachloroethene	5	6	*	10	3	8
Chlorobenzene	<2	<2	*	<2	<2	<2
1,3-Dichlorobenzene	<4	<2	*	<2	<4	<2
1,2-Dichlorobenzene	<4	<2	*	<2	<4	<2
1,4-Dichlorobenzene	<4	<2	*	<2	<4	<2
Benzene	<2	<2	*	<2	30	<2
Toluene	28	58	*	37	240	37
Ethyl benzene	<2	2	*	6	44	<2
m Xylene	17	13	*	17	130	9
o + p Xylene	<8	10	*	11	108	<5
Total VOCs	58	89	*	106	999	76

All results reported in parts per billion (ppb).

Samples analyzed using USEPA Methods 601, 602 by EcoTest Laboratories, Inc., North Babylon, New York.

* Not analyzed: gas well was not sampled during the first sampling round (July 1987). Samples were collected from wells during the second round (April 1988) to replace wells destroyed since the first sampling round.

** Wells destroyed between first and second sampling rounds.

*** Barometric pressures were obtained from the Long Island Weather Observers, Mineola, New York; measured in inches of mercury at about 6 pm each day.

Table 22. Concentrations of Volatile Organic Compounds in Gas Samples Collected from Selected Gas Monitoring Wells during the Subsurface Gas Study, Syosset Landfill, Syosset, New York.

Sample Designation:	G-16	G-16	G-17	G-17	G-18	G-18
Date Sampled:	7/8/87	8/88	7/9/87	8/26/88	7/8/87	8/26/88
*** Barometric Pressure:	30.13		29.87	29.88	30.13	29.88
Parameter						
Chloromethane	<2	**	<2	<1	<2	<1
Bromomethane	<2	**	<2	<1	<2	<1
Dichlorodifluoromethane	<100	**	<100	<1	<2	<1
Vinyl chloride	190	**	>400	<1	<2	<1
Chloroethane	<2	**	<2	<2	<2	<2
Methylene chloride	6	**	34	5	9	<3
Trichlorofluoromethane	<4	**	<4	<3	<4	<3
1,1-Dichloroethene	8	**	<4	<3	<4	<3
1,1-Dichloroethane	<4	**	<4	<3	<4	<3
1,2-Dichloroethene	<4	**	<4	<3	<4	<3
Chloroform	11	**	5	2	8	5
1,2-Dichloroethane	<4	**	<4	<3	<4	<3
1,1,1-Trichloroethane	<2	**	<2	2	2	2
Carbon tetrachloride	<2	**	<2	<2	<2	<2
Bromodichloromethane	<2	**	<2	<2	<2	<2
1,2-Dichloropropane	<4	**	<4	<3	<4	<3
trans-1,3-Dichloropropene	<4	**	<4	<3	<4	<3
Trichloroethylene	3	**	<2	<2	<2	<2
Chlorodibromomethane	<2	**	<2	<2	<2	<2
1,1,2-Trichloroethane	<4	**	<4	<2	<4	<2
cis-1,3-Dichloropropene	<4	**	<4	<3	<4	<3
2-Chloroethyl vinyl ether	<4	**	<4	<3	<4	<3
Bromoform	<4	**	<4	<2	<4	<2
1,1,2,2-Tetrachloroethane	<4	**	<4	<2	<4	<2
Tetrachloroethene	6	**	5	5	8	9
Chlorobenzene	<2	**	<2	<2	<2	<2
1,3-Dichlorobenzene	<4	**	<4	<2	<4	<2
1,2-Dichlorobenzene	<4	**	<4	<2	<4	<2
1,4-Dichlorobenzene	<4	**	<4	<2	<4	<2
Benzene	<2	**	19	<2	9	<2
Toluene	39	**	120	22	58	29
Ethyl benzene	12	**	20	4	11	<2
m Xylene	35	**	55	<3	26	6
o + p Xylene	15	**	43	<5	18	8
Total VOCs	325	**	>781	40	149	59

All results reported in parts per billion (ppb).
Samples analyzed using USEPA Methods 601, 602 by EcoTest Laboratories, Inc., North Babylon, New York.

* Not analyzed: gas well was not sampled during the first sampling round (July 1987). Samples were collected from wells during the second round (April 1988) to replace wells destroyed since the first sampling round.

** Wells destroyed between first and second sampling rounds.

*** Barometric pressures were obtained from the Long Island Weather Observers, Mineola, New York: measured in inches of mercury at about 6 pm each day.

Table 22. Concentrations of Volatile Organic Compounds in Gas Samples Collected from Selected Gas Monitoring Wells during the Subsurface Gas Study, Syosset Landfill, Syosset, New York.

Sample Designation:	G-19	G-19	Blank	Trip Blank
Date Sampled:	7/8/87	8/88	7/8/87	7/9/87
*** Barometric Pressure:	30.13		30.13	29.87
Parameter				
Chloromethane	<2	**	<2	<2
Bromomethane	<2	**	<2	<2
Dichlorodifluoromethane	<10	**	<2	<2
Vinyl chloride	53	**	<2	<2
Chloroethane	2	**	<2	<2
Methylene chloride	34	**	<4	<4
Trichlorofluoromethane	<4	**	<4	<4
1,1-Dichloroethene	<4	**	<4	<4
1,1-Dichloroethane	<4	**	<4	<4
1,2-Dichloroethene	<4	**	<4	<4
Chloroform	9	**	<2	<2
1,2-Dichloroethane	<4	**	<4	<4
1,1,1-Trichloroethane	<2	**	<2	<2
Carbon tetrachloride	<2	**	<2	<2
Bromodichloromethane	<2	**	<2	<2
1,2-Dichloropropane	<4	**	<4	<4
trans-1,3-Dichloropropene	<4	**	<4	<4
Trichloroethylene	<2	**	<2	<2
Chlorodibromomethane	<2	**	<2	<2
1,1,2-Trichloroethane	<4	**	<4	<4
cis-1,3-Dichloropropene	<4	**	<4	<4
2-Chloroethyl vinyl ether	<4	**	<4	<4
Bromoform	<4	**	<4	<4
1,1,2,2-Tetrachloroethane	<4	**	<4	<4
Tetrachloroethene	12	**	5	<2
Chlorobenzene	<2	**	<2	<2
1,3-Dichlorobenzene	<4	**	<4	<4
1,2-Dichlorobenzene	<4	**	<4	<4
1,4-Dichlorobenzene	<4	**	<4	<4
Benzene	35	**	12	<2
Toluene	210	**	70	4
Ethyl benzene	25	**	4	<2
m Xylene	70	**	30	<4
o + p Xylene	49	**	18	<8
Total VOCs	499	**	139	4

All results reported in parts per billion (ppb).
Samples analyzed using USEPA Methods 601, 602 by EcoTest Laboratories, Inc., North Babylon, New York.

* Not analyzed; gas well was not sampled during the first sampling round (July 1987). Samples were collected from wells during the second round (April 1988) to replace wells destroyed since the first sampling round.

** Wells destroyed between first and second sampling rounds.

*** Barometric pressures were obtained from the Long Island Weather Observers, Mineola, New York; measured in inches of mercury at about 6 pm each day.

Table 20. Concentrations of Leachable Metals in Soil Samples Collected from Soil Borings during the Landfill Dimension Study, Syosset Landfill, Syosset, New York.

Sample Designation:		B-1	B-1	B-1	B-2	B-2	B-2	B-3	B-3
Sample Date:		10/29/87	10/30/87	10/30/87	11/3/87	11/4/87	11/4/87	11/7/87	11/9/87
Sample Depth (ft):		15	40	85	30	60	85	40	80
Parameter	Maximum Concentration of Contaminants for Characteristic of EP Toxicity								
Antimony as Sb		<5	<5	<5	<5	<5	64	12	<5
Arsenic as As	5,000	2	4	2	<2	<2	20	8	<2
Beryllium as Be		<1	<1	<1	<1	<1	<1	<1	<1
Cadmium as Cd	1,000	<1	<1	<1	<1	<1	<1	2	<1
Chromium as Cr	5,000	<20	<20	<20	<20	<20	<20	<20	<20
Copper as Cu		20	<20	<20	<20	<20	<20	<20	<20
Lead as Pb	5,000	<5	<5	<5	<5	<5	<5	<5	<5
Mercury as Hg	200	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Nickel as Ni		<100	<100	<100	<100	<100	<100	<100	<100
Selenium as Se	1,000	<2	<2	<2	<2	<2	<2	<2	<2
Silver as Ag	5,000	<10	<10	<10	<10	<10	<10	20	<10
Thallium as Tl		<5	<5	<5	<5	<5	<5	<5	<5
Zinc as Zn		100	460	50	50	70	70	700	30

All results reported in micrograms per liter (ug/L).
Samples analyzed by Extraction Procedure (EP) Testing by EcoTest Laboratories, Inc., North Babylon, New York.

Table 20. Concentrations of Leachable Metals in Soil Samples Collected from Soil Borings during the Landfill Dimension Study, Syosset Landfill, Syosset, New York.

		----Replicates----				
Sample Designation:		B-3	B-3	B-4	B-4	B-4
Sample Date:		11/9/87	11/9/87	11/16/87	11/16/87	11/17/87
Sample Depth (ft):		110	110	40	70	100
Parameter	Maximum Concentration of Contaminants for Characteristic of EP Toxicity					
Antimony as Sb		<5	<5	34	<5	<5
Arsenic as As	5,000	<2	3	<2	<2	7
Beryllium as Be		<1	<1	<1	<1	<1
Cadmium as Cd	1,000	<1	<1	<1	<1	<1
Chromium as Cr	5,000	<20	<20	<20	<20	<20
Copper as Cu		<20	<20	30	<20	<20
Lead as Pb	5,000	<5	<5	<5	<5	<5
Mercury as Hg	200	<0.2	<0.2	<0.2	<0.2	<0.2
Nickel as Ni		<100	<100	<100	<100	<100
Selenium as Se	1,000	<2	<2	<2	<2	<2
Silver as Ag	5,000	<10	<10	10	10	<10
Thallium as Tl		<5	<5	<5	<5	<5
Zinc as Zn		30	30	100	<20	<20

All results reported in micrograms per liter (ug/L).
Samples analyzed by Extraction Procedure (EP) Testing by EcoTest Laboratories, Inc., North Babylon, New York.

Table 15. Depth of Landfill Encountered in Soil and Well Borings at the Syosset Landfill, Syosset, New York.

Well/Boring Designation	Depth of Landfill (ft below land surface)
ERM Wells	
SY-1	8 *
SY-3	0
SY-4	8
SY-5	18
SY-6	6
SY-7	0
G&M Wells/Borings	
SY-1D	0
SY-2D	0
SY-3D	0
SY-6D	0
SY-8	41
SY-9	0
B-1	31
B-2	59
B-3	84
B-4	54
LKB Borings	
A	38
B	58
C	78.5
D	91
E	36

* Geologic log indicates 8 feet of fill material but does not specify whether fill is clean fill or landfill material. In preparing Figure 13, it was assumed that 8 feet of landfill was encountered.

Table 16. Concentrations of Volatile Organic Compounds in Soil Samples Collected from Soil Borings during the Landfill Dimension Study, Syosset Landfill, Syosset, New York.

Sample Designation:	B-1	B-1	B-1	B-2	B-2
Sample Date:	10/29/87	10/30/87	10/30/87	11/3/87	11/4/87
Sample Depth (ft):	15	40	55	30	60
Parameter					
Chloromethane	<11	10 J	<12	<15	<14
Bromomethane	5 J	9 J	<12	<15	<14
Vinyl chloride	<11	8 J	<12	<15	<14
Chloroethane	<11	9 J	<12	<15	<14
Methylene chloride	6	<6	<6	21	<7
Acetone	61 B	33 B	13	280 B	53 B
Carbon disulfide	4 J	6	<6	<7	<7
1,1-Dichloroethene	<6	<6	<6	<7	<7
1,1-Dichloroethane	<6	4 J	<6	<7	<7
1,2-Dichloroethene	<6	<6	<6	<7	<7
Chloroform	6	7	6	13	<7
1,2-Dichloroethane	<6	6	<6	<7	<7
2-Butanone	20	14	<12	<15	20
1,1,1-Trichloroethane	5 J	6	<6	<7	<7
Carbon tetrachloride	4 J	4 J	<6	<7	<7
Vinyl acetate	<11	<11	<12	<15	<14
Bromodichloromethane	4 J	6	<6	<7	<7
1,2-Dichloropropane	<6	7	<6	<7	<7
trans-1,3-Dichloropropene	<6	4 J	<6	<7	<7
Trichloroethylene	<6	5 J	<6	<7	<7
Dibromochloromethane	<6	6	<6	<7	<7
1,1,2-Trichloroethane	<6	8	<6	<7	<7
Benzene	6	8	<6	<7	<7
cis-1,3-Dichloropropene	<6	6	<6	<7	<7
2-Chloroethylvinylether	<11	<11	<12	<15	<14
Bromoform	3 J	6	<6	<7	<7
4-Methyl-2-pentanone	<11	5 J	<12	<15	<14
2-Hexanone	<11	<11	<12	<15	<14
Tetrachloroethane	5 J	5 J	<6	<7	<7
1,1,2,2-Tetrachloroethane	<6	9	<6	<7	<7
Toluene	6	9	<6	<7	<7
Chlorobenzene	10	10	<6	11	<7
Ethylbenzene	5 J	16	<6	8	<7
Styrene	4 J	6	<6	<7	<7
Total xylenes	69	29	<6	16 B	<7
Dichlorodifluoromethane	--	--	--	--	--
Total VOCs	123	165	19	33	20

All results reported in micrograms per kilogram (ug/kg).
Samples analyzed using USEPA Method 624 by York Laboratories, Inc.
J Estimated value: less than the detection limit, but greater than zero.
B Analyte detected in the blank as well as in the sample.
-- No detection limit given.

Table 16. Concentrations of Volatile Organic Compounds in Soil Samples Collected from Soil Borings during the Landfill Dimension Study, Syosset Landfill, Syosset, New York.

Sample Designation:	B-3 (REP 1)	B-3 (REP 2)	B-4	B-4	B-4
Sample Date:	11/9/87	11/9/87	11/16/87	11/17/87	11/17/87
Sample Depth (ft):	110	110	40	70	100
Parameter					
Chloromethane	<12	<12	<14	<11	<10
Bromomethane	<12	<12	<14	<11	<10
Vinyl chloride	<12	<12	<14	<11	<10
Chloroethane	<12	<12	<14	<11	<10
Methylene chloride	<6	<6	2 B	8 B	74 B
Acetone	44 B	45 B	180 B	36 B	73 B
Carbon disulfide	<6	3 J	<7	<5	<5
1,1-Dichloroethene	<6	<6	<7	<5	<5
1,1-Dichloroethane	<6	<6	<7	<5	<5
1,2-Dichloroethene	<6	<6	<7	<5	<5
Chloroform	<6	<6	3 J	<5	<5
1,2-Dichloroethane	<6	<6	<7	<5	<5
2-Butanone	<12	<12	32	<11	<10
1,1,1-Trichloroethane	<6	<6	<7	<5	<5
Carbon tetrachloride	<6	<6	<7	<5	<5
Vinyl acetate	<12	<12	<14	<11	<10
Bromodichloromethane	<6	<6	<7	<5	<5
1,2-Dichloropropane	<6	<6	<7	<5	<5
trans-1,3-Dichloropropene	<6	<6	<7	<5	<10
Trichloroethylene	<6	<6	<7	<5	<5
Dibromochloromethane	<6	<6	<7	<5	<5
1,1,2-Trichloroethane	<6	<6	<7	<5	<5
Benzene	<6	<6	<7	<5	<5
cis-1,3-Dichloropropene	<6	<6	<7	<5	<5
2-Chloroethylvinylether	<12	<12	<14	<11	<10
Bromoform	<6	<6	<7	<5	<5
4-Methyl-2-pentanone	<12	<12	<14	<11	<10
2-Hexanone	<12	<12	<14	<11	<10
Tetrachloroethene	<6	<6	<7	<5	<5
1,1,2,2-Tetrachloroethane	<6	<6	<7	<5	<5
Toluene	<6	<6	<7	<5	<5
Chlorobenzene	<6	<6	15	<5	<5
Ethylbenzene	<6	<6	<7	<5	<5
Styrene	<6	<6	<7	<5	<5
Total xylenes	<6	<6	<7	<5	<5
Dichlorodifluoromethane	--	--	--	--	--
Total VOCs	0	0	47	0	0

All results reported in micrograms per kilogram (ug/kg).

Samples analyzed using USEPA Method 624 by York Laboratories, Inc., Monroe, Connecticut.

J Estimated value; less than the detection limit, but greater than zero.

B Analyte detected in the blank as well as in the sample.

-- No detection limit given.

Table 16A. Concentrations of Volatile Organic Compounds in Soil Samples Collected from Well Borings during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Sample Designation:	SY-1D	SY-1D	SY-1D	SY-1D	SY-1D
Sample Date:	12/28/87	12/29/87	1/7/88	1/8/88	1/27/88
Sample Depth (ft):	30	60	100	120	150
Parameter					
Chloromethane	<5	<5	<5	<5	<5
Bromomethane	<5	<5	<5	<5	<5
Dichlorodifluoromethane	<5	<5	<5	<5	<5
Vinyl chloride	<5	<5	<5	<5	<5
Chloroethane	<5	<5	<5	<5	<5
Methylene chloride	<10	<10	<10	<10	<10
Trichlorofluoromethane	<10	<10	<10	<10	<10
1,1-Dichloroethene	<10	<10	<10	<10	<10
1,1-Dichloroethane	<10	<10	<10	<10	<10
1,2-Dichloroethene	<10	<10	<10	<10	<10
Chloroform	<5	<5	<5	<5	<5
1,2-Dichloroethane	<10	<10	<10	<10	<10
1,1,1-Trichloroethane	<5	<5	<5	<5	<5
Carbon tetrachloride	<5	<5	<5	<5	<5
Bromodichloromethane	<5	<5	<5	<5	<5
1,2-Dichloropropane	<10	<10	<10	<10	<10
trans-1,3-Dichloropropene	<10	<10	<10	<10	<10
Trichloroethylene	<5	<5	<5	<5	<5
Chlorodibromomethane	<5	<5	<5	<5	<5
1,1,2-Trichloroethane	<10	<10	<10	<10	<10
cis-1,3-Dichloropropene	<10	<10	<10	<10	<10
2-Chloroethyl vinyl ether	<10	<10	<10	<10	<10
Bromoform	<10	<10	<10	<10	<10
1,1,2,2-Tetrachloroethane	<10	<10	<10	<10	<10
Tetrachloroethene	<5	<5	<5	<5	<5
Chlorobenzene	<5	<5	<5	<5	<5
1,3-Dichlorobenzene	<10	<10	<10	<10	<10
1,2-Dichlorobenzene	<10	<10	<10	<10	<10
1,4-Dichlorobenzene	<10	<10	<10	<10	<10
Benzene	<5	<5	<5	<5	<5
Toluene	<10	<10	<10	<10	<10
Ethyl benzene	<5	<5	<5	<5	<5
m Xylene	<10	<10	<10	<10	<10
o + p Xylene	<20	<20	<20	<20	<20
Total VOCs	0	0	0	0	0

All results reported in micrograms per kilogram (ug/kg).
Samples analyzed using USEPA Methods 601, 602 by EcoTest Laboratories, Inc., North Babylon, New York.

Table 16A. Concentrations of Volatile Organic Compounds in Soil Samples Collected from Well Borings during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Sample Designation:	SY-2D	SY-2D	SY-2D	SY-2D	SY-2D
Sample Date:	2/4/88	2/8/88	2/8/88	2/8/88	2/8/88
Sample Depth (ft):	33	63	93	123	153
Parameter					
Chloromethane	<5	<5	<5	<5	<5
Bromomethane	<5	<5	<5	<5	<5
Dichlorodifluoromethane	<5	<5	<5	<5	<5
Vinyl chloride	<5	<5	<5	<5	<5
Chloroethane	<5	<5	<5	<5	<5
Methylene chloride	<10	<10	<10	<10	<10
Trichlorofluoromethane	<10	<10	<10	<10	<10
1,1-Dichloroethene	<10	<10	<10	<10	<10
1,1-Dichloroethane	<10	<10	<10	<10	<10
1,2-Dichloroethene	<10	<10	<10	<10	<10
Chloroform	<5	<5	<5	<5	<5
1,2-Dichloroethane	<10	<10	<10	<10	<10
1,1,1-Trichloroethane	<5	<5	<5	<5	<5
Carbon tetrachloride	<5	<5	<5	<5	<5
Bromodichloromethane	<5	<5	<5	<5	<5
1,2-Dichloropropane	<10	<10	<10	<10	<10
trans-1,3-Dichloropropene	<10	<10	<10	<10	<10
Trichloroethylene	<5	<5	<5	<5	<5
Chlorodibromomethane	<5	<5	<5	<5	<5
1,1,2-Trichloroethane	<10	<10	<10	<10	<10
cis-1,3-Dichloropropene	<10	<10	<10	<10	<10
2-Chloroethyl vinyl ether	<10	<10	<10	<10	<10
Bromoform	<10	<10	<10	<10	<10
1,1,2,2-Tetrachloroethane	<10	<10	<10	<10	<10
Tetrachloroethene	<5	<5	<5	<5	<5
Chlorobenzene	<5	<5	<5	<5	<5
1,3-Dichlorobenzene	<10	<10	<10	<10	<10
1,2-Dichlorobenzene	<10	<10	<10	<10	<10
1,4-Dichlorobenzene	<10	<10	<10	<10	<10
Benzene	<5	<5	<5	<5	<5
Toluene	<10	<10	<10	<10	<10
Ethyl benzene	<5	<5	<5	<5	<5
m Xylene	<10	<10	<10	<10	<10
o + p Xylene	<20	<20	<20	<20	<20
Total VOCs	0	0	0	0	0

All results reported in micrograms per kilogram (ug/kg).
Samples analysed using USEPA Methods 601, 602 by EcoTest Laboratories, Inc., North Babylon, New York.

Table 16A. Concentrations of Volatile Organic Compounds in Soil Samples Collected from Well Borings during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Sample Designation:	SY-2D	SY-3D	SY-3D	SY-3D	SY-3D
Sample Date:	2/8/88	2/17/88	2/17/88	2/17/88	2/18/88
Sample Depth (ft):	183	33	63	93	123
Parameter					
Chloromethane	<5	<5	<5	<5	<5
Bromomethane	<5	<5	<5	<5	<5
Dichlorodifluoromethane	<5	<5	<5	<5	<5
Vinyl chloride	<5	<5	<5	<5	<5
Chloroethane	<5	<5	<5	<5	<5
Methylene chloride	<10	<10	<10	<10	<10
Trichlorofluoromethane	<10	<10	<10	<10	<10
1,1-Dichloroethene	<10	<10	<10	<10	<10
1,1-Dichloroethane	<10	<10	<10	<10	<10
1,2-Dichloroethene	<10	<10	<10	<10	<10
Chloroform	<5	<5	<5	<5	<5
1,2-Dichloroethane	<10	<10	<10	<10	<10
1,1,1-Trichloroethane	<5	<5	<5	<5	<5
Carbon tetrachloride	<5	<5	<5	<5	<5
Bromodichloromethane	<5	<5	<5	<5	<5
1,2-Dichloropropane	<10	<10	<10	<10	<10
trans-1,3-Dichloropropene	<10	<10	<10	<10	<10
Trichloroethylene	<5	<5	<5	<5	<5
Chlorodibromomethane	<5	<5	<5	<5	<5
1,1,2-Trichloroethane	<10	<10	<10	<10	<10
cis-1,3-Dichloropropene	<10	<10	<10	<10	<10
2-Chloroethyl vinyl ether	<10	<10	<10	<10	<10
Bromoform	<10	<10	<10	<10	<10
1,1,2,2-Tetrachloroethane	<10	<10	<10	<10	<10
Tetrachloroethene	<5	<5	<5	<5	<5
Chlorobenzene	<5	<5	<5	<5	<5
1,3-Dichlorobenzene	<10	<10	<10	<10	<10
1,2-Dichlorobenzene	<10	<10	<10	<10	<10
1,4-Dichlorobenzene	<10	<10	<10	<10	<10
Benzene	<5	<5	<5	<5	<5
Toluene	<10	<10	<10	<10	<10
Ethyl benzene	<5	<5	<5	<5	<5
m Xylene	<10	<10	<10	<10	<10
o + p Xylene	<20	<20	<20	<20	<20
Total VOCs	0	0	0	0	0

All results reported in micrograms per kilogram (ug/kg).
Samples analyzed using USEPA Methods 601, 602 by EcoTest Laboratories, Inc., North Babylon, New York.

Table 16A. Concentrations of Volatile Organic Compounds in Soil Samples Collected from Well Borings during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Sample Designation:	SY-3D	SY-3D	SY-6D	SY-6D	SY-6D
Sample Date:	2/18/88	2/18/88	3/2/88	3/7/88	3/7/88
Sample Depth (ft):	153	183	33	63	93
Parameter					
Chloromethane	<5	<5	<5	<5	<5
Bromomethane	<5	<5	<5	<5	<5
Dichlorodifluoromethane	<5	<5	<5	<5	<5
Vinyl chloride	<5	<5	<5	<5	<5
Chloroethane	<5	<5	<5	<5	<5
Methylene chloride	<10	<10	<10	<10	<10
Trichlorofluoromethane	<10	<10	<10	<10	<10
1,1-Dichloroethene	<10	<10	<10	<10	<10
1,1-Dichloroethane	<10	<10	<10	<10	<10
1,2-Dichloroethene	<10	<10	<10	<10	<10
Chloroform	<5	<5	<5	<5	<5
1,2-Dichloroethane	<10	<10	<10	<10	<10
1,1,1-Trichloroethane	<5	<5	<5	<5	<5
Carbon tetrachloride	<5	<5	<5	<5	<5
Bromodichloromethane	<5	<5	<5	<5	<5
1,2-Dichloropropane	<10	<10	<10	<10	<10
trans-1,3-Dichloropropene	<10	<10	<10	<10	<10
Trichloroethylene	<5	<5	<5	<5	<5
Chlorodibromomethane	<5	<5	<5	<5	<5
1,1,2-Trichloroethane	<10	<10	<10	<10	<10
cis-1,3-Dichloropropene	<10	<10	<10	<10	<10
2-Chloroethyl vinyl ether	<10	<10	<10	<10	<10
Bromoform	<10	<10	<10	<10	<10
1,1,2,2-Tetrachloroethane	<10	<10	<10	<10	<10
Tetrachloroethene	<5	<5	<10	<10	<10
Chlorobenzene	<5	<5	<5	<5	<5
1,3-Dichlorobenzene	<10	<10	<10	<10	<10
1,2-Dichlorobenzene	<10	<10	<10	<10	<10
1,4-Dichlorobenzene	<10	<10	<10	<10	<10
Benzene	<5	<5	<5	<5	<5
Toluene	<10	<10	<10	<10	<10
Ethyl benzene	<5	<5	<5	<5	<5
m Xylene	<10	<10	<10	<10	<10
o + p Xylene	<20	<20	<20	<20	<20
Total VOCs	0	0	0	0	0

All results reported in micrograms per kilogram (ug/kg).
Samples analyzed using USEPA Methods 601, 602 by EcoTest Laboratories, Inc., North Babylon, New York.

Table 16A. Concentrations of Volatile Organic Compounds in Soil Samples Collected from Well Borings during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Sample Designation:	SY-6D	SY-6D	SY-6D	SY-8	SY-8
Sample Date:	3/7/88	3/8/88	3/8/88	12/4/87	12/10/87
Sample Depth (ft):	123	153	183	30	60
Parameter					
Chloromethane	<5	<10	<5	<5	<5
Bromomethane	<5	<10	<5	<5	<5
Dichlorodifluoromethane	<5	<10	<5	<5	<5
Vinyl chloride	<5	<10	<5	<5	<5
Chloroethane	<5	<10	<5	<5	<5
Methylene chloride	<10	<20	<10	<10	<10
Trichlorofluoromethane	<10	<20	<10	<10	<10
1,1-Dichloroethene	<10	<20	<10	<10	<10
1,1-Dichloroethane	<10	<20	<10	<10	<10
1,2-Dichloroethene	<10	<20	<10	<10	<10
Chloroform	<5	<10	<5	<5	<5
1,2-Dichloroethane	<10	<20	<10	<10	<10
1,1,1-Trichloroethane	<5	<10	<5	<5	<5
Carbon tetrachloride	<5	<10	<5	<5	<5
Bromodichloromethane	<5	<10	<5	<5	<5
1,2-Dichloropropane	<10	<20	<10	<10	<10
trans-1,3-Dichloropropene	<10	<20	<10	<10	<10
Trichloroethylene	<5	<10	<5	<5	<5
Chlorodibromomethane	<5	<10	<5	<5	<5
1,1,2-Trichloroethane	<10	<20	<10	<10	<10
cis-1,3-Dichloropropene	<10	<20	<10	<10	<10
2-Chloroethyl vinyl ether	<10	<20	<10	<10	<10
Bromoform	<10	<20	<10	<10	<10
1,1,2,2-Tetrachloroethane	<10	<20	<10	<10	<10
Tetrachloroethene	<10	<20	<10	<5	<5
Chlorobenzene	<5	<10	<5	64	<5
1,3-Dichlorobenzene	<10	<20	<10	<10	<10
1,2-Dichlorobenzene	<10	<20	<10	<10	<10
1,4-Dichlorobenzene	<10	<20	<10	230	<10
Benzene	<5	<10	<5	<5	<5
Toluene	<10	<20	<10	<10	<10
Ethyl benzene	<5	<10	<5	41	<5
m Xylene	<10	<20	<10	<10	<10
o + p Xylene	<20	<40	<20	<20	<20
Total VOCs	0	0	0	335	0

All results reported in micrograms per kilogram (ug/kg).
Samples analyzed using USEPA Methods 601, 602 by EcoTest Laboratories, Inc., North Babylon, New York.

Table 16A. Concentrations of Volatile Organic Compounds in Soil Samples Collected from Well Borings during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Sample Designation:	SY-8	SY-8	SY-9	SY-9	SY-9
Sample Date:	12/14/87	12/16/87	1/20/88	1/25/88	1/28/88
Sample Depth (ft):	90	120	30	60	90
Parameter					
Chloromethane	<5	<5	<5	<5	<5
Bromomethane	<5	<5	<5	<5	<5
Dichlorodifluoromethane	<5	<5	<5	<5	<5
Vinyl chloride	<5	<5	<5	<5	<5
Chloroethane	<5	<5	<5	<5	<5
Methylene chloride	<10	<10	<10	<10	<10
Trichlorofluoromethane	<10	<10	<10	<10	<10
1,1-Dichloroethene	<10	<10	<10	<10	<10
1,1-Dichloroethane	<10	<10	<10	<10	<10
1,2-Dichloroethene	<10	<10	<10	<10	<10
Chloroform	<5	<5	<5	<5	<5
1,2-Dichloroethane	<10	<10	<10	<10	<10
1,1,1-Trichloroethane	<5	<5	<5	<5	<5
Carbon tetrachloride	<5	<5	<5	<5	<5
Bromodichloromethane	<5	<5	<5	<5	<5
1,2-Dichloropropane	<10	<10	<10	<10	<10
trans-1,3-Dichloropropene	<10	<10	<10	<10	<10
Trichloroethylene	<5	<5	<5	<5	<5
Chlorodibromomethane	<5	<5	<5	<5	<5
1,1,2-Trichloroethane	<10	<10	<10	<10	<10
cis-1,3-Dichloropropene	<10	<10	<10	<10	<10
2-Chloroethyl vinyl ether	<10	<10	<10	<10	<10
Bromoform	<10	<10	<10	<10	<10
1,1,2,2-Tetrachloroethane	<10	<10	<10	<10	<10
Tetrachloroethene	9	<5	<5	<5	<5
Chlorobenzene	<5	<5	<5	<5	<5
1,3-Dichlorobenzene	<10	<10	<10	<10	<10
1,2-Dichlorobenzene	<10	<10	<10	<10	<10
1,4-Dichlorobenzene	<10	<10	<10	<10	<10
Benzene	<5	<5	<5	<5	<5
Toluene	<10	<10	<10	<10	<10
Ethyl benzene	<5	<5	<5	<5	<5
m Xylene	<10	<10	<10	<10	<10
o + p Xylene	<20	<20	<20	<20	<20
Total VOCs	9	0	0	0	0

All results reported in micrograms per kilogram (ug/kg).
Samples analyzed using USEPA Methods 601, 602 by EcoTest Laboratories, Inc., North Babylon, New York.

Table 16A. Concentrations of Volatile Organic Compounds in Soil Samples Collected from Well Borings during the On-Site Ground-Water Study, Syosset Landfill, Syosset, New York.

Sample Designation:	SY-9	SY-9
Sample Date:	1/28/88	1/28/88
Sample Depth (ft):	120	180
Parameter		
Chloromethane	<5	<5
Bromomethane	<5	<5
Dichlorodifluoromethane	<5	<5
Vinyl chloride	<5	<5
Chloroethane	<5	<5
Methylene chloride	<10	<10
Trichlorofluoromethane	<10	<10
1,1-Dichloroethene	<10	<10
1,1-Dichloroethane	<10	<10
1,2-Dichloroethene	<10	<10
Chloroform	5	<5
1,2-Dichloroethane	<10	<10
1,1,1-Trichloroethane	<5	<5
Carbon tetrachloride	<5	<5
Bromodichloromethane	<5	<5
1,2-Dichloropropane	<10	<10
trans-1,3-Dichloropropene	<10	<10
Trichloroethylene	<5	<5
Chlorodibromomethane	<5	<5
1,1,2-Trichloroethane	<10	<10
cis-1,3-Dichloropropene	<10	<10
2-Chloroethyl vinyl ether	<10	<10
Bromoform	<10	<10
1,1,2,2-Tetrachloroethane	<10	<10
Tetrachloroethene	<5	<5
Chlorobenzene	<5	<5
1,3-Dichlorobenzene	<10	<10
1,2-Dichlorobenzene	<10	<10
1,4-Dichlorobenzene	<10	<10
Benzene	<5	<5
Toluene	<10	<10
Ethyl benzene	<5	<5
m Xylene	<10	<10
o + p Xylene	<20	<20
Total VOCs	5	0

All results reported in micrograms per kilogram (ug/kg).
Samples analyzed using USEPA Methods 601, 602 by EcoTest Laboratories, Inc., North Babylon, New York.

Table 17. Concentrations of PCBs in Soil Samples Collected from Soil Borings during the Landfill Dimension Study, Syosset Landfill, Syosset, New York.

Sample Designation:	B-1	B-1	B-1	B-2	B-2	B-2 *	B-3 *	B-3	B-3	B-4	B-4	B-4
Sample Date:	10/29/87	10/30/87	10/30/87	11/3/87	11/4/87	11/4/87	11/7/87	11/9/87	11/9/87	11/16/87	11/16/87	11/17/87
Sample Depth (ft):	15	40	55	30	60	85	40	80	110	40	70	100
Parameter												
Aroclor 1016	490	200	<40	<40	<40	<40,000	<1,000	<40	<40	3,100	390	110
Aroclor 1221	<200	<40	<40	<40	<40	<40,000	<1,000	<40	<40	<1,000	<40	<40
Aroclor 1232	<200	<40	<40	<40	<40	<40,000	<1,000	<40	<40	<1,000	<40	<40
Aroclor 1242	<200	<40	<40	<40	<40	<40,000	<1,000	<40	<40	<1,000	<40	<40
Aroclor 1248	<200	<40	<40	<40	<40	<40,000	<1,000	<40	<40	<1,000	<40	<40
Aroclor 1254	300	180	<40	<40	<40	<40,000	<1,000	<40	<40	1,500	170	61
Aroclor 1260	<200	<40	<40	<40	<40	<40,000	<1,000	<40	<40	<1,000	<40	<40
Total PCBs	790	380	0	0	0	0	0	0	0	4,600	560	171

All results reported in micrograms per kilogram (ug/kg).
Samples analyzed using USEPA Method 608 by EcoTest Laboratories, Inc., North Babylon, New York.

Table 18. Concentrations of Base/Neutral Compounds Detected in Soil Samples, Collected from Soil Borings during the Landfill Dimension Study, Syosset Landfill, Syosset, New York.

Sample Designation:	B-1	B-1	B-1	B-2	B-2
Sample Date:	10/29/87	10/30/87	10/30/87	11/3/87	11/4/87
Sample Depth (ft):	15	40	55	30	60
Parameter					
N-nitrosodimethylamine	<20000	<420	<360	<28000	<350
bis(2-Chloroethyl)ether	<20000	<420	<360	<28000	<350
1,3-Dichlorobenzene	<20000	<420	<360	<28000	<350
1,4-Dichlorobenzene	<20000	<420	<360	<28000	<350
1,2-Dichlorobenzene	<20000	20 J	<360	<28000	<350
bis(2-Chloroisopropyl)ether	<20000	<420	<360	<28000	<350
Hexachloroethane	<20000	<420	<360	<28000	<350
N-nitroso-di-n-propylamine	<20000	<420	<360	<28000	<350
Nitrobenzene	<20000	<420	<360	<28000	<350
Isophorone	<20000	<420	<360	<28000	<350
bis(2-Chloroethoxy)methane	<20000	<420	<360	<28000	<350
1,2,4-Trichlorobenzene	<20000	<420	<360	<28000	<350
Naphthalene	<20000	610	<360	24000 J	30 J
Hexachlorobutadiene	<20000	<420	<360	<28000	<350
Hexachlorocyclopentadiene	<20000	<420	<360	<28000	<350
2-Chloronaphthalene	<20000	<420	<360	<28000	<350
Dimethyl phthalate	<20000	<420	<360	4400 J	<350
Acenaphthylene	<20000	<420	<360	<28000	<350
2,6-Dinitrotoluene	<20000	<420	<360	<28000	<350
Acenaphthene	1100 J	41 J	<360	7200 J	19 J
2,4-Dinitrotoluene	<20000	<420	<360	<28000	<350
Diethyl phthalate	<20000	12 J	<360	40000	<350
Fluorene	990 J	62 J	<360	3600 J	29 J
4-Chlorophenyl phenyl ether	<20000	<420	<360	<28000	<350
4-Bromophenyl phenyl ether	<20000	<420	<360	<28000	<350
N-nitrosodiphenylamine	<20000	<420	<360	<28000	<350
Hexachlorobenzene	<20000	<420	<360	<28000	<350
Phenanthrene	2900 J	210 J	34 J	9700 J	87 J
Anthracene	650 J	42 J	<360	<28000	<350
Di-n-butyl phthalate	<20000	220 JB	350 B	610 J	110 JB
Fluoranthene	2700 J	180 J	78 J	7400 J	49 J
Benzidine	<20000	<420	<360	<28000	<350
Pyrene	1900 J	180 J	41 J	5400 J	22 J
Butyl benzyl phthalate	<20000	160 J	<360	<28000	<350
3,3'-Dichlorobenzidine	<40000	<840	<720	<56000	<700

All results reported in micrograms per kilogram (ug/kg).

Samples analyzed using USEPA Method 625 by York Laboratories, Inc., Monroe, Connecticut.

J Estimated value; less than the detection limit, but greater than zero.

B Analyte detected in the blank as well as in the sample.

Table 18. Concentrations of Base/Neutral Compounds Detected in Soil Samples, Collected from Soil Borings during the Landfill Dimension Study, Syosset Landfill, Syosset, New York.

Sample Designation:	B-2	B-2	B-3	B-3	B-3
Sample Date:	11/4/87	10/27/87	11/7/87	11/9/87	11/9/87
Sample Depth (ft):	85	Trip Blank	40	80	110
Parameter					
N-nitrosodimethylamine	<370	NA	<390	<370	<410
bis(2-Chloroethyl)ether	<370	NA	<390	<370	<410
1,3-Dichlorobenzene	<370	NA	<390	<370	<410
1,4-Dichlorobenzene	<370	NA	<390	<370	<410
1,2-Dichlorobenzene	<370	NA	<390	<370	<410
bis(2-Chloroisopropyl)ether	<370	NA	<390	<370	<410
Hexachloroethane	<370	NA	<390	<370	<410
N-nitroso-di-n-propylamine	<370	NA	<390	<370	<410
Nitrobenzene	<370	NA	<390	<370	<410
Isophorone	<370	NA	<390	<370	<410
bis(2-Chloroethoxy)methane	<370	NA	<390	<370	<410
1,2,4-Trichlorobenzene	<370	NA	<390	<370	<410
Naphthalene	<370	NA	90 J	<370	<410
Hexachlorobutadiene	<370	NA	<390	<370	<410
Hexachlorocyclopentadiene	<370	NA	<390	<370	<410
2-Chloronaphthalene	<370	NA	<390	<370	<410
Dimethyl phthalate	<370	NA	<390	<370	<410
Acenaphthylene	<370	NA	250 J	<370	<410
2,6-Dinitrotoluene	<370	NA	<390	<370	<410
Acenaphthene	<370	NA	560	<370	<410
2,4-Dinitrotoluene	<370	NA	<390	<370	<410
Diethyl phthalate	<370	NA	380 J	<370	<410
Fluorene	<370	NA	840	<370	<410
4-Chlorophenyl phenyl ether	<370	NA	<390	<370	<410
4-Bromophenyl phenyl ether	<370	NA	<390	<370	<410
N-nitrosodiphenylamine	<370	NA	180 J	<370	<410
Hexachlorobenzene	<370	NA	<390	<370	<410
Phenanthrene	<370	NA	2200	<370	<410
Anthracene	<370	NA	640	<370	<410
Di-n-butyl phthalate	13 JB	NA	220 JB	78 JB	50 JB
Fluoranthene	<370	NA	2100	<370	<410
Benzidine	<370	NA	<390	<370	<410
Pyrene	<370	NA	1200	<370	<410
Butyl benzyl phthalate	<370	NA	<390	<370	<410
3,3'-Dichlorobenzidine	<740	NA	<780	<740	<820

All results reported in micrograms per kilogram (ug/kg).

Samples analyzed using USEPA Method 625 by York Laboratories, Inc., Monroe, Connecticut.

J Estimated value; less than the detection limit, but greater than zero.

B Analyte detected in the blank as well as in the sample.

NA Not analyzed.

Table 18. Concentrations of Base/Neutral Compounds Detected in Soil Samples, Collected from Soil Borings during the Landfill Dimension Study, Syosset Landfill, Syosset, New York.

Sample Designation:	B-2	B-2	B-3	B-3	B-3
Sample Date:	11/4/87	10/27/87	11/7/87	11/9/87	11/9/87
Sample Depth (ft):	85	Trip Blank	40	80	110
Parameter					
Chrysene	<370	NA	630	<370	<410
Benzo(a)anthracene	<370	NA	610	<370	<410
bis(2-Ethylhexyl)phthalate	<370	NA	1100 B	650 B	1100 B
di-n-octyl phthalate	<370	NA	<390	<370	8 J
Benzo(b)fluoranthene	<370	NA	710	<370	<410
Benzo(k)fluoranthene	<370	NA	<390	<370	<410
Benzo(a)pyrene	<370	NA	440	<370	<410
Benzo(g,h,i)perylene	<370	NA	180 J	<370	<410
Dibenzo(a,h)anthracene	<370	NA	<390	<370	<410
Indeno(1,2,3-c,d)pyrene	<370	NA	170 J	<370	<410
1,2-Diphenylhydrazine	<370	NA	<390	<370	<410
Total Base Neutral Compounds:	0	NA	9930	0	0

All results reported in micrograms per kilogram (ug/kg).
Samples analysed using USEPA Method 625 by York Laboratories, Inc., Monroe, Connecticut.
J Estimated value; less than the detection limit, but greater than zero.
B Analyte detected in the blank as well as in the sample.
NA Not analysed.

Table 18. Concentrations of Base/Neutral Compounds Detected in Soil Samples, Collected from Soil Borings during the Landfill Dimension Study, Syosset Landfill, Syosset, New York.

Sample Designation:	B-3 (REP 1)	B-3 (REP 2)	B-4	B-4	B-4
Sample Date:	11/9/87	11/9/87	11/16/87	11/17/87	11/17/87
Sample Depth (ft):	110	110	40	70	100
Parameter					
N-nitrosodimethylamine	<400	<410	<4500	<380	<420
bis(2-Chloroethyl)ether	<400	<410	<4500	<380	<420
1,3-Dichlorobenzene	<400	<410	<4500	<380	<420
1,4-Dichlorobenzene	<400	<410	<4500	<380	<420
1,2-Dichlorobenzene	<400	<410	<4500	<380	<420
bis(2-Chloroisopropyl)ether	<400	<410	<4500	<380	<420
Hexachloroethane	<400	<410	<4500	<380	<420
N-nitroso-di-n-propylamine	<400	<410	<4500	<380	<420
Nitrobenzene	<400	<410	<4500	<380	<420
Isophorone	<400	<410	<4500	<380	<420
bis(2-Chloroethoxy)methane	<400	<410	<4500	<380	<420
1,2,4-Trichlorobenzene	<400	<410	<4500	<380	<420
Naphthalene	<400	<410	830 J	14 J	<420
Hexachlorobutadiene	<400	<410	<4500	<380	<420
Hexachlorocyclopentadiene	<400	<410	<4500	<380	<420
2-Chloronaphthalene	<400	<410	<4500	<380	<420
Dimethyl phthalate	<400	<410	<4500	<380	<420
Acenaphthylene	<400	<410	<4500	<380	<420
2,6-Dinitrotoluene	<400	<410	<4500	<380	<420
Acenaphthene	<400	<410	2200 J	32 J	<420
2,4-Dinitrotoluene	<400	<410	<4500	<380	<420
Diethyl phthalate	<400	<410	<4500	<380	22 JB
Fluorene	<400	<410	2200 J	30 J	<420
4-Chlorophenyl phenyl ether	<400	<410	<4500	<380	<420
4-Bromophenyl phenyl ether	<400	<410	<4500	<380	<420
N-nitrosodiphenylamine	<400	<410	<4500	<380	<420
Hexachlorobenzene	<400	<410	<4500	<380	<420
Phenanthrene	<400	<410	8400	170 J	19 J
Anthracene	<400	<410	2300 J	47 J	<420
Di-n-butyl phthalate	41 JB	78 JB	300 JB	29 JB	35 JB
Fluoranthene	<400	<410	9000	240 J	27 J
Benzidine	<400	<410	<4500	<380	<420
Pyrene	<400	<410	3900 J	140 J	16 J
Butyl benzyl phthalate	<400	<410	<4500	<380	<420
3,3'-Dichlorobenzidine	<800	<830	<9100	<750	<840

All results reported in micrograms per kilogram (ug/kg).

Samples analyzed using USEPA Method 625 by York Laboratories, Inc., Monroe, Connecticut.

J Estimated value; less than the detection limit, but greater than zero.

B Analyte detected in the blank as well as in the sample.

Table 18. Concentrations of Base/Neutral Compounds Detected in Soil Samples, Collected from Soil Borings during the Landfill Dimension Study, Syosset Landfill, Syosset, New York.

Sample Designation:	B-3 (REP 1)	B-3 (REP 2)	B-4	B-4	B-4
Sample Date:	11/9/87	11/9/87	11/16/87	11/17/87	11/17/87
Sample Depth (ft):	110	110	40	70	100
Parameter					
Chrysene	<400	<410	3300 J	100 J	<420
Benzo(a)anthracene	<400	<410	3300 J	100 J	<420
bis(2-Ethylhexyl)phthalate	2100 B	1800 B	47000 B	840 B	960 B
di-n-octyl phthalate	<400	<410	<4500	8 J	<420
Benzo(b)fluoranthene	<400	<410	3800 J	<380	<420
Benzo(k)fluoranthene	<400	<410	<4500	<380	<420
Benzo(a)pyrene	<400	<410	2500 J	86 J	<420
Benzo(g,h,i)perylene	<400	<410	2200 J	<380	<420
Dibenzo(a,h)anthracene	<400	<410	<4500	<380	<420
Indeno(1,2,3-c,d)pyrene	<400	<410	2000 J	<380	<420
1,2-Diphenylhydrazine	<400	<410	<4500	<380	<420
Total Base Neutral Compounds:	0	0	17400	0	0

All results reported in micrograms per kilogram (ug/kg).

Samples analyzed using USEPA Method 625 by York Laboratories, Inc., Monroe, Connecticut.

J Estimated value: less than the detection limit, but greater than zero.

B Analyte detected in the blank as well as in the sample.

Table 19. Concentrations of Acid Extractable Compounds in Soil Samples Collected from Soil Borings during the Landfill Dimension Study, Syosset Landfill, Syosset, New York.

Sample Designation:	B-1	B-1	B-1	B-2	B-2
Sample Date:	10/29/87	10/30/87	10/30/87	11/3/87	11/4/87
Sample Depth (ft):	15	40	55	30	60
Parameter					
Phenol	<20000	<420	<360	<28000	<350
2-Chlorophenol	<20000	<420	<360	<28000	<350
2-Nitrophenol	<20000	<420	<360	<28000	<350
2,4-Dimethylphenol	<20000	<420	<360	<28000	<350
2,4-Dichlorophenol	<20000	<420	<360	<28000	<350
4-Chloro-3-methyl phenol	<20000	<420	<360	<28000	<350
2,4,6-Trichlorophenol	<20000	<420	<360	<28000	<350
2,4-Dinitrophenol	<96000	<2100	<1700	<130000	<1700
4-Nitrophenol	<96000	<2100	<1700	<130000	<1700
2-Methyl-4,6-dinitrophenol	<96000	<2100	<1700	<130000	<1700
Pentachlorophenol	<96000	<2100	<1700	<130000	<1700

All results reported in micrograms per kilogram (ug/kg).

Samples analyzed using USEPA Method 625 by York Laboratories, Inc., Monroe, Connecticut.

J Estimated value; less than the detection limit, but greater than zero.

B Analyte detected in the blank as well as in the sample.

NA Not analyzed.

Table 19. Concentrations of Acid Extractable Compounds in Soil Samples Collected from Soil Borings during the Landfill Dimension Study, Syosset Landfill, Syosset, New York.

Sample Designation:	B-2	B-3	B-3	B-3	B-3 (REP 1)
Sample Date:	11/6/87	11/7/87	11/9/87	11/9/87	11/9/87
Sample Depth (ft):	85	40	80	110	110
Parameter					
Phenol	<370	<390	<370	<410	<400
2-Chlorophenol	<370	<390	<370	<410	<400
2-Nitrophenol	<370	<390	<370	<410	<400
2,4-Dimethylphenol	<370	<390	<370	<410	<400
2,4-Dichlorophenol	<370	<390	<370	<410	<400
4-Chloro-3-methyl phenol	<370	<390	<370	<410	<400
2,4,6-Trichlorophenol	<370	<390	<370	<410	<400
2,4-Dinitrophenol	<1800	<1900	<1800	<2000	<1900
4-Nitrophenol	<1800	<1900	<1800	<2000	<1900
2-Methyl-4,6-dinitrophenol	<1800	<1900	<1800	<2000	<1900
Pentachlorophenol	<1800	<1900	<1800	<2000	<1900

All results reported in micrograms per kilogram (ug/kg).
Samples analyzed using USEPA Method 625 by York Laboratories, Inc., Monroe, Connecticut.
J Estimated value: less than the detection limit, but greater than zero.
B Analyte detected in the blank as well as in the sample.
NA Not analyzed.

Table 19. Concentrations of Acid Extractable Compounds in Soil Samples Collected from Soil Borings during the Landfill Dimension Study, Syosset Landfill, Syosset, New York.

Sample Designation:	B-3 (REP 2)	B-4	B-4	B-4
Sample Date:	11/9/87	11/16/87	11/17/87	11/17/87
Sample Depth (ft):	110	40	70	100
Parameter				
Phenol	<410	<4500	<380	<420
2-Chlorophenol	<410	<4500	<380	<420
2-Nitrophenol	<410	<4500	<380	<420
2,4-Dimethylphenol	<410	<4500	<380	<420
2,4-Dichlorophenol	<410	<4500	<380	<420
4-Chloro-3-methyl phenol	<410	<4500	<380	<420
2,4,6-Trichlorophenol	<410	<4500	<380	<420
2,4-Dinitrophenol	<2000	<22000	<1800	<2000
4-Nitrophenol	<2000	<22000	<1800	<2000
2-Methyl-4,6-dinitrophenol	<2000	<22000	<1800	<2000
Pentachlorophenol	<2000	<22000	<1800	<2000

All results reported in micrograms per kilogram (ug/kg).
Samples analyzed using USEPA Method 625 by York Laboratories, Inc., Monroe, Connecticut.
J Estimated value; less than the detection limit, but greater than zero.
B Analyte detected in the blank as well as in the sample.
NA Not analyzed.

APPENDIX B

CHEMICAL PROFILES FROM THE CHEMTOX DATABASE

CHEMTOX DATA

---------- IDENTIFIERS ----------

CHEMTOX RECORD 49 LAST UPDATE OF THIS RECORD: 09/01/89

NAME: ARSENIC

SYNONYMS: ARSENICALS; ARSEN (German, Polish); ARSENIC BLACK; ARSENIC-75; ARSENIC, SOLID; COLLOIDAL ARSENIC; GREY ARSENIC; METALLIC ARSENIC

CAS: 7440-38-2 RTECS: CG0525000

FORMULA: As4 MOL WT: 299.69

CHEMICAL CLASS:

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: SILVERY TO BLACK, BRITTLE; GREY, SHINY, METALLIC LOOKING; CRYSTALLINE AND AMORPHOUS METALLOID

BOILING POINT:	888 K	614.8 C	1138.7 F
MELTING POINT:	1087 K	813.8 C	1496.9 F

FLASH POINT:

AUTO IGNITION: NA

VAPOR PRESSURE: 1mm @ 372 C

UEL: NA

LEL: NA

VAPOR DENSITY: No data

SPECIFIC GRAVITY: 2.026

DENSITY: 5.724 g/mL

WATER SOLUBILITY: INSOL

INCOMPATIBILITIES: OXIDIZERS, ACIDS; BROMINE OXIDE, DIRUBIDIUM ACETYLIDE, HALOGENS, PALLADIUM, ZINC, PLATINUM, NITROGEN TRICHLORIDE, SILVER NITRATE, CHROMIUM TRIOXIDE, SODIUM PEROXIDE

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: CAN REACT VIGOROUSLY ON CONTACT WITH OXIDIZING MATERIALS. MODERATE FIRE HAZARD, IN THE FORM OF DUST WHEN EXPOSED TO HEAT OR FLAME OR BY CHEMICAL REACTION WITH POWERFUL OXIDIZERS SUCH AS BROMATES, CHLORATES, IODATES, PEROXIDES, LITHIUM, NITROGEN TRICHLORIDE

ODOR DESCRIPTION: GARLIC

100 % ODOR DETECTION: No data

---------- TOXICITY DATA ----------

TARGET ORGANS:
SYMPTOMS: NAUSEA, VOMITING, DIARRHEA, DEATH Source:

CONC IDLH: Unknown ppm

ACGIH TLV: 0.2 mg/M3
ACGIH STEL: Not specified

OSHA PEL: Final Rule Limits:
TWA = 10 ug/M3

CARCINOGEN?: Y STATUS: HUMAN POSITIVE
REFERENCES:
HUMAN POSITIVE IARC** 23,39,80
INDEFINITE IARC** 2,48,73

CARCINOGEN LISTS:
IARC: Carcinogen as defined by IARC as carcinogenic to humans, with sufficient epidemiological evidence.
NIOSH: Carcinogen defined by NIOSH with no further categorization.
NTP: Carcinogen defined by NTP as known to be carcinogenic, with evidence from human studies.
ACGIH: Not listed.

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
orl-man TDLo:7857 mg/kg/55Y CMAJAX 120,168,79
GASTROINTESTINAL
Changes on structute or function of esophagus
BLOOD
Hemorrhage
SKIN AND APPENDAGES
Skin - after systemic exposure
Dermatitis,other

LD50 value: orl-rat LD50:763 mg/kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1988)

orl-rat LD50:763 mg/kg
orl-mus LD50:145 mg/kg
ipr-mus LD50:46200 ug/kg
scu-rbt LDLo:300 mg/kg
ipr-gpg LDLo:10 mg/kg
scu-gpg LDLo:300 mg/kg

Reproductive toxicity (1988 RTECS):
This chemical is a mammalian reproductive toxin.

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED:
FROM THE CHRIS MANUAL:

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (ARSENIC)
Greater at any detectable concentration. : Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back- mounted acid gas canister having a high-efficiency particulate filter. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID (NIOSH):
EYE:
IRRIGATE EYES WITH WATER.
SKIN:
WASH CONTAMINATED AREAS OF BODY WITH SOAP AND WATER.
INHALATION:

INGESTION:

CHEMTOX DATA

---------- IDENTIFIERS ----------

CHEMTOX RECORD 743 LAST UPDATE OF THIS RECORD: 09/01/89
NAME: BARIUM METAL
SYNONYMS:
CAS: 7440-39-3 RTECS: CA8370000
FORMULA: Ba MOL WT: 137.34
CHEMICAL CLASS:METAL

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: SILVER-WHITE SLIGHTLY LUSTROUS, SOMEWHAT MALLEABLE METAL.
BOILING POINT: 1913 K 1639.8 C 2983.7 F
MELTING POINT: 998 K 724.8 C 1336.7 F
FLASH POINT:
AUTO IGNITION: NA
VAPOR PRESSURE: 10 mm @ 1049 C
UEL: NA
LEL: NA
VAPOR DENSITY: No data
SPECIFIC GRAVITY: 3.6
DENSITY: 3.5 @20 C
WATER SOLUBILITY: DECOMPOSES

INCOMPATIBILITIES: WATER, OXIDIZING AGENTS, OXYGEN, ACIDS, CHLORINATED SOLVENTS

REACTIVITY WITH WATER: MOISTURE SENSITIVE Source: ALD
REACTIVITY WITH COMMON MATERIALS: No data
STABILITY DURING TRANSPORT: No Data
NEUTRALIZING AGENTS: No data
POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors
ODOR DETECTED AT (ppm):
ODOR DESCRIPTION:
100 % ODOR DETECTION: No data

---------- TOXICITY DATA ----------

TARGET ORGANS: SKIN, EYES
SYMPTOMS: DERMATITIS, DEPILATION, VERTIGO, NAUSEA, VOMITING, COLIC, DIARRHEA, RAPID RESPIRATION, HYPERTENSION, IRREGULAR HEART ACTION, CYANOSIS, MUSCULAR WEAKNESS, TREMOR, LUMBAR PAIN, CONVULSION, PARALYSIS.
Source: THC

CONC IDLH: Unknown ppm

ACGIH TLV: Not listed
ACGIH STEL: Not specified

OSHA PEL: Transitional Limits:
PEL = 0.5mg/M3
Final Rule Limits:
TWA = 0.5 mg/M3

CARCINOGEN?: STATUS:

CARCINOGEN LISTS:
IARC: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed.

LD50 value: Not in RTECS 1988

Reproductive toxicity (1988 RTECS):
This chemical has no known mammalian reproductive toxicity.

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED:
FROM THE CHRIS MANUAL:

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (BARIUM METAL)
5 mg/M3G/ mg/M33: Any dust and mist respirator except single-use and quarter-mask respirators. / Any supplied-air respirator. / Any self-contained breathing apparatus.
12.5 mg/M3G/ mg/M33: Any powered air-purifying respirator with a dust and mist filter. / Any supplied-air respirator operated in a continuous flow mode.
25 mg/M3G/ mg/M33: Any air-purifying full facepiece respirator with a high-efficiency particulate filter. / Any powered air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter. / Any supplied-air respirator with a tight-fitting

facepiece operated in a continuous flow mode. / Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece.
250 mg/M3G/ mg/M33: Any supplied-air respirator with a full facepiece and operated in a pressure-demand or other positive pressure mode.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator with a high-efficiency particulate filter. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID (NIOSH):
EYE:
FLUSH WITH WATER
SKIN:
WASH WITH SOAP AND WATER
INHALATION:

INGESTION:
GASTRIC LAVAGE FOLLOWED BY SALINE CATHARSIS. TREAT MUSCULAR CONVULSION BY INJECTION OF CALCIUM GLUCONATE.

CHEMTOX DATA

---------- IDENTIFIERS ----------

CHEMTOX RECORD 423 LAST UPDATE OF THIS RECORD: 09/01/89
NAME: ZINC
SYNONYMS: BLUE POWDER; C.I. 77945; C.I. PIGMENT BLACK 16; C.I. PIGMENT METAL 6; EMANAY ZINC DUST; GRANULAR ZINC; JASAD; ZINC DUST; ZINC POWDER
CAS: 7440-66-6 RTECS: ZG8600000
FORMULA: Zn MOL WT:
CHEMICAL CLASS:

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION:
BOILING POINT:
MELTING POINT:
FLASH POINT:
AUTO IGNITION: NA
VAPOR PRESSURE:
UEL: NA
LEL: NA
VAPOR DENSITY: No data
SPECIFIC GRAVITY:
DENSITY: g/cc or 0 lb/gal
WATER SOLUBILITY:

INCOMPATIBILITIES: ACIDS, STRONG BASES, CHLORINE, BROMINE

REACTIVITY WITH WATER: No data on water reactivity
REACTIVITY WITH COMMON MATERIALS: No data
STABILITY DURING TRANSPORT: No Data
NEUTRALIZING AGENTS: No data
POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors
ODOR DETECTED AT (ppm):
ODOR DESCRIPTION:
100 % ODOR DETECTION: No data

---------- TOXICITY DATA ----------

TARGET ORGANS: SKIN
SYMPTOMS: INHALATION OF FUMES MAY RESULT IN SWEET TASTE, THROAT DRYNESS, COUGH, WEAKNESS, GENERALIZED ACHING, CHILLS, FEVER, NAUSEA, VOMITING; A HUMAN SKIN IRRITANT AND PUL-PURE ZINC POWDER, DUST, FUME IS RELATIVELY NON-TOXIC TO HUMANS VIA IRRITATION OR INHALATION DIFFICULTY ARISES FROM OXIDATION OF ZINC FUMES PRIOR TO INHALATION OR PRESENCE OF IMPURITIES SUCH AS LEAD, ARSENIC, CADMIUM, ANTIMONY Source: MI; SAX

CONC IDLH: Unknown ppm

ACGIH TLV: Not listed
ACGIH STEL: Not specified

OSHA PEL: Not in Table Z-1-A

CARCINOGEN?: STATUS:

CARCINOGEN LISTS:
IARC: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed.

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
ihl-hmn TCLo:124 mg/m3/50M AHYGAJ 72,358,10
LUNGS, THORAX, OR RESPIRATION
Cough
LUNGS, THORAX, OR RESPIRATION
Dyspnea
SKIN AND APPENDAGES
Other
Sweating

LD50 value: Not in RTECS 1988

IRRITATION DATA: (Source: NIOSH RTECS 1988)

skn-hmn 300 ug/3D-I MLD

Reproductive toxicity (1988 RTECS):
This chemical has no known mammalian reproductive toxicity.

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED:
FROM THE CHRIS MANUAL:

DISCLAIMER: The data shown above on this chemical represents a best effort o
the part of the compilers of the CHEMTOX database to obtain useful, accurate,
and factual data. The use of these data shall be in accordance with the
guidelines and limitations of the user's CHEMTOX license agreement.
The COMPILERS of the CHEMTOX database shall not be held liable for inaccuracie
or omissions within this database, or in any of its printed or displayed outpu
forms.

CHEMTOX DATA

---------- IDENTIFIERS ----------

CHEMTOX RECORD 59 LAST UPDATE OF THIS RECORD: 09/01/89
NAME: BENZENE
SYNONYMS: BENZOL; COAL TAR NAPHTHA; CYCLOHEXATRIENE; PHENYL HYDRIDE; PHENE; COAL NAPHTHA; PYROBENZOL
CAS: 71-43-2 RTECS: CY1400000
FORMULA: C6H6 MOL WT: 78.11
CHEMICAL CLASS: AROMATIC

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: COLORLESS TO PALE YELLOW WATERY LIQUID WITH A GASOLINE-LIKE ODOR

BOILING POINT:	353.15 K	80 C	176 F
MELTING POINT:	278.71 K	5.5 C	42 F
FLASH POINT:	262 K	-11.2 C	11.9 F
AUTO IGNITION:	864.8 K	591.6 C	1096.9 F

VAPOR PRESSURE: 75 mm @ 20 C
UEL: 7.1 %
LEL: 1.3 %
IONIZATION POTENTIAL (eV): 9.25
VAPOR DENSITY: 2.77 air=1
SPECIFIC GRAVITY: 0.86-0.88 20 C
DENSITY: 0.8794 @ 20 C
WATER SOLUBILITY: 0.06%

INCOMPATIBILITIES: STRONG OX,CHLORINE,BROMINE WITH IRON

REACTIVITY WITH WATER: No data on water reactivity
REACTIVITY WITH COMMON MATERIALS: OXIDIZING MATERIALS(Br2, F2, CL2, CrO3, NaClO4, O2, O3), PERCHLORATES (AlCl3 +NaClO4), (H2SO4
STABILITY DURING TRANSPORT: No Data
NEUTRALIZING AGENTS: No data
POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: VAPOR IS HEAVIER THAN AIR AND MAY TRAVEL CONSIDERABLE DISTANCE TO SOURCE OF IGNITION AND FLASH BACK.
ODOR DETECTED AT (ppm): 4.68
ODOR DESCRIPTION: LIKE BENZENE, TOLUENE, AND XYLENE Source: CHRIS
100 % ODOR DETECTION: No data

---------- TOXICITY DATA ----------

TARGET ORGANS: BLOOD, CNS, SKIN, BONE MARROW, EYES, RESP SYS
SYMPTOMS: IRRIT EYES, NOSE, RESP SYS; GIDDY; HEAD, NAU, STAGGERED GAIT; FTG, ANOR, LASS; DERM; BONE MARROW DEPRES; ABDOM PAIN Source: SAX

CONC IDLH: 2000PPM

ACGIH TLV: 10 A2 ppm
ACGIH STEL: 25 ppm CARCINOGEN

OSHA PEL: Final Rule Limits:
TWA = 1 ppm
STEL = 5 ppm

CARCINOGEN?: Y STATUS: HUMAN POSITIVE
REFERENCES:

HUMAN SUSPECTED IARC** 7,203,74
HUMAN SUSPECTED IARC** 28,151,82
ANIMAL SUSPECTED IARC** 28,151,82
ANIMAL SUSPECTED IARC** 29,93,82
HUMAN POSITIVE IARC** 29,93,82
ANIMAL INDEFINITE IARC** 7,203,74

CARCINOGEN LISTS:

IARC: Carcinogen as defined by IARC as carcinogenic to humans, with sufficient epidemiological evidence.
NIOSH: Carcinogen defined by NIOSH with no further categorization.
NTP: Carcinogen defined by NTP as known to be carcinogenic, with evidence from human studies.
ACGIH: Carcinogen defined by ACGIH TLV Committee as a suspected carcinogen, based on either limited epidemological evidence or demonstration of carcinogenicity in experimental animals.

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)

* ihl-hmn LCLo:2 pph/5M TABIA2 3,231,33

* orl-man LDLo:50 mg/kg YAKUD5 22,883,80

* ihl-hmn LCLo:2000 ppm/5M YAKUD5 22,883,80

ihl-man TCLo:150 ppm/1Y-I BLUTA9 28,293,74
BLOOD
Other changes
NUTRITIONAL AND GROSS METABOLIC
Changes in:
Body temperature increase

ihl-hmn TCLo:100 ppm INMEAF 17,199,48
BEHAVIORAL
Somnolence(general depressed activity)
GASTROINTESTINAL
Nausea or vomiting
SKIN AND APPENDAGES
Skin - after systemic exposure
Dermatitis,other

ihl-hmn LCLo:65 mg/m3/5Y ARGEAR 44,145,74
BLOOD
Other changes

LD50 value: orl-rat LD50:3306 mg/kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1988)

orl-rat LD50:3306 mg/kg
ihl-rat LC50:10000 ppm/7H
ipr-rat LD50:2890 ug/kg
orl-mus LD50:4700 mg/kg
ihl-mus LC50:9980 ppm
ipr-mus LD50:340 mg/kg
orl-dog LDLo:2000 mg/kg
ihl-dog LCLo:146000 mg/m3
ihl-cat LCLo:170000 mg/m3
ivn-rbt LDLo:88 mg/kg
ipr-gpg LDLo:527 mg/kg
scu-frg LDLo:1400 mg/kg
ihl-mam LCLo:20000 ppm/5M

IRRITATION DATA: (Source: NIOSH RTECS 1988)

skn-rbt 15 mg/24H open MLD
skn-rbt 20 mg/24H MOD
eye-rbt 88 mg MOD
eye-rbt 2 mg/24H SEV

Reproductive toxicity (1988 RTECS):
This chemical is a mammalian reproductive toxin.

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED:
FROM THE CHRIS MANUAL:
HYDROCARBON VAPOR CANISTER, SUPPLIED AIR OR HOSE MASK;
HYDROCARBON-INSOLUBLE RUBBER OR PLASTIC GLOVES; CHEMICAL GOGGLES OR FACE SPLASH SHIELD; HYDROCARBON-INSOLUBLE APRON SUCH AS NEOPRENE.

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS
** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.
** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.
** EXPOSED PERSONNEL SHOULD WASH:
Promptly wash with soap when skin becomes contaminated.
* REMOVE CLOTHING:
Immediately remove any clothing that becomes wet to avoid any flammabil
hazard.
** REFERENCE: NIOSH
RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (BENZENE)
Greater at any detectable concentration. : Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID (NIOSH):
EYE:
IRR IMMED
SKIN:
SOAP WASH PROMPTLY
INHALATION:
ART RESP
INGESTION:
NO VOMIT

FIRST AID (CHRIS):
EYE:
FLUSH WITH PLENTY OF WATER UNTIL IRRITATION SUBSIDES.
SKIN:
FLUSH WITH WATER FOLLOWED BY SOAP AND WATER; REMOVE CONTAMINATED CLOTHING AND WASH SKIN.
INHALATION:
REMOVE FROM EXPOSURE IMMEDIATELY. CALL PHYSICIAN. IF BREATHING IS IRREGULAR OR STOPPED, START RESUSCITATION, ADMINISTER OXYGEN.
INGESTION:

CHEMTOX DATA

---------- IDENTIFIERS ----------

CHEMTOX RECORD 101 LAST UPDATE OF THIS RECORD: 09/01/89

NAME: CHLOROBENZENE

SYNONYMS: MONOCHLOROBENZENE; CHLOROBENZOL; PHENYL CHLORIDE; MCB; BENZENE, CHLORO-; BENZENE CHLORIDE; PHENYLCHLORIDE; CHLOORBENZEEN (DUTCH); CHLORBENZEN; CHLOROBENZOL; CHLOROBENZEN (POLISH); MONOCHLOORBENZEEN (DUTCH); MONOCHLORBENZENE; MONOCHLORBENZOL (GERMAN); NCI-C54886

CAS: 108-90-7 RTECS: CZ0175000

FORMULA: C6H5Cl MOL WT: 112.56

CHEMICAL CLASS: CHLORINATED AROMATIC

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: COLORLESS, WATERY LIQUID WITH A SWEET, ALMOND ODOR.

BOILING POINT:	405.0 K	131.8 C	269.3 F
MELTING POINT:	227.4 K	-45.8 C	-50.4 F
FLASH POINT:	302 K	28.8 C	83.9 F
AUTO IGNITION:	913 K	639.8 C	1183.7 F

VAPOR PRESSURE: .0156

UEL: 9.6 %

LEL: 1.3 %

IONIZATION POTENTIAL (eV): 9.07

VAPOR DENSITY: No data

SPECIFIC GRAVITY: 1.11 20C

DENSITY: 1.11 g/cc or 10.323 lb/gal

WATER SOLUBILITY: 0.1%

INCOMPATIBILITIES: STRONG OXIDIZERS

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: No data

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors

ODOR DETECTED AT (ppm): 0.21

ODOR DESCRIPTION: MILD AMINE ODOR; SWEET, ALMOND-LIKE; AROMATIC. Sourc
CHRIS

100 % ODOR DETECTION: No data

---------- TOXICITY DATA ----------

TARGET ORGANS:	RESP SYS, EYES, SKIN, CNS, LIVER
SYMPTOMS:	IRRITATING TO SKIN, EYES, MUCOUS MEMBRANES. REPEATED EXPOSURE OF SKIN MAY CAUSE DERMITITIS DUE TO DEFATTING ACTION. CHRONIC INHALATION OF VAPORS OR MIST MAY RESULT IN DAMAGE TO LUNGS, LIVER, KIDNEYS. ACUTE VAPOR EXPOSURES CAN CAUSE SYMPTOMS RANGING FROM COUGHING TO TRANSIENT ANESTHESIA AND CENTRAL NERVOUS SYSTEM DEPRESSION. SOMNOLENCE, LOSS OF CONSCIOUSNESS, TWITCHING OF EXTREMITIES, CYANOSIS, RAPID RESPIRATION AND WEAK, IRREGULAR PULSE. IRRITATION TO EYES, NOSE AND THROAT. Source: CSDS,CHRIS
CONC IDLH:	2400PPM
ACGIH TLV:	75 ppm
ACGIH STEL:	Not specified
OSHA PEL:	Transitional Limits: PEL = 75ppm(350mg/M3) Final Rule Limits: TWA = 75 ppm (350 mg/M3)
CARCINOGEN?:	STATUS:
CARCINOGEN LISTS:	IARC: Not listed NIOSH: Not listed NTP: Not listed ACGIH: Not listed.
LD50 value:	orl-rat LD50:2290 mg/kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1988)

orl-rat LD50:2290 mg/kg
ipr-rat LDLo:7400 mg/kg
scu-rat LDLo:7000 mg/kg
orl-mus LD50:2300 mg/kg
ihl-mus LCLo:15 gm/m3
ipr-mus LD50:515 mg/kg
orl-rbt LD50:2250 mg/kg
orl-gpg LD50:2250 mg/kg
ipr-gpg LDLo:4100 mg/kg
unr-mam LD50:2300 mg/kg

Reproductive toxicity (1988 RTECS):
This chemical is a mammalian reproductive toxin.

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED:
FROM THE CHRIS MANUAL:
ORGANIC VAPOR-ACID GAS RESPIRATOR WHERE APPROPRIATE; NEOPRENE OR VINYL GLOVES; CHEMICAL SAFETY SPECTACLES, PLUS FACE-SHIELD WHERE APPROPRIATE; RUBBER FOOTWEAR; APRON OR IMPERVIOUS CLOTHING FOR SPLASH PROTECTION; HARD HAT.

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Immediately when skin becomes wet.

** REMOVE CLOTHING:
Immediately remove any clothing that becomes wet to avoid any flammabil: hazard.

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (CHLOROBENZENE)
1000 ppm: Any powered air-purifying respirator with organic vapor cartridge(s). * Substance causes eye irritation or damage; eye protection needed. / Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s).
1875 ppm: Any supplied-air respirator operated in a continuous flow mode. * Substance causes eye irritation or damage; eye protection needed.
2400 ppm: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any self-contained breathing apparatus with a full facepiece. / Any

supplied-air respirator with a full facepiece.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.

ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID (NIOSH):
EYE:
FLUSH THOROUGHLY WITH WATER.
SKIN:
REMOVE CONTAMINATED CLOTHING, WASH EXPOSED AREA WITH SOAP AND WATER.
INHALATION:
REMOVE TO CLEAN AIR; ADMINISTER OXYGEN AS NEEDED.
INGESTION:
DILUTE BY DRINKING WATER; IF VOMITING OCCURS, ADMINISTER MORE WATER. ADMINISTER SALINE LAXATIVE.

CHEMTOX DATA

---------- IDENTIFIERS ----------

CHEMTOX RECORD 106 LAST UPDATE OF THIS RECORD: 09/01/89

NAME: CHLOROFORM

SYNONYMS: CHLOROFORM (DOT); CHLOROFORME (French); CLOROFORMIO (Italian); FORMYL TRICHLORIDE; FREON 20; METHANE TRICHLORIDE; METHANE, TRICHLORO-; METHENYL TRICHLORIDE; METHYL TRICHLORIDE; NCI-C02686; R 20; R 20 (REFRIGERANT); TCM; TRICHLOORMETHAAN (Dutch); TRICHLORMETHAN (Czech); TRICHLOROFORM; TRICHLOROMETHANE; TRICLOROMETANO (Italian)

CAS: 67-66-3 RTECS: FS9100000

FORMULA: CHCl3 MOL WT: 119.38

CHEMICAL CLASS: CHLORINATED HC

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: A CLEAR, COLORLESS MOBILE LIQUID WITH A CHARACTERISTIC ODOR

BOILING POINT: 333.65 K 60.5 C 140.9 F

MELTING POINT: 210.15 K -63 C -81.4 F

FLASH POINT: NA

AUTO IGNITION: NA

VAPOR PRESSURE: 160 MM

UEL: NA

LEL: NA

IONIZATION POTENTIAL (eV): 11.42

VAPOR DENSITY: 4.1 air=1

SPECIFIC GRAVITY: 1.49 20C

DENSITY: 1.49 g/cc or 13.857 lb/gal

WATER SOLUBILITY: 0.8%

INCOMPATIBILITIES: STRONG CAUSTICS, CHEMICALLY ACTIVE METALS, SUCH AS ALUMINUM, MAGNESIUM POWDER, SODIUM, POTASSIUM

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: DECOMPOSES SLOWLY IN SUNLIGHT, REACTION MAY BE ACCELERATED BY IRON AND WATER AT HIGH TEMPERATURES Source: THIC

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: HCl, PHOSGENE

ODOR DETECTED AT (ppm): 205-307

ODOR DESCRIPTION: PLEASANT, SWEET; ETHEREAL Source: CHRIS

100 % ODOR DETECTION: No data

---------- TOXICITY DATA ----------

TARGET ORGANS: LIVER, KIDNEYS, HEART, EYES, SKIN, CNS
SYMPTOMS: HEADACHE, NAUSEA, DIZZINESS, DRUNKENESS, NARCOSIS. ANOREXIA, DIURESIS., THIC Source: CHRIS

CONC IDLH: 1000ppm

ACGIH TLV: 10 A2 ppm CEILING VALUE
ACGIH STEL: 50 ppm CARCINOGEN

OSHA PEL: Transitional Limits:
PEL = (C)50ppm((C)240mg/M3)
Final Rule Limits:
TWA = 2 ppm (9.78 mg/M3)

CARCINOGEN?: Y STATUS: ANIMAL POSITIVE
REFERENCES:

ANIMAL POSITIVE IARC** 20,401,79
HUMAN SUSPECTED IARC** 20,401,79
ANIMAL SUSPECTED IARC** 1,61,72

CARCINOGEN LISTS:

IARC: Carcinogen defined by IARC to be probably carcinogenic to humans, but having (usually) no human evidence.
NIOSH: Carcinogen defined by NIOSH with no further categorization.
NTP: Carcinogen defined by NTP as reasonable anticipated to be carcinogenic, with limited evidence in humans or sufficient evidence in experimental animals.
ACGIH: Carcinogen defined by ACGIH TLV Committee as a suspected carcinogen, based on either limited epidemological evidence or demonstration of carcinogenicity in experimental animals.

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)

ihl-hmn TCLo:10 mg/m3/1Y IRGGAJ 24,127,67
BEHAVIORAL
Anorexia(human)
GASTROINTESTINAL
Nausea or vomiting
GASTROINTESTINAL
Other changes

* ihl-hmn LCLo:25000 ppm/5M TABIA2 3,231,33

ihl-hmn TCLo:5000 mg/m3/7M AHBAAM 116,131,36
BEHAVIORAL
Hallucinations, distorted perceptions

LD50 value: orl-rat LD50:908 mg/kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1988)

orl-rat LD50:908 mg/kg
ihl-rat LC50:47702 ug/m3/4H
ipr-rat LD50:894 mg/kg
orl-mus LD50:36 mg/kg
ihl-mus LCLo:28 gm/m3
ipr-mus LD50:623 mg/kg
scu-mus LD50:704 mg/kg
orl-dog LDLo:1000 mg/kg
ihl-dog LCLo:100 gm/m3
ipr-dog LD50:1000 mg/kg
ivn-dog LDLo:75 mg/kg
ihl-cat LCLo:35 gm/m3/4H
orl-rbt LDLo:500 mg/kg
ihl-rbt LCLo:59 gm/m3
scu-rbt LDLo:800 mg/kg
orl-gpg LD50:820 mg/kg
ihl-gpg LCLo:20000 ppm/2H
ihl-frg LCLo:6000 mg/m3
ihl-mam LCLo:25000 ppm/5M

IRRITATION DATA: (Source: NIOSH RTECS 1988)

skn-rbt 10 mg/24H open MLD
skn-rbt 500 mg/24H MLD
eye-rbt 148 mg
eye-rbt 20 mg/24H MOD

Reproductive toxicity (1988 RTECS):
This chemical is a mammalian reproductive toxin.

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED:
FROM THE CHRIS MANUAL:
CHEMICAL GOGGLES, 50 PPM TO 2%; SUITABLE FULL-FACE MASK. ABOVE 2%: SUITABLE SELF-CONTAINED SYSTEM.

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS
** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Reasonable probability of skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly when skin becomes wet.

** REMOVE CLOTHING:
Promptly remove non-impervious clothing that becomes contaminated.
** REFERENCE: NIOSH
RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (CHLOROFORM)
Greater at any detectable concentration. : Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID (NIOSH):
EYE:
FLUSH WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES AND GET MEDICAL ATTENTION.
SKIN:
WASH WITH SOAP AND WATER, REMOVE CONTAMINATED CLOTHING AND FREE OF CHEMICAL.
INHALATION:
IF ILL EFFECTS DEVELOP, GET VICTIM TO FRESH AIR, KEEP HIM WARM & QUIET; GET MEDICAL ATTENTION. IF BREATHING STOPS, START ARTIFICIAL RESPIRATION.
INGESTION:
INDUCE VOMITING & GET MEDICAL ATTENTION. NO KNOWN ANTIDOTE; TREAT SYMPTOMS.

CHEMTOX DATA

---------- IDENTIFIERS ----------

CHEMTOX RECORD 1655 LAST UPDATE OF THIS RECORD: 09/01/89

NAME: DICHLOROMETHANE

SYNONYMS: AEROTHENE MM; CHLORURE DE METHYLENE (French); DCM; DICHLOROMETHANE; DICHLOROMETHANE (DOT); FREON 30; METHANE DICHLORIDE; METHYLENE BICHLORIDE; METHYLENE CHLORIDE; METHYLENE CHLORIDE (DOT); METHYLENE DICHLORIDE; METYLENU CHLOREK (Polish); NARKOTIL; NCI-C50102; SOLAESTHIN; SOLMETHINE

CAS: 75-09-2 RTECS: PA8050000

FORMULA: CH2Cl2 MOL WT: 84.93

CHEMICAL CLASS:ALIPHATIC HC HALIDE

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: COLORLESS LIQUID WITH A CHLOROFORM-LIKE ODOR

BOILING POINT: 313.15 K 40 C 104 F

MELTING POINT: 176.49 K -96.7 C -142 F

FLASH POINT: NA

AUTO IGNITION: 913 K 639.8 C 1183.7 F

VAPOR PRESSURE: 440mm @ 25 C

UEL: 19 %

LEL: 12 %

IONIZATION POTENTIAL (eV): 11.35

VAPOR DENSITY: 2.9 air=1

SPECIFIC GRAVITY:

DENSITY: 1.36174g/mL @ 0 C

WATER SOLUBILITY: 1.3%

INCOMPATIBILITIES: STRONG OXIDIZERS, STRONG CAUSTICS, CHEMICALLY ACTIVE METALS, SUCH AS ALUMINUM OR MAGNESIUM POWDERS; SODIUM, POTASSIUM. REACTS VIOLENTLY WITH LITHIUM, SODIUM POTASSIUM ALLOY, POTASSIUM-TERT-BUTOXIDE, (POTASSIUM HYDROXIDE+N-METHYL-N-NITROSOUREA) "SAX

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: No data

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: PHOSGENE/CORROSIVE. HIGHLY TOXIC ARID IRRITATING FUMES "THIC. WHEN HEATED TO DECOMPOSE, EMITS HIGHLY TOXIC FUMES OF PHOSGENE "SAX.

ODOR DETECTED AT (ppm): 307

ODOR DESCRIPTION: LIKE CHLOROFORM, SWEET ETHERAL Source: CHRIS

100 % ODOR DETECTION: No data

---------- REGULATIONS ----------

"OT HAZARD CLASS: ORM-A

OT GUIDE: 74

DOT ID NUMBER: UN1593
DOT SHIPPING NAME: METHYLENE CHLORIDE
STCC NUMBER: 0

CLEAN AIR ACT: N
EPA WASTE NUMBER: U080
CERCLA REF: Y
RQ DESIGNATION: C 1000 pounds (454 kg)
SARA TPQ VALUE: Not listed
SARA Sect. 312 categories:
Chronic toxicity: carcinogen
Acute toxicity: Toxic. LD50 > 50 and <= 500 mg/kg (oral rat).
Acute toxicity: adverse effect to target organs.
Chronic toxicity: adverse effect to target organ after long period of exposure.
LISTED IN SARA Sect. 313: Yes

NFPA CODES:
HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with self-contained breathing apparatus.
FLAMMABILITY (RED) : (1) This material must be preheated before ignition can occur.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- TOXICITY DATA ----------

TARGET ORGANS: SKIN, CVS, EYES, CNS
SYMPTOMS: FATIGUE, WEAK, SLEEPY, LI-HEAD, LIMBS NUMB, TINGLE, NAU; IRRIT EYES, SKIN IRRITATION OF EYES, RESPIRATORY TRACT, HEADACHE; DIZZINESS AND STUPOR; NAUSEA, VOMITING, PARASTHESIAS OF EXTREMITIES; ANEMIA; SKIN INFLAMMATION AND SKIN BURNS; UNCONSCIOUSNESS, NARCOSIS. Source: NIOSHP, THIC, SAX

CONC IDLH: 5000PPM

ACGIH TLV: 100 ppm
ACGIH STEL: 500 ppm

OSHA PEL: Transitional Limits:
PEL = 500 ppm
1000 ppm Ceiling
MAX Peak 2000 ppm for 5 min in any 2 hrs
Final Rule Limits:
TWA = In process of 6(b) rulemaking

CARCINOGEN?: Y-POSSIBLE STATUS: ANIMAL INDEFINITE

CARCINOGEN LISTS:
IARC: Not listed
NIOSH: Not listed

ACGIH: Carcinogen defined by ACGIH TLV Committee as a suspected carcinogen, based on either limited epidemological evidence or demonstration of carcinogenicity in experimental animals.

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)

orl-hmn LDLo:357 mg/kg 34ZIAG -,390,69
PERIPHERAL NERVE AND SENSATION
Paresthesia
BEHAVIORAL
Somnolence(general depressed activity)
BEHAVIORAL
Convulsions or effect on seizure threshold

ihl-hmn TCLo:500 ppm/1Y-I ABHYAE 43,1123,68
BEHAVIORAL
Altered sleep time(including change in righting reflex)
BEHAVIORAL
Somnolence(general depressed activity)
CARDIAC
Change in rate

LD50 value: orl-rat LD50:1600 mg/kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1988)

orl-rat LD50:1600 mg/kg
ihl-rat LC50:88000 mg/m3/30M
ipr-rat LD50:916 mg/kg
ihl-mus LC50:14400 ppm/7H
ipr-mus LD50:437 mg/kg
scu-mus LD50:6460 mg/kg
unr-mus LD50:4770 mg/kg
orl-dog LDLo:3 gm/kg
ihl-dog LCLo:14108 ppm/7H
ipr-dog LDLo:950 mg/kg
scu-dog LDLo:2700 mg/kg
ivn-dog LDLo:200 mg/kg
ihl-cat LCLo:43400 mg/m3/4.5H
orl-rbt LDLo:1900 mg/kg
ihl-rbt LCLo:10000 ppm/7H
scu-rbt LDLo:2700 mg/kg
ihl-gpg LCLo:5000 ppm/2H

IRRITATION DATA: (Source: NIOSH RTECS 1988)

skn-rbt 810 mg/24H SEV
skn-rbt 100 mg/24H MOD
eye-rbt 162 mg MOD
eye-rbt 10 mg MLD
eye-rbt 500 mg/24H MLD

Reproductive toxicity (1988 RTECS):
This chemical is a mammalian reproductive toxin.

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED:
FROM THE CHRIS MANUAL:
ORGANIC VAPOR CANISTER MASK, SAFETY GLASSES, PROTECTIVE CLOTHING.

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly when skin becomes wet.

** REMOVE CLOTHING:
Promptly remove non-impervious clothing that becomes wet.

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (DICHLOROMETHANE)
750 ppm: Any supplied-air respirator. * Substance reported to cause eye irritation or damage may require eye protection. / Any self-contained breathing apparatus. * Substance reported to cause eye irritation or damage may require eye protection.
1875 ppm: Any supplied-air respirator operated in a continuous flow mode. * Substance reported to cause eye irritation or damage may require eye protection.
3750 ppm: Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece.
5000 ppm: Any supplied-air respirator with a full facepiece and operated in a pressure-demand or other positive pressure mode.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID (NIOSH):
EYE:
WASH.
SKIN:
REMOVE CONTAMINATED CLOTHING; WASH.
INHALATION:
REMOVE FROM EXPOSURE. GIVE OXYGEN IF NEEDED.
INGESTION:
NO SPECIFIC ANTIDOTE.

---------- INITIAL INCIDENT RESPONSE ----------

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.4 (1987).
DOT SHIPPING NAME: METHYLENE CHLORIDE
DOT ID NUMBER: UN1593

POTENTIAL HAZARD DOT GUIDE NUMBER 74

*HEALTH HAZARDS

Vapors may cause dizziness or suffocation.
Exposure in an enclosed area may be very harmful.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

*FIRE OR EXPLOSION

Some of these materials may burn, but none of them ignites readily.
Most vapors heavier than air.
Container may explode in heat of fire.

EMERGENCY ACTION

Keep unnecessary people away.
Stay upwind; keep out of low areas.
Self-contained breathing apparatus (SCBA) and structural firefighter's protective clothing will provide limited protection.
Isolate 1/2 mile in all directions if tank car or truck is involved in fire.
Remove and isolate contaminated clothing at the site.
CALL CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE. If water pollution occurs, notify the appropriate authorities.

*FIRE

Small Fires: Dry chemical, CO2 or Halon.
Large Fires: Water spray, fog or standard foam is recommended.
Cool containers that are exposed to flames with water from the side until well after fire is out. Stay away from ends of tanks.

SPILL OR LEAK

Stop leak if you can do it without risk.
Shut off ignition sources; no flares, smoking or flames in hazard area.
Small Liquid Spills: Take up with sand, earth or other noncombustible absorbent material.
Large Spills: Dike far ahead of liquid spill for later disposal.

FIRST AID

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen.
In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water.
Remove and isolate contaminated clothing and shoes at the site.
Use first aid treatment according to the nature of the injury.

CHEMTOX DATA

---------- IDENTIFIERS ----------

CHEMTOX RECORD 2263 LAST UPDATE OF THIS RECORD: 09/01/89

NAME: DI-SEC-OCTYL PHTHALATE

SYNONYMS: BEHP; 1,2-BENZENEDICARBOXYLIC ACID, BIS(2-ETHYLHEXYL) ESTER; BIS(2-ETHYLHEXYL)-1,2-BENZENEDICARBOXYLATE; BIS(2-ETHYLHEXYL)PHTHALATE; BISOFLEX 81; BISOFLEX DOP; COMPOUND 889; DAF 68; DEHP; DI(2-ETHYLHEXYL)ORTHOPHTHALATE; DI(2-ETHYLHEXYL)PHTHALATE; DIOCTYL PHTHALATE; DI-sec-OCTYL PHTHALATE; DOP; ERGOPLAST FDO; ETHYLHEXYL PHTHALATE; 2-ETHYLHEXYL PHTHALATE; EVIPLAST 80; EVIPLAST 81; FLEXIMEL; FLEXOL DOP; FLEXOL PLASTICIZER DOP; GOOD-RITE GP 264; HATCOL DOP; HERCOFLEX 260; KODAFLEX DOP; MOLLAN O; NCI-C52733; NUOPLAZ DOP; OCTOIL; OCTYL PHTHALATE; PALATINOL AH; PHTHALIC ACID DIOCTYL ESTER; PITTSBURGH PX-138; PLATINOL AH; PLATINOL DOP; RC PLASTICIZER DOP; REOMOL DOP; REOMOL D 79P; SICOL 150; STAFLEX DOP; TRUFLEX DOP; VESTINOL AH; VINICIZER 80; WITCIZER 312; BIS-(2-ETHYLHEXYL) PHTHALATE; DI-(2-ETHYLHEXYL) PHTHALATE; 1,2-BENZENE DICARBOXYLIC ACID,[BIS(2-ETHYLHEXYL)² ESTER; PHTHALIC ACID, BIS(2-ETHYLHEXYL)ESTER

CAS: 117-81-7 RTECS: TI0350000

FORMULA: C24H3804 MOL WT: 390.62

CHEMICAL CLASS:

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: CLEAR, COLORLESS, OILY LIQUID WITH ALMOST NO ODOR

BOILING POINT:	659.26 K	386.1 C	726.9 F
MELTING POINT:	227.04 K	-46.2 C	-51 F
FLASH POINT:	491 K	217.8 C	424.1 F
AUTO IGNITION:	663.7 K	390.5 C	734.9 F

VAPOR PRESSURE: <.01 mm Hg @ 200 C

JEL: NA

LEL: 0.3 @ 474 F

VAPOR DENSITY: 16.0 air=1

SPECIFIC GRAVITY: 0.9861 @ 20 C

DENSITY: 0.986 g/mL @ 20 C

WATER SOLUBILITY: 0.005%

INCOMPATIBILITIES: NITRATES, STRONG OXIDIZERS, STRONG ACIDS, STRONG ALKALIES

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: CAN REACT WITH OXIIZING MATERIALS; HYDROLYZES UNDER ACID OR BASIC CONDITIONS Source: CSDS

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: ACRID SMOKE

ODOR DETECTED AT (ppm):

ODOR DESCRIPTION:
100 % ODOR DETECTION: No data

---------- REGULATIONS ----------

DOT HAZARD CLASS: ORM-A
DOT GUIDE: 58
DOT ID NUMBER: UN1693
DOT SHIPPING NAME: ORM-A, N.O.S.
STCC NUMBER:

CLEAN AIR ACT: N
EPA WASTE NUMBER: U028
CERCLA REF: Y
RQ DESIGNATION: X 1 pound (0.454 kg)
SARA TPQ VALUE: Not listed
SARA Sect. 312 categories:
Chronic toxicity: carcinogen
Acute toxicity: adverse effect to target organs.
LISTED IN SARA Sect. 313: Yes

NFPA CODES:
HEALTH HAZARD (BLUE): (0) No unusual health hazard.
FLAMMABILITY (RED) : (1) This material must be preheated before ignition can occur.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- TOXICITY DATA ----------

TARGET ORGANS: GIT, SKIN, EYES.
SYMPTOMS: IRRIT EYES, MUC MEMBRANE, NAU, DIARR, LOCAL IRRITATION OF SKIN, EYES, MUCOUS MEMBRANES, AND BRONCHIA, STAGGERING, NAUSEA AND CNS DEPRESSION. Source: CSDS

CONC IDLH: N.A. ppm

ACGIH TLV: 5 mg/M3
ACGIH STEL: 10 mg/M3

OSHA PEL: Transitional Limits:
PEL = 5mg/M3
Final Rule Limits:
TWA = 5 mg/M3
STEL = 10 mg/M3

CARCINOGEN?: Y STATUS: ANIMAL POSITIVE
REFERENCES:
ANIMAL POSITIVE IARC** 28,151,82
ANIMAL POSITIVE IARC** 29,269,82
HUMAN INDEFINITE IARC** 29,269,82

CARCINOGEN LISTS:
IARC: Defined by IARC in Appendix 2 to have sufficient evidence of carcinogenicity in experimental animals.

NTP: Carcinogen defined by NTP as reasonable anticipated to be carcinogenic, with limited evidence in humans or sufficient evidence in experimental animals.
ACGIH: Not listed.

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
orl-man TDLo:143 mg/kg JIHTAB 27,130,45
GASTROINTESTINAL
Other changes

LD50 value: orl-rat LD50:30600 mg/kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1988)

orl-rat LD50:30600 mg/kg
ipr-rat LD50:30700 mg/kg
ivn-rat LD50:250 mg/kg
orl-mus LD50:30 gm/kg
ipr-mus LD50:14 gm/kg
ivn-mus LD50:1060 mg/kg
orl-rbt LD50:34 gm/kg
skn-rbt LD50:25 gm/kg
orl-gpg LD50:26 gm/kg
skn-gpg LD50:10 gm/kg

RRITATION DATA: (Source: NIOSH RTECS 1988)

skn-rbt 500 mg/24H MLD
eye-rbt 500 mg
eye-rbt 500 mg/24H MLD

Reproductive toxicity (1988 RTECS):
This chemical is a mammalian reproductive toxin.

---------- PROTECTION AND FIRST AID ----------

ROTECTION SUGGESTED:
FROM THE CHRIS MANUAL:

ECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (DI-SEC-OCTYL PHTHALATE)
reater at any detectable concentration. : Any self-contained breathing pparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode n combination with an auxiliary self-contained breathing apparatus perated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator with a igh-efficiency particulate filter. / Any appropriate escape-type elf-contained breathing apparatus.

FIRST AID (NIOSH):
YE:

SKIN:

NHALATION:

EPA REGION II
SCANNING TRACKING SHEET

DOC ID # 63412

DOC TITLE/SUBJECT:

SYOSSET LANDFILL SITE
FINAL HEALTH AND ENDANGERMENT
ASSESSMENT (PAGE 001225)

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CHEMTOX DATA

---------- IDENTIFIERS ----------

CHEMTOX RECORD 5249 LAST UPDATE OF THIS RECORD: 09/01/89

NAME: ETHYLENE, TETRACHLORO-

SYNONYMS: ANKILOSTIN; ANTISOL 1; CARBON BICHLORIDE; CARBON DICHLORIDE; CZTERDCHLORDETYLEN (Polish); DIDAKENE; DOW-PER; ENT 1,860; ETHENE, TETRACHLORO-; ETHYLENE TETRACHLORIDE; FEDAL-UN; NCI-C04580; NEMA; PER; PERAWIN; PERC; PERCHLOORETHYLEEN, PER (Dutch); PERCHLOR; PERCHLORAETHYLEN, PER (German); PERCHLORETHYLENE; PERCHLORETHYLENE, PER (French); PERCHLORDETHYLENE; PERCLENE; PERCLORDETILENE (Italian); PERCOSOLVE; PERK; PERKLONE; PERSEC; TETLEN; TETRACAP; TETRACHLOORETHEEN (Dutch); TETRACHLORAETHEN (German); TETRACHLORETHYLENE; TETRACHLORDETHENE; TETRACHLORDETHYLENE; 1,1,2,2,-TETRACHLORDETHYLENE; TETRACHLORDETHYLENE (DOT); TETRACLORDETENE (Italian); TETRALENO; TETRALEX; TETRAVEC; TETROGUER; TETROPIL

CAS: 127-18-4 RTECS: KX3850000

FORMULA: C2Cl4 MOL WT: 165.82

CHEMICAL CLASS: ALIPHATIC HC HALIDE

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: COLORLESS LIQUID, CHLOROFORM-LIKE ODOR.

BOILING POINT:	394.2 K	121 C	249.6 F
MELTING POINT:	249.65 K	-23.5 C	-10.3 F

FLASH POINT:

AUTO IGNITION: NA

VAPOR PRESSURE: 15.8MM @ 22C

FEL: NA

FEL: NA

IONIZATION POTENTIAL (eV): 9.32

VAPOR DENSITY: No data

SPECIFIC GRAVITY: 1.625 @20/4C

DENSITY: 1.6311 @ 15/4C

WATER SOLUBILITY: QUITE SOLUBLE IN H2O(0.015G/ML @20C), IT IS MISCIBLE WITH MOST O

INCOMPATIBILITIES: STRONG OXIDIZERS, CHEMICALLY ACTIVE METALS, SUCH AS BARIUM, LITHIUM, BERYLLIUM, SODIUM

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: No data

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: HCL AND PHOSGENE\CORROSIVE

ODOR DETECTED AT (ppm): 5

ODOR DESCRIPTION: ETHEREAL; LIKE CHLOROFORM; MILDLY SWEET Source: CHRIS

100 % ODOR DETECTION: No data

---------- REGULATIONS ----------

DOT HAZARD CLASS: ORM-A
DOT GUIDE: 74
DOT ID NUMBER: UN1897
DOT SHIPPING NAME: PERCHLOROETHYLENE
STCC NUMBER:

CLEAN AIR ACT:
EPA WASTE NUMBER: U210
CERCLA REF: Y
RQ DESIGNATION: X 1 pound (0.454 kg)
SARA TPQ VALUE: Not listed
SARA Sect. 312 categories:
Acute toxicity: adverse effect to target organs.
Chronic toxicity: adverse effect to target organ after long period of exposure.
LISTED IN SARA Sect. 313: Yes

NFPA CODES:
HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with self-contained breathing apparatus.
FLAMMABILITY (RED) : (0) This material does not readily burn.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- TOXICITY DATA ----------

TARGET ORGANS: SKIN, MUCOUS MEMBRANE, EYES, CNS, GASTROINTESTINAL TRACT, LIVER,
SYMPTOMS: CONJUCTIVITIS, SKIN INFLAMATION HEADACHE, DIZZINESS, FAILURE OF STRENGTH, DEFECTIVE MUSCLE CONTROL IRRITATION, TREMOR, CONVULSIONS, PARALYSIS, COMA, RESPIRATORY TRACT IRRITATION, CARDIAC IRREGULARITY, NAUSEA, VOMITING, DIARRHEA, BLOODY EXCREMENT, DROWSINESS, IRRESPONSIBILITY, APPEARANCE OF ALCOHOLIC INTOXICATION.
Source: CSDS, SAX

CONC IDLH: 500ppm

ACGIH TLV: (100) ppm SKIN
ACGIH STEL: (150) ppm

OSHA PEL: Transitional Limits:
PEL = 100
CEILING 200ppm
Final Rule Limits:
TWA = 25 ppm (170 mg/M3)

CARCINOGEN?: N STATUS: INADEQUATE EVIDENCE FOR HUMAN CARCINOGEN.

CARCINOGEN LISTS:
IARC: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed.

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)

ihl-hmn TCLo:96 ppm/7H NTIS** PB257-185
PERIPHERAL NERVE AND SENSATION
Local anesthetic
SENSE ORGANS
Eye
Conjunctive irritation
BEHAVIORAL
Hallucinations, distorted perceptions

ihl-man TCLo:280 ppm/2H AMIHBC 5,566,52
SENSE ORGANS
Eye
Conjunctive irritation
BEHAVIORAL
General anesthetic

ihl-man LDLo:2857 mg/kg MLDCAS 5,152,72
BEHAVIORAL
Coma
LUNGS, THORAX, OR RESPIRATION
Other changes

D50 value: orl-rat LD50:2629 mg/kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1986)

orl-rat LD50:2629 mg/kg
ihl-rat LC50:34200 mg/m3/8H
ipr-rat LD50:4678 mg/kg
orl-mus LD50:8100 mg/kg
ihl-mus LC50:5200 ppm/4H
scu-mus LD50:65 gm/kg
orl-dog LDLo:4000 mg/kg
ipr-dog LD50:2100 mg/kg
ivn-dog LDLo:85 mg/kg
orl-cat LDLo:4000 mg/kg
orl-rbt LDLo:5000 mg/kg
scu-rbt LDLo:2200 mg/kg

RRITATION DATA: (Source: NIOSH RTECS 1988)

skn-rbt 810 mg/24H SEV
skn-rbt 500 mg/24H MLD
eye-rbt 162 mg MLD
eye-rbt 500 mg/24H MLD

Reproductive toxicity (1988 RTECS):
This chemical is a mammalian reproductive toxin.

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED:
FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS

WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly when skin becomes contaminated.

** REMOVE CLOTHING:
Promptly remove non-impervious clothing that becomes contaminated.

** REFERENCE: NIOSH

FIRST AID (NIOSH):
EYE:
IRR IMMED
SKIN:
SOAP WASH PROMPTLY
INHALATION:
ART RESP
INGESTION:
IPECAC, VOMIT

---------- INITIAL INCIDENT RESPONSE ----------

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.4 (1987).
DOT SHIPPING NAME: PERCHLOROETHYLENE
DOT ID NUMBER: UN1897

POTENTIAL HAZARD DOT GUIDE NUMBER 74

*HEALTH HAZARDS
Vapors may cause dizziness or suffocation.
Exposure in an enclosed area may be very harmful.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

*FIRE OR EXPLOSION
Some of these materials may burn, but none of them ignites readily.
Most vapors heavier than air.
Container may explode in heat of fire.

EMERGENCY ACTION

Keep unnecessary people away.
Stay upwind; keep out of low areas.
Self-contained breathing apparatus (SCBA) and structural firefighter's protective clothing will provide limited protection.
Isolate 1/2 mile in all directions if tank car or truck is involved in fire.
Remove and isolate contaminated clothing at the site.
CALL CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE. If water pollution occurs, notify the appropriate authorities.

*FIRE
Small Fires: Dry chemical, CO2 or Halon.
Large Fires: Water spray, fog or standard foam is recommended.

Cool containers that are exposed to flames with water from the side until well after fire is out. Stay away from ends of tanks.

*SPILL OR LEAK

Stop leak if you can do it without risk.
Shut off ignition sources; no flares, smoking or flames in hazard area.
Small Liquid Spills: Take up with sand, earth or other noncombustible absorbent material.
Large Spills: Dike far ahead of liquid spill for later disposal.

*FIRST AID

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen.
In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water.
Remove and isolate contaminated clothing and shoes at the site.
Use first aid treatment according to the nature of the injury.

CHEMTOX DATA

IDENTIFIERS

CHEMTOX RECORD 407 LAST UPDATE OF THIS RECORD: 09/01/89
NAME: TRICHLOROETHYLENE
SYNONYMS: TRICHLOROETHENE; ETHYLENE TRICHLORIDE; TRICLENE
CAS: 79-01-6 RTECS: KX4550000
FORMULA: C2HCl3 MOL WT: 131
CHEMICAL CLASS: CHLORINATED HC

See other identifiers listed below under Regulations.

PROPERTIES

PHYSICAL DESCRIPTION: COLORLESS WATERY LIQUID WITH A SWEET ODOR

BOILING POINT:	359.82 K	86.6 C	188 F
MELTING POINT:	187.04 K	-86.2 C	-123 F
FLASH POINT:	NA		
AUTO IGNITION:	683 K	409.8 C	769.7 F

VAPOR PRESSURE: 58 MM
UEL: 41 %
LEL: 11 %
IONIZATION POTENTIAL (eV): 9.47
VAPOR DENSITY: 4.5 air=1
SPECIFIC GRAVITY: 1.46 20C
DENSITY: 1.460
WATER SOLUBILITY: 0.1%

INCOMPATIBILITIES: STRONG CAUSTICS; WHEN ACIDIC REACTS WITH ALUMINUM; CHEMICALLY ACTIVE METALS; BARIUM, LITHIUM, SODIUM, MAGNESIUM, TITANIUM

REACTIVITY WITH WATER: No data on water reactivity
REACTIVITY WITH COMMON MATERIALS: No data
STABILITY DURING TRANSPORT: No Data
NEUTRALIZING AGENTS: No data
POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors
ODOR DETECTED AT (ppm): 50
ODOR DESCRIPTION: CHLOROFORM-LIKE; ETHEREAL Source: CHRIS
100 % ODOR DETECTION: No data

REGULATIONS

DOT HAZARD CLASS: ORM-A
DOT GUIDE: 74
DOT ID NUMBER: UN1710
DOT SHIPPING NAME: TRICHLOROETHYLENE
STCC NUMBER: 4941771

CLEAN AIR ACT:
EPA WASTE NUMBER: U228
CERCLA REF:
RQ DESIGNATION: C 1000 pounds (454 kg)
ARA TPQ VALUE: Not listed

SARA Sect. 312
categories:

Chronic toxicity: carcinogen
Acute toxicity: Toxic. LD50 > 50 and <= 500 mg/kg (oral rat).
Acute toxicity: adverse effect to target organs.
Chronic toxicity: adverse effect to target organ after long period of exposure.

LISTED IN SARA Sect. 313: Yes

NFPA CODES:

HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with self-contained breathing apparatus.
FLAMMABILITY (RED) : (1) This material must be preheated before ignition can occur.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- TOXICITY DATA ----------

TARGET ORGANS: EYES, SKIN, NOSE, THROAT, RESP. SYSTEM, HEART, LIVER, KIDNEYS, C
SYMPTOMS: HEAD, VERTIGO, VIS DIST, TREMORS, SOMNOLENCE, NAU, VOMIT, CARD ARRHY, PARESTHESIA, IRRIT EYES, DERM, BLURRED VISION, IRRITATION OF NOSE AND THROAT, NAUSIA, ATTITUDE OF IRRESPONSIBILITY, DISTURBANCE OF CENTRAL NERVOUS SYSTEM, LACHRYMATION. INHAL OF HIGH CONC CAUSES NARCOSIS AND ANESTHESIA. Source: CHRIS,SAX

CONC IDLH: Unknown ppm

ACGIH TLV: 50 ppm
ACGIH STEL: 150 ppm

OSHA PEL: Final Rule Limits:
TWA = 50 ppm (270 mg/M3)
STEL = 200 ppm(1080 mg/M3)

CARCINOGEN?: Y STATUS: ANIMAL POSITIVE
REFERENCES:

ANIMAL SUSPECTED IARC** 20,545,79
ANIMAL POSITIVE IARC** 11,263,76
HUMAN INDEFINITE IARC** 20,545,79

CARCINOGEN LISTS:

IARC: Not listed
NIOSH: Carcinogen defined by NIOSH with no further categorization.
NTP: Not listed
ACGIH: Not listed.

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
orl-hmn LDLo:7 gm/kg ARTODN 35,295,76

. Other changes

ihl-hmn TCLo:6900 mg/m3/10M AHBAAM 116,131,36
BEHAVIORAL
Somnolence(general depressed activity)
BEHAVIORAL
Hallucinations, distorted perceptions

ihl-hmn TCLo:160 ppm/83M AIHAAP 23,167,62
BEHAVIORAL
Hallucinations, distorted perceptions

ihl-hmn TDLo:812 mg/kg BMJOAE 2,689,45
BEHAVIORAL
Somnolence(general depressed activity)
GASTROINTESTINAL
Other changes
LIVER
Jaundice,other or unclassified

ihl-man TCLo:110 ppm/8H BJIMAG 28,293,71
SENSE ORGANS
Eye
Other
BEHAVIORAL
Hallucinations, distorted perceptions

.D50 value: Not in RTECS 1988

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1988)

ihl-rat LCLo:8000 ppm/4H
ipr-rat LD50:1282 mg/kg
orl-mus LD50:2402 mg/kg
ihl-mus LC50:8450 ppm/4H
scu-mus LD50:16 gm/kg
ivn-mus LD50:33900 ug/kg
ipr-dog LD50:1900 mg/kg
scu-dog LDLo:150 mg/kg
ivn-dog LDLo:150 mg/kg
orl-cat LDLo:5864 mg/kg
ihl-cat LCLo:32500 mg/m3/2H
orl-rbt LDLo:7330 mg/kg
ihl-rbt LCLo:11000 ppm
scu-rbt LDLo:1800 mg/kg
ihl-gpg LCLo:37200 ppm/40M

'RRITATION DATA: (Source: NIOSH RTECS 1988)

skn-rbt 2 mg/24H SEV
eye-rbt 20 mg/24H MOD

eproductive toxicity (1988 RTECS):
This chemical is a mammalian reproductive toxin.

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED:
'ROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

* EXPOSED PERSONNEL SHOULD WASH:
Promptly when skin becomes wet.

* REMOVE CLOTHING:
Promptly remove non-impervious clothing that becomes wet.

* REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (TRICHLORDETHYLENE)
reater at any detectable concentration. : Any self-contained breathing
pparatus with full facepiece and operated in a pressure-demand or other
positive pressure mode. / Any supplied-air respirator with a full
acepiece and operated in pressure-demand or other positive pressure mode
n combination with an auxiliary self-contained breathing apparatus
operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a
in-style or front- or back-mounted organic vapor canister. / Any
ppropriate escape-type self-contained breathing apparatus.

IRST AID (NIOSH):
YE:
IRR IMMED
SKIN:
SOAP WASH PROMPTLY
HALATION:
ART RESP
NGESTION:
IPECAC, VOMIT

---------- INITIAL INCIDENT RESPONSE ----------

Department of Transportation Guide to Hazardous Materials Transport
Information - Publication DOT 5800.4 (1987).
DOT SHIPPING NAME: TRICHLORDETHYLENE
IT ID NUMBER: UN1710

POTENTIAL HAZARD DOT GUIDE NUMBER 74

EALTH HAZARDS
Vapors may cause dizziness or suffocation.
Exposure in an enclosed area may be very harmful.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

IRE OR EXPLOSION
Some of these materials may burn, but none of them ignites readily.
Most vapors heavier than air.
Container may explode in heat of fire.

EMERGENCY ACTION

Keep unnecessary people away.
Stay upwind; keep out of low areas.
Self-contained breathing apparatus (SCBA) and structural firefighter's protective clothing will provide limited protection.
Isolate 1/2 mile in all directions if tank car or truck is involved in fire.
Remove and isolate contaminated clothing at the site.
CALL CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE. If water pollution occurs, notify the appropriate authorities.

*FIRE

Small Fires: Dry chemical, CO2 or Halon.
Large Fires: Water spray, fog or standard foam is recommended.
Cool containers that are exposed to flames with water from the side until well after fire is out. Stay away from ends of tanks.

*SPILL OR LEAK

Stop leak if you can do it without risk.
Shut off ignition sources; no flares, smoking or flames in hazard area.
Small Liquid Spills: Take up with sand, earth or other noncombustible absorbent material.
Large Spills: Dike far ahead of liquid spill for later disposal.

*FIRST AID

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen.
In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water.
Remove and isolate contaminated clothing and shoes at the site.
Use first aid treatment according to the nature of the injury.

CHEMTOX DATA

---------- IDENTIFIERS ----------

CHEMTOX RECORD 398 LAST UPDATE OF THIS RECORD: 09/01/89
NAME: TOLUENE
SYNONYMS: TOLUOL; PHENYL METHANE; METHYL BENZENE; BENZENE, METHYL-
CAS: 108-88-3 RTECS: XS5250000
FORMULA: C7H8 MOL WT: 92
CHEMICAL CLASS:AROMATIC HC

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: COLORLESS WATERY LIQUID WITH A PLEASANT ODOR

BOILING POINT:	383.6 K	110.4 C	230.8 F
MELTING POINT:	178.00 K	-95.2 C	-139.3 F
FLASH POINT:	277.6 K	4.4 C	40 F
AUTO IGNITION:	809 K	535.8 C	996.5 F

VAPOR PRESSURE: 36.7 mm @ 30 C
UEL: 7.1 %
LEL: 1.3 %
IONIZATION POTENTIAL (eV): 8.82
VAPOR DENSITY: 3.14 air=1
SPECIFIC GRAVITY: 0.867 @ 20 C
DENSITY: 0.867 g/cc or 8.0631 lb/gal
WATER SOLUBILITY: 0.05%

INCOMPATIBILITIES: STRONG OX

REACTIVITY WITH WATER: No data on water reactivity
REACTIVITY WITH COMMON MATERIALS: No data
STABILITY DURING TRANSPORT: No Data
NEUTRALIZING AGENTS: No data
POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors
ODOR DETECTED AT (ppm): 0.17
ODOR DESCRIPTION: PUNGENT; AROMATIC, BENZENE-LIKE; DISTINCT, PLEASANT Source
100 % ODOR DETECTION: No data

---------- REGULATIONS ----------

DOT HAZARD CLASS: Flammable liquid
DOT GUIDE: 27
DOT ID NUMBER: UN1294
DOT SHIPPING NAME: TOLUENE
FDCC NUMBER: 4909305

CLEAN AIR ACT:
EPA WASTE NUMBER: U220
CERCLA REP:
RQ DESIGNATION: C 1000 pounds (454 kg)
SARA TPQ VALUE: Not listed
SARA Sect. 312 categories:

Fire hazard: flammable.
Acute toxicity: adverse effect to target organs.
Chronic toxicity: adverse effect to target organ after long period of exposure.

LISTED IN SARA Sect. 313: Yes

NFPA CODES:
HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with self-contained breathing apparatus.
FLAMMABILITY (RED) : (3) This material can be ignited under almost all temperature conditions.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- TOXICITY DATA ----------

TARGET ORGANS: CNS, LIVER, KIDNEYS, SKIN, EYES
SYMPTOMS: FAINTING, WEAKNESS, CONF, EUPHORIA, DIZZINESS, HEADACHE; DIAL PUPILS, LACRIMATION, NER, MUSCLE FATIGUE, INSOMNIA, PARESTHESIAS, DERM, PHOTO, CNS, PSYCHOTROPIC EFFECTS. Source: NIOSHP

ONC IDLH: 2000ppm

ACGIH TLV: 100 ppm
ACGIH STEL: 150 ppm

OSHA PEL: Final Rule Limits:
TWA = 100 ppm (375 mg/M3)
STEL = 150 ppm(560 mg/M3)

CARCINOGEN?: N STATUS:

CARCINOGEN LISTS:
IARC: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed.

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
orl-hmn LDLo:50 mg/kg YAKUD5 22,883,80

ihl-hmn TCLo:200 ppm JAMAAP 123,1106,43
BRAIN AND COVERINGS
Recordings from specific areas of CNS
BEHAVIORAL
Antipsychotic
BLOOD
Changes in bone marrow not included above

LD50 value: orl-rat LD50:5000 mg/kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1988)

orl-rat LD50:5000 mg/kg

ipr-rat LD50:1332 mg/kg
ivn-rat LD50:1960 mg/kg
unr-rat LD50:6900 mg/kg
ihl-mus LC50:5320 ppm/8H
ipr-mus LD50:640 mg/kg
scu-mus LD50:2250 mg/kg
unr-mus LD50:2000 mg/kg
skn-rbt LD50:12124 mg/kg
ivn-rbt LDLo:130 mg/kg
ihl-gpg LCLo:1600 ppm
scu-frg LDLo:920 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1988)

eye-hmn 300 ppm
skn-rbt 435 mg MLD
skn-rbt 500 mg MOD
skn-rbt 20 mg/24H MOD
eye-rbt 870 ug MLD
eye-rbt 2 mg/24H SEV
eye-rbt 100 mg/30S rinse MLD

Reproductive toxicity (1988 RTECS):
This chemical is a mammalian reproductive toxin.

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED:
FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly when skin becomes wet.

* REMOVE CLOTHING:
Immediately remove any clothing that becomes wet to avoid any flammability haz

REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (TOLUENE)
500 ppm: Any chemical cartridge respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection. / Any supplied-air respirator. * Substance reported to cause eye irritation or damage may require eye protection. / Any powered air-purifying respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection. / Any self-contained breathing apparatus. * Substance reported to cause eye irritation or damage may require eye protection.
2000 ppm: Any supplied-air respirator operated in a continuous flow mode. * Substance reported to cause eye irritation or damage may require eye protection. / Any self-contained breathing apparatus with a full

facepiece. / Any supplied-air respirator with a full facepiece. / Any
ir-purifying full facepiece respirator (gas mask) with a chin-style or
ront- or back-mounted organic vapor canister.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.:
Any self-contained breathing apparatus with full facepiece and operated
n a pressure-demand or other positive pressure mode. / Any supplied-air
espirator with a full facepiece and operated in pressure-demand or other
positive pressure mode in combination with an auxiliary self-contained
reathing apparatus operated in pressure-demand or other positive
ressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a
chin-style or front- or back-mounted organic vapor canister. / Any
ppropriate escape-type self-contained breathing apparatus.

FIRST AID (NIOSH):
EYE:
IRR IMMED
SKIN:
SOAP WASH PROMPTLY
INHALATION:
ART RESP
INGESTION:
NO VOMIT

---------- INITIAL INCIDENT RESPONSE ----------

Department of Transportation Guide to Hazardous Materials Transport
nformation - Publication DOT 5800.4 (1987).
DOT SHIPPING NAME: TOLUENE
DOT ID NUMBER: UN1294

POTENTIAL HAZARDS DOT GUIDE NUMBER 27

FIRE OR EXPLOSION
Flammable/combustible material; may be ignited by heat, sparks or flames.
Vapors may travel to a source of ignition and flash back.
Container may explode in heat of fire.
Vapor explosion hazard indoors, outdoors or in sewers.
Runoff to sewer may create fire or explosion hazard.

HEALTH HAZARDS
May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry.
Stay upwind; keep out of low areas.
Self-contained breathing apparatus (SCBA) and structural firefighter's protective clothing will provide limited protection.
Isolate for 1/2 mile in all direction if tank car or truck is involved in fire.
CALL CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE. If water pollution occurs, notify the appropriate authorities.

FIRE
Small Fires: Dry chemical, CO2, Halon, water spray or standard foam.

Large Fires: Water spray, fog or standard foam is recommended.
Move container from fire area if you can do it without risk.
Cool containers that are exposed to flames with water from the side until well after fire is out. Stay away from ends of tanks.
For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn.
Withdraw immediately in case of rising sound of venting safety device or any discoloration of tank due to fire.

*SPILL OR LEAK
Shut off ignition sources; no flares, smoking or flames in hazard area.
Stop leak if you can do it without risk.
Water spray may reduce vapor; but it may not prevent ignition in closed spaces.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.

*FIRST AID
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen.
In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water.
Remove and isolate contaminated clothing and shoes at the site.

CHEMTOX DATA

---------- IDENTIFIERS ----------

CHEMTOX RECORD 419 LAST UPDATE OF THIS RECORD: 09/01/89

NAME: VINYL CHLORIDE

SYNONYMS: CHLOROETHYLENE; VINYL CHLOROIDE; CHLOROETHEN; CHLOROETHYLENE; CHLORURE DE VINYLE (FRENCH); CHLORO DI VINYLE (ITALIAN); ETHYLENE MONOCHLORIDE; MONOCHLOROETHENE; MONOCHLOROETHYLENE (DOT); VINYL CHLORIDE MONOMER; VINYL C MONOMER; WINYLU CHLORED (POLISH); VCM; VCL

CAS: 75-01-4 RTECS: KU9625000

FORMULA: C2H3Cl MOL WT: 62.50

CHEMICAL CLASS: CHLORINATED HC

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: COLORLESS LIQUEFIED COMPRESSED GAS WITH A SWEET ODOR

BOILING POINT:	259.4 K	-13.8 C	7.2 F
MELTING POINT:	-119.4 K	-119.4	-119.4
FLASH POINT:	194 K	-79.2 C	-110.5 F
AUTO IGNITION:	745 K	471.8 C	881.3 F

VAPOR PRESSURE:

UEL: 26 %

LEL: 4 %

IONIZATION POTENTIAL (eV): 7.57

VAPOR DENSITY: 2.2 air=1

SPECIFIC GRAVITY: 0.969 -13C

DENSITY: 0.969 g/cc or 9.0117 lb/gal

WATER SOLUBILITY: INSOL

INCOMPATIBILITIES:

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: No data

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: POLYMERIZES IN PRESENCE OF AIR, SUNLIGHT, OR HEAT UNLESS STABILIZED BY INHIBITORS.

TOXIC FIRE GASES: HCl and unburned toxic vapors

ODOR DETECTED AT (ppm): 260

ODOR DESCRIPTION: PLEASANT, SWEET Source: CHRIS

50 % ODOR DETECTION: No data

---------- REGULATIONS ----------

DOT HAZARD CLASS: Flammable gas

DOT GUIDE: 17

DOT ID NUMBER: UN1086

DOT SHIPPING NAME: VINYL CHLORIDE; MONOCHLOROETHYLENE

CUSTOMS NUMBER: 4905792

CLEAN AIR ACT:

RCRA WASTE NUMBER: U043

CERCLA REF:
RQ DESIGNATION: X 1 pound (0.454 kg)
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Fire hazard: flammable.
Chronic toxicity: carcinogen
Sudden pressure: compressed gases.
Acute toxicity: adverse effect to target organs.
Chronic toxicity: adverse effect to target organ after long period of exposure.
Reactive hazard: unstable/reactive.
LISTED IN SARA Sect. 313: Yes

NFPA CODES:
HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with self-contained breathing apparatus.
FLAMMABILITY (RED) : (4) This material forms readily ignitable mixtures in air.
REACTIVITY (YELLOW): (1) Normally stable, but may become unstable at elevated temperature and pressures.
SPECIAL : Unspecified

---------- TOXICITY DATA ----------

TARGET ORGANS: SKIN, EYES, MUCOUS MEMBRANES, NERVOUS SYSTEM, LIVER, KIDNEYS.
SYMPTOMS: IRRITATION OF EYES, NOSE; HEADACHE; NARCOSIS; NAUSEA; VOMITING; DIARRHEA; DRY SKIN; FREEZING; INFLAMMATION; LIQUID CAUSES FROSTBITE; SHOCK, COMA, DEATH AS RESULT OF CARDIAC OR RESPIRATORY FAILURE. "VINYL CHLORIDE DISEASE." A HMN BRAIN CARC AND AN EXPER BR Source: SAX, FAM, MI

CONC IDLH: Unknown ppm

ACGIH TLV: 5 ppm HUMAN CARCINOGEN
ACGIH STEL: Not specified

OSHA PEL: Final Rule Limits:
TWA = 1 ppm (See 29 CFR 1910.1017 mg/M3)
STEL = 5 ppm

CARCINOGEN?: Y STATUS: HUMAN POSITIVE
REFERENCES:
HUMAN POSITIVE IARC** 19,377,79
ANIMAL POSITIVE IARC** 7,291,74
HUMAN SUSPECTED IARC** 7,291,74
ANIMAL POSITIVE IARC** 19,377,79
HUMAN POSITIVE IARC** 28,151,82

CARCINOGEN LISTS:
IARC: Carcinogen as defined by IARC as carcinogenic to humans, with sufficient epidemiological evidence.

NTP: Carcinogen defined by NTP as known to be carcinogenic, with evidence from human studies.
ACGIH: Carcinogen defined by ACGIH TLV Committee as a confirmed human carcinogen, recognized to have carcinogenic or cocarcinogenic potential.

_D50 value: orl-rat LD50:500 mg/kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1988)

orl-rat LD50:500 mg/kg

Reproductive toxicity (1988 RTECS):
This chemical is a mammalian reproductive toxin.

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED:
FROM THE CHRIS MANUAL:

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (VINYL CHLORIDE)
greater at any detectable concentration. : Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a thin-style or front- or back-mounted canister providing protection against the compound of concern. / Any appropriate escape-type self-contained breathing apparatus.

IRST AID (NIOSH):
EYE:

KIN:

INHALATION:
MOVE TO FRESH AIR, KEEP QUIET AND WARM, CALL DOCTOR, ARTIFICIAL RESPIRATOR.
INGESTION:

---------- INITIAL INCIDENT RESPONSE ----------

US Department of Transportation Guide to Hazardous Materials Transport nformation - Publication DOT 5800.4 (1987).
DOT SHIPPING NAME: VINYL CHLORIDE; MONOCHLOROETHYLENE
DOT ID NUMBER: UN1086

POTENTIAL HAZARDS DOT GUIDE NUMBER 17

*FIRE OR EXPLOSION
Extremely flammable.
May be ignited by heat, sparks and flames.
Vapors may travel to a source of ignition and flash back.
Container may explode violently in heat of fire.
Vapor explosion hazard indoors, outdoors or in sewers.

*HEALTH HAZARDS

If inhaled, may be harmful; contact may cause burns to skin and eyes.
Vapors may cause dizziness or suffocation.
Contact with liquid may cause frostbite.
Fire may produce irritating or poisonous gases.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry.
Stay upwind, out of low areas, and ventilate closed spaces before entering.
Self-contained breathing apparatus (SCBA) and structural firefighter's protective clothing will provide limited protection.
Isolate for 1/2 mile in all directions if tankcar or truck is involved in fire.
CALL CHEMTREC AT 1-800-424-9300 AS SOON AS POSSIBLE, especially if there is no local hazardous team available.

*FIRE

Let tank car, tank truck or storage tank burn unless leak can be stopped: with smaller tanks or cylinders, extinguish/isolate from other flammables.
Small Fires: Dry chemical, CO2 or Halon.
Large Fires: Water spray, fog or standard foam is recommended.
Move container from fire area if you can do it without risk.
For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn.
Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.
Cool container with water using unmanned device until well after fire is out.

*SPILL OR LEAK

Shut off ignition sources; no flares, smoking or flames in hazard area.
Stop leak if you can do it without risk.
Water spray may reduce vapors; but it may not prevent ignition in closed spaces.
Isolate area until gas has dispersed.

*FIRST AID

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen.
In case of frostbite, thaw frosted parts with water.
Keep victim quiet and maintain normal body temperature.