HEALTH CONSULTATION

HEALTH IMPACT OF CONTAMINANTS IN SOIL, AIR AND TAP WATER

MONTROSE CHEMICAL CORPORATION

TORRANCE, LOS ANGELES COUNTY, CALIFORNIA

CERCLIS NO. CAD008242711

AND

DEL AMO FACILITY

LOS ANGELES, LOS ANGELES COUNTY, CALIFORNIA

CERCLIS NO. CAD029544731

MAY 1995

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members.

This document has previously been released for a 30 day public comment period. Subsequent to the public comment period, ATSDR addressed all public comments and revised or appended the document as appropriate. The health consultation has now been reissued. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conlusions previously issued.

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Prepared By

California Department of Health Services
Under a Cooperative Agreement with
The Agency for Toxic Substances and Disease Registry

BACKGROUND AND STATEMENT OF ISSUES

The Montrose site is located in the city of Torrance, California. The Del Amo site, another hazardous waste site, is located directly west of the Montrose site in the city of Los Angeles, California. From 1947 to 1982, Montrose manufactured, formulated, and ground the insecticide DDT (dichlorodiphenyltrichloroethane) at its 13-acre facility. As for the Del Amo site, it was built and operated by the United States government to produce synthetic rubber from 1943 until mid- to late 1960s. The facility consisted of three plants: a styrene plant, a butadiene plant, and a synthetic rubber plant. Various companies leased and operated the plants from the government until 1955. That year, the Shell Chemical Company purchased the plants and continued operation until sometime between 1969 and 1972.

In 1984, the United States Environmental Protection Agency (USEPA) placed the Montrose site on the National Priorities List (NPL) of hazardous wastes sites because of potential contamination to the soil, groundwater, and air due to the migration of DDT (all isomers of DDT and its degradation products DDD and DDE) and other chemicals off-site via surface water runoff into drainage ditches and canals, discharges to the sanitary sewer system, airborne dispersion, and percolation to groundwater. In 1991, USEPA proposed that the Del Amo site be listed on the NPL because the handling, storage, and disposal practices of the raw materials, products, and by-products by the personnel of the synthetic rubber manufacturing facility appear to have resulted in soil, air, and groundwater contamination. The primary contaminants associated with the Del Amo site include volatile aromatic hydrocarbons (e.g., benzene and ethylbenzene) and polycyclic aromatic hydrocarbons (e.g., naphthalene, benzo(a)pyrene, phenanthrene, and chrysene). Although past activities at both sites may have contributed to contamination of the soil, groundwater, and air, it would be difficult, if not impossible, to delineate the extent of contamination contributed by either the Montrose site or the Del Amo site because there are several other known hazardous waste sites, such as landfills, refineries, and manufacturing facilities, in the immediate area in addition to vehicular traffic from the two major highways.

In 1995, the Del Amo community requested the Agency for Toxic Substances and Disease Registry (ATSDR) and the Environmental Health Investigations Branch (EHIB) of the California Department of Health Services (CDHS) to review the data from the field investigation work (viz., soil, dust, tap water, and indoor air) conducted along West 204th Street during July-August, 1994. This particular health consultation focuses on the soil, tap water, and air data.

DISCUSSION

A) SUMMARY OF THE CONTAMINANTS DETECTED IN THE SOIL

In July 1994, USEPA collected subsurface soil samples to depths of up to 19 feet along West 204th Street. Twenty-eight properties were sampled: 965, 971, 1005, 1006, 1009, 1010, 1013, 1017/1019, 1020, 1021, 1029, 1033, 1035, 1036, 1038, 1039/1039.5, 1041/1041.5, 1043/1043.5, 1050, 1051, 1054, 1055, 1058, 1063, 1101, 1107, 1113, and 1117. See Figure 1. The soil samples were analyzed for pesticides (P), semivolatile organic compounds

(SVOC), and volatile organic compounds (VOC) [which are listed in Table 1]. Also, a specific analytical method, the immunoassay test, was used to analyze randomly selected soil samples for DDT.

The soil sample results for 965, 971, 1005, 1009, 1010, 1021, 1029, 1033, 1035, 1036, 1038, 1039/1039.5, 1050, 1058, 1063, 1107, and 1113 were all non-detect for pesticides, semivolatile organic compounds, and volatile organic compounds. The following pesticides DDD, DDE, DDT, methoxychlor, or 2-methylphenol were detected in the soil sample(s) collected at 1006, 1013, 1017/1019, 1020, 1041/1041.5, 1043/1043.5, 1054, 1101, and 1117, but at levels below health comparison values. Also, three additional pesticides, alpha-chlordane (1 ppb), arochlor-1260 (30 ppb), and endosulfan sulfate (4 ppb) were detected at low levels in soil samples collected at 1017/1019, 1041/1041.5, and 1101, respectively. No health comparison levels were available for these pesticides.

At 1051, two semivolatile organic compounds [viz., benzo(a)pyrene, and phenol] were detected in the soil samples; benzo(a)pyrene was detected slightly above the health comparison value, but phenol was detected below the health comparison value. A soil boring taken behind the property at a depth between 1.7 to 3.0 feet contained 4,100 ppb DDT (which is above the health comparison value). At other depths, several other pesticides (viz., DDE and DDT) and semivolatile organic compounds [viz., bis(2-chloroethyl)-ether, bis(2-ethylhexyl)phthalat, di-n-octylphthalate, and acenaphthene] were detected but at levels below the health comparison values. Also, two additional semivolatile organic compounds, 3-nitroaniline (75 ppb) and phenanthrene (120 ppb), were detected. No health comparison levels were available for either contaminant.

In the soil samples collected behind 1055, several pesticides (viz., DDD, DDE, DDT, aldrin, heptachlor epoxide, and dieldrin) and semivolatile organic compounds (viz., anthracene, fluoranthene, phenol, and pyrene) were detected, but at levels below their respective health comparison values. However, one semivolatile organic compound, benzo(a)pyrene was detected at 400 ppb, which is above the health comparison value. Six semivolatile organic compounds [viz., acenaphthylene (84 ppb), benzo(a)anthracene (76 ppb), benzo(b)fluoranthene (1,200 ppb), chrysene (91 ppb), indeno(1,2,3-cd)pyrene (600 ppb), and diben(a,h)anthracene (2,100 ppb)], and two pesticides [viz., endrin aldehyde (2 ppb) and gamma-chlordane (1 ppb)] were detected in the soil samples; however, there are no health comparison values for these chemicals.

For the soil samples analyzed with the immunoassay test method, DDT was detected in ten soil borings taken from depths up to twenty-one feet. The soil borings analyzed from 1006, 1054, and behind 1101 contained DDT (viz., 500 ppb, 600 ppb, and 600 ppb, respectively), but at levels below the health comparison value. On the other hand, DDT was detected at 1013 and 1051, and behind 1051 and 1055 at levels above the health comparison level. The maximum level of DDT detected at 1013 was 3,000 ppb (1.0-1.5 feet), at 1051 was 1,000 ppb (at 1.0-3.0 feet), behind 1051 was 26,000 ppb (2.0-4.0 feet), and behind 1055 was 2,000 ppb (at 1.0-3.0 & 2.9-4.0 feet).

B) SUMMARY OF THE CONTAMINANTS DETECTED IN THE TAP WATER

During August and September 1994, USEPA, in conjunction with the Dominguez Water Company, collected tap water samples from the properties located on West 204th Street. Twenty-five properties were sampled: 1017, 1019, 1023, 1029, 1033, 1035, 1036, 1038, 1039, 1039.5, 1040, 1041.5, 1043, 1043.5, 1050, 1051, 1054, 1054 (trailer), 1054 (detached), 1055, 1058, 1061, 1061R, 1063, 1063R. The tap water samples were analyzed for pesticides (P), semivolatile organic compounds (SVOC), and volatile organic compounds (VOC) [which are listed in Table 2].

The principle contaminants in all the tap water samples collected contained low levels of trihalomethanes (viz., chloroform, bromodichloromethane, dibromochloromethane, and bromoform). The usage of chlorine for the disinfection of the water supply may have resulted in the production of these trihalomethanes. The amount of trihalomethanes produced increases substantially as the pH of the water becomes more alkaline (6); thus, the levels of trihalomethanes can vary in the water supply. The total trihalomethanes levels in the tap water samples collected ranged between 0.37 ppb to 70 ppb. The maximum total trihalomethane level allowable in all community water systems is 100 ppb; therefore, all the tap water samples contained acceptable levels (10). Two other halogenated hydrocarbons (viz., dibromomethane and bromochloromethane) were also detected in the tap water samples. Again, the usage of chlorine for the disinfection of the water supply may have resulted in the production of these halogenated hydrocarbons. The levels of bromochloromethane ranged between 0.2 ppb to 4 ppb and the levels of dibromomethane ranged between 0.2 ppb to 1 ppb. Although accurate quantitative data are not available for the levels of halogenated hydrocarbons in chlorinated waters, the typical levels are less than 1 ppb. The majority of the mono- and di-halogenated hydrocarbons were below 1 ppb. However, the tap water sampled at 1041.5 and 1050 contained slightly greater levels of bromomethane (viz., 4 ppb and 2 ppb, respectively), but these levels are below health comparison values. The tap water sample from 1017 contained low levels of sec-butylbenzene (0.1 ppb). There are no health comparison values for sec-butylbenzene. At present, the source of sec-butylbenzene is unknown; thus, further investigation is warranted.

C) SUMMARY OF THE CONTAMINANTS DETECTED IN THE INDOOR AIR

During August and September 1994, USEPA collected indoor air samples from the properties located on West 204th Street. Twenty-five properties were sampled: 1017, 1019, 1023, 1029, 1033, 1035, 1036, 1038, 1039, 1039.5, 1040, 1041.5, 1043, 1043.5, 1050, 1051, 1054, 1054 (trailer), 1054 (detached), 1055, 1058, 1061, 1061R, 1063, 1063R. The indoor air samples were analyzed for semivolatile organic compounds (SVOC), and volatile organic compounds (VOC). See Table 3.

The results of the indoor air samples were compared to both the ATSDR's health comparison levels and the Los Angeles indoor air reference levels; unfortunately, historical data do not exist for all the contaminants detected (12). Comparison to the latter, the Los Angeles

indoor air reference levels, is especially important because many of the contaminants detected in the indoor air samples in the properties located along West 204th Street have been detected in the indoor air of homes in the Los Angeles area that have not been impacted by either the Montrose site or the Del Amo site. For many industrialized urban areas in the United States, low levels of airborne contaminants are ubiquitous; thus, the air pollution problem in Los Angeles County is not an unusual or unique phenomenon.

The levels of benzene in 24 of the indoor air samples collected in the properties along West 204th Street contain levels of benzene (< 0.50 ppb to 1.3 ppb) well below the Los Angeles indoor air reference level of 3.63 ppb. The Montrose site, Del Amo site, or one of the other known hazardous waste sites in the immediate vicinity may have contributed to the source of the benzene contamination of the indoor air samples; however, it would not be possible to target any of the hazardous waste sites as the sole culprit because benzene is ubiquitous in the environment. Furthermore, in addition to hazardous waste sites, benzene is also released from a wide gamut of "everyday" sources such as auto exhaust, gasoline vapors, off-gassing of particle boards, cigarette smoke, exhaled breath of smokers, etc. (8).

In two properties sampled (i.e., 1051 and 1063R), the levels of benzene were elevated (i.e., 12 ppb and 9 ppb, respectively). Although benzene is a primary contaminant at the Del Amo site, it would be difficult, if not impossible, to state that this specific site is the sole contributor of the benzene contamination. Thus, in order to gain a better understanding on the source of the benzene contamination in the indoor air samples, further investigations at these two properties are warranted.

In the majority of the indoor air samples, there were a wide assortment of volatile organic compounds (viz., 1,1,1-trichloroethane, toluene, ethylene benzene, m-,p-,o- xylene, styrene, 1,3,5-trimethylbenzene, 1,2,4-trimethylbenzene, p-isopropyltoluene, 1,4-dichlorobenzene, and 1,2 -dichlorobenzene) and semivolatile organic compounds (viz., acenaphtylene, napthalene, fluorene, fluoranthene, beta-, gamma-, delta-BHC, acenaphthene, phenanthrene, pyrene, and DDT, anthracene) detected. The levels detected were below (or slightly above) the Los Angeles indoor air reference levels. Also, the levels detected were below the health comparison levels. The source(s) of the contaminants can not be easily ascertained because a majority of the levels are comparable to levels in properties not impacted by either the Montrose or Del Amo sites.

For 1054 (detached), the level of tetrachloroethylene was detected at an elevated level, 11 ppb. Tetrachloroethylene is widely detected in relatively low levels (i.e., < 2 ppb) in the environment because of releases via industrial emissions, waste disposal sites, and consumer products. However, higher levels (means of 6 ppb and 10 ppb) have been detected downwind of a chemical laundry and a rubber factory, respectively, in Hamburg, Germany (9). Thus, in order to determine the source(s) of the high level of tetrachloroethylene detected in the indoor air sample at 1054 (detached), further investigation is warranted.

There were no health comparison levels found for a few contaminants (viz., 1,3,5-trimethylbenzene, 1,2,4-trimethylbenzene, p-isopropyltoluene, delta-BHC); however, the levels of the four contaminants detected in the indoor air samples were very low (i.e., the maximum levels detected were < 0.50 ppb, 0.96 ppb, < 0.50 ppb, and 0.00020 ppb, respectively.)

C.1) Health Impact of the Elevated Levels of Benzene and Tetrachloroethylene in the Indoor Air

CDHS estimated the benzene and tetrachloroethylene inhalation doses. These doses were then compared to noncancer health comparison values and were also used to estimate cancer risk.

Noncancer: The inhalation dose for benzene exceeded ATSDR's acute MRL (2 ppb). A Minimal Risk Level, which is developed by ATSDR, and a Reference Dose, which is similar to a MRL, but is developed by USEPA, are estimates of daily exposure of a human being to a chemical that is likely to be without an appreciable risk of noncarcinogenic effects over a specific duration of exposure (viz., acute: less than 14 days; intermediate: greater than 14 days, but less than 1 year; and chronic: greater than 1 year). The MRL and the RfD are based on non-toxic exposure levels in animals extrapolated to human being using several orders of safety factors. Although the estimated doses exceeded the health guidance level, this does not mean that noncancer health effects will or have occurred because there are several orders of safety factors built into the MRL and the RfD. Furthermore, adverse noncancer health effects have only been documented in workers exposed to high levels of benzene (in the parts per million range).

The inhalation dose for tetrachloroethylene did not exceed ATSDR's acute MRL (600 ppb) but exceeded ATSDR's intermediate MRL (9 ppb). Although the estimated doses exceeded the health guidance level, this does not mean that noncancer health effects will or have occurred because, once again, there are several orders of safety factors built into the MRL and the RfD. The health effects of breathing low levels of tetrachloroethylene in air is not known; however, in occupational settings, adverse noncancer health effects may develop in workers who are exposed to high levels of tetrachloroethylene.

Cancer Risk: In order to calculate the increased lifetime cancer risk, it was assumed that adults were exposed for a 9- or a 30-year period. The exposure to benzene at the level of 9 ppb for a period of 9 years may result in a potential lifetime excess cancer risk of 1 in 32,000, which translates as "very low increased risk," and for a time period of 30 years, the potential lifetime excess cancer risk is 1 in 9,000 which translates as "low increased risk." The exposure to benzene at the level of 12 ppb for a period of 9 years may result in a potential lifetime excess cancer risk of 1 in 24,000 which translates as "very low increased risk," and for a time period of 30 years, the potential lifetime excess cancer risk is 1 in 7,000 which also translates as "low increased risk." The United States Department of Health

and Human Services (DHHS) has determined that benzene is a known human carcinogen (8). Long-term exposure to relatively high levels of benzene in the air can cause leukemia (cancer of the blood).

The exposure to tetrachloroethylene at the level of 11 ppb for a period of 9 years may result in a potential lifetime excess cancer risk of 1 in 180,000 which translates as "no apparent increased risk" and for a time period of 30 years, the potential lifetime excess cancer risk is 1 in 54,000 which translates as "very low increased risk." Tetrachloroethylene has not been shown to cause cancer in humans. Despite this, DHHS has determined that it may reasonably be anticipated to be a carcinogen (9).

CONCLUSIONS

Based on the subsurface soil data reviewed and the information provided, the levels of pesticides, semivolatile organic compounds, and volatile organic compounds do not appear to pose health concerns with the exception of the soil sampled from 1013 and 1051, behind the properties of 1051 and 1055. The principle contaminant of concern is DDT. At 1051 and behind 1055, benzo(a)pyrene was detected at 130 ppb (sampled at a depth between 3.75 to 5.0 feet) and 400 ppb (sampled at a depth between 1.0 to 3.0 feet), respectively. Ingestion or dermal doses were not calculated because the contaminants were detected in subsurface soil samples.

The tap water samples do not appear to be contaminated by pesticides, semivolatile organic compounds, or volatile compounds related to the Montrose or Del Amo Superfund sites. However, at 1017, a low level of sec-butylbenzene was detected. Because there is no health comparison value and the source is unknown, further investigation is warranted.

A wide gamut of semivolatile organic compounds and volatile organic compounds were detected in the indoor air samples; the levels detected were either below the Los Angeles indoor air reference levels and/or below the health comparison levels. At 1051 and 1063R, the indoor air levels of benzene were elevated, and at 1054 (detached), the indoor air level of tetrachloroethylene was elevated; thus, further investigation is warranted. Because of this, CDHS estimated the benzene and tetrachloroethylene inhalation doses and the cancer risks. The inhalation dose for benzene exceeded ATSDR's MRL. The exposure to benzene at the level of 9 ppb for a period of 9 years may result in a "very low increased cancer risk," and for a time period of 30 years, the result may be "a low increased cancer risk." As for tetrachloroethylene, the inhalation dose did not exceed ATSDR's acute MRL but exceeded ATSDR's intermediate MRL. The exposure to tetrachloroethylene at the level of 11 ppb for a period of 9 years may result in "no apparent increased cancer risk," and for a time period of 30 years, the result may be a "very low increased cancer risk."

RECOMMENDATIONS

1) ATSDR's Division of Toxicology should consider providing additional health comparison information for the pesticides: alpha-chlordane, arochlor, endosulfan sulfate, endrin aldehyde, and gamma-chlordane; and the semivolatile organic compounds: 3-nitroaniline, phenanthrene, benzo(a)anthracene, benzo(b)fluoranthene, chrysene, indeno(1,2,3-cd)pyrene, and diben(a,h)anthracene because there are no comparison values. The additional information on the contaminants would provide valuable insight as to whether there is a significant human health concern as a result of exposure to them.

2) USEPA should resample, if possible, the tap water at 1017 to confirm the level of sec-butylbenzene.

3) USEPA should resample, if possible, the indoor air at 1051 and 1063R to confirm the elevated levels of benzene.

4) USEPA should resample, if possible, the indoor air at 1054 (detached) to confirm the elevated level of tetrachloroethylene.

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DOCUMENTS REVIEWED

1) ATSDR Draft Soil Comparison Values and Health Guidelines for Selecting Environmental Contaminants for Further Evaluation. Expires 12/31/94.
2) Hawley, J. K., Assessment of Health Risk from Exposure to Contaminated Soil. Risk Analysis, Vol. 5(4):289-302, 1985.
3) ATSDR Preliminary Public Health Assessment for Del Amo Facility, Los Angeles, Los Angeles County, California. Cerclis No. CAD029544731. 1/12/94.
4) ATSDR Preliminary Public Health Assessment for Montrose Chemical Corporation, Torrance, Los Angeles County, California. Cerclis No. CAD008242711. 10/26/94.
5) United States Environmental Protection Agency (USEPA), Region IX, Region IX Preliminary Remediation Goals (PRGs) Second Half, August 1994.
6) World Health Organization, International Agency for Research on Cancer (IARC). IARC Monographs on the Evaluation of Carcinogenic Risks to Humans: Chlorinated Drinking-water; Chlorination By- products; Some Other Halogenated Compounds; Cobalt and Cobalt Compounds, Vol. 52, June 12-19, 1990.
7) ATSDR Toxicological Profile for Carbon Tetrachloride (Update), TP-93/02.
8) ATSDR Toxicological Profile for Benzene, TP-92/03.
9) ATSDR Toxicological Profile for Tetrachloroethylene, TP-92/18.
10) Code of Federal Regulations (CFR), CFR 40, Parts 100 to 149, Revised as of July 1, 1993.
11) Park, JK et al, Permeation of Plastic Pipes by Organic Chemicals, Interagency Agreement No. 84/84371 between the California Department of Health Services and the Regents of the University of California, Berkeley, Department of Civil Engineering-Sanitary Engineering and Environmental Health Research Laboratory, January 1989.
12) USEPA letter (dated 11/15/94) to the residents along West 204th Street (re: explanation for the tap water, indoor air, and subsurface soil results), by John Blevins, Section Chief.

CERTIFICATION

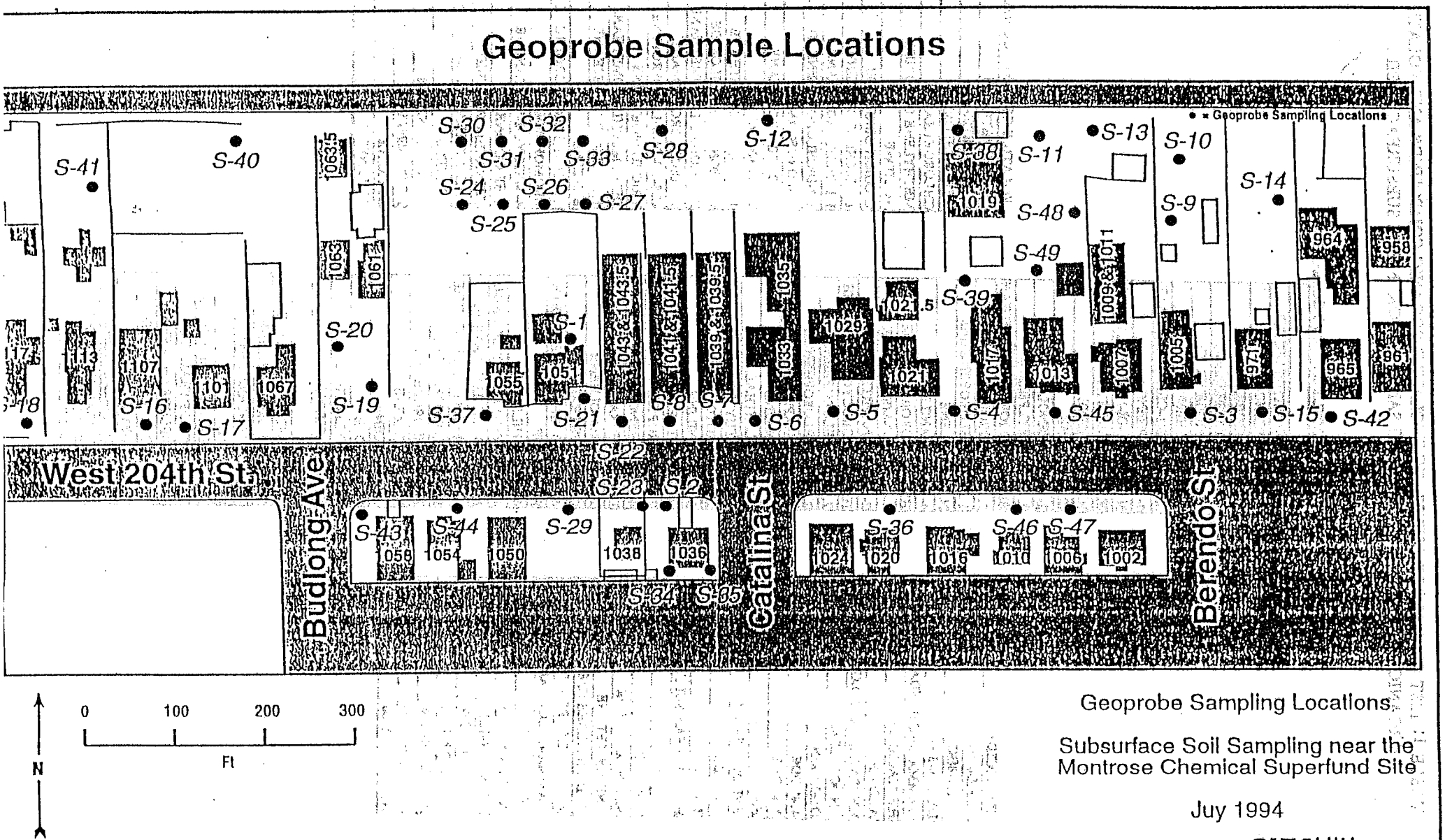
The Montrose and Del Amo Health Consultation for Soil, Air, and Tap Water Samples has been prepared by the California Department of Health Services under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was initiated.

Gail D. Godfrey
Technical Project Officer, SPS, RPB, DHAC

The Division of Health Assessment and Consultation, ATSDR, has reviewed this health consultation and concurs with its findings.

Sharon Williams-Fleetwood
Chief, Superfund Site Assessment Branch

FIGURE 1: DIAGRAM OF THE SOIL SAMPLE LOCATIONS ALONG WEST 204TH STREET



E69132.02.02 11/2/94 RTW Montrose LOCATIONS (large)

TABLE 1: LIST OF THE PESTICIDES, SEMIVOLATILE ORGANIC COMPOUNDS AND VOLATILE ORGANIC COMPOUNDS THAT WERE SAMPLED FOR IN THE SUBSURFACE SOIL.

PESTICIDES
ALPHA-BHC
BETA-BHC
DELTA-BHC
GAMMA-BHC (LINDANE)
HEPTACHLOR
ALDRIN
HEPTACHLOR EPOXIDE
ENDOSULFAN I
DIELDRIN
4,4'-DDE
2,4'-DDE
ENDRIN
ENDOSULFAN II
4,4'-DDD
2,4'-DDD
ENDOSULFAN SULFATE
4,4'-DDT
2,4'-DDT
METHOXYCHLOR
ENDRIN KETONE
ENDRIN ALDEHYDE
ALPHA-CHLORDANE
GAMMA-CHLORDANE
TOXAPHENE
AROCLOR-1016
AROCLOR-1221
AROCLOR-1232
AROCLOR-1242
AROCLOR-1248
AROCLOR-1254
AROCLOR-1260

SEMIVOLATILE ORGANIC COMPOUNDS
PHENOL
BIS(2-CHLOROETHYL)ETHER
2-CHLOROPHENOL
1,3-DICHLOROBENZENE
1,4-DICHLOROBENZENE
1,2-DICHLOROBENZENE
2-METHYLPHENOL
2,2'-OXYBIS(1-CHLOROPROPANE
4-METHYLPHENOL
N-NITROSO-DI-N-PROPYLAMINE
HEXACHLOROETHANE
NITROBENZENE
ISOPHORONE
2-NITROPHENOL
2,4-DIMETHYLPHENOL
BIS(2-CHLOROETHOXY)METHAN
2,4-DICHLOROPHENOL
1,2,4-TRICHLOROBENZENE
NAPHTHALENE
4-CHLOROANILINE
HEXACHLOROBUTADIENE
4-CHLORO-3-METHYLPHENOL
2-METHYLNAPHTHALENE
HEXACHLOROCYCLOPENTADIE
2,4,6-TRICHLOROPHENOL
2,4,5-TRICHLOROPHENOL
2-CHLORONAPHTHALENE
2-NITROANILINE
DIMETHYLPHTHALATE
ACENAPHTHYLENE
2,6-DINITROTOLUENE
3-NITROANILINE
ACENAPHTHENE
2,4-DINITROPHENOL
4-NITROPHENOL
DIBENZOFURAN
2,4-DINITROTOLUENE
DIETHYLPHTHALATE
4-CHLOROPHENYL-PHENYLETH
FLUORENE
4-NITROANILINE
4,6-DINITRO-2-METHYLPHENOL
N-NITROSODIPHENYLAMINE
4-BROMOPHENYL-PHENYLETHE
HEXACHLOROBENZENE
PENTACHLOROPHENOL
PHENANTHRENE
ANTHRACENE
CARBAZOLE
DI-N-BUTYLPHTHALATE
FLUORANTHENE
PYRENE
BUTYLBENZYLPHTHALATE
3,3'-DICHLOROBENZIDINE
BENZO(A)ANTHRACENE
CHRYSENE
BIS(2-ETHYLHEXYL)PHTHALATE
DI-N-OCTYLPHTHALATE
BENZO(B)FLUORANTHENE
BENZO(K)FLUORANTHENE
BENZO(A)PYRENE
INDENO(1,2,3-CD)PYRENE
DIBENZ(A,H)ANTHRACENE
BENZO(G,H,I)PERYLENE

VOLATILE ORGANIC COMPOUNDS
CHLOROMETHANE
BROMOMETHANE
VINYL CHLORIDE
CHLOROETHANE
METHYLENE CHLORIDE
ACETONE
CARBON DISULFIDE
1,1-DICHLOROETHENE
1,1-DICHLOROETHANE
1,2-DICHLOROETHENE (TOTAL)
CHLOROFORM
1,2-DICHLOROETHANE
2-BUTANONE
1,1,1-TRICHLOROETHANE
CARBON TETRACHLORIDE
BROMODICHLOROMETHANE
1,2-DICHLOROPROPANE
CIS-1,3-DICHLOROPROPENE
TRICHLOROETHENE
DIBROMOCHLOROMETHANE
1,1,2-TRICHLOROETHANE
BENZENE
TRANS-1,3-DICHLOROPROPENE
BROMOFORM
4-METHYL-2-PENTANONE
2-HEXANONE
TETRACHLOROETHENE
1,1,2,2-TETRACHLOROETHANE
TOLUENE
CHLOROBENZENE
ETHYLBENZENE
STYRENE
XYLENES (TOTAL)

TABLE 2: LIST OF THE PESTICIDES, SEMIVOLATILE ORGANIC COMPOUNDS AND VOLATILE ORGANIC COMPOUNDS THAT WERE SAMPLED FOR IN THE TAP WATER.

PESTICIDES
alpha-BHC
beta-BHC
delta-BHC
gamma-BHC (Lindane)
Heptachlor
Aldrin
Heptachlor epoxide
Endosulfan I
Dieldrin
4,4'-DDE
Endrin
Endosulfan II
4,4'-DDD
Endosulfan sulfate
4,4'-DDT
Methoxychlor
Endrin ketone
Endrin aldehyde
alpha-Chlordane
gamma-Chlordane
Toxaphene
Aroclor-1016
Aroclor-1221
Aroclor-1232
Aroclor-1242
Aroclor-1248
Aroclor-1254
Aroclor-1260
Chloneb
Chlorobenzilate
Chlorothalonil
DCPA
Etridiazole
Hexachlorobenzene
cis-Permethrin
trans-Permethrin
Propachlor
Trifluralin

SEMIVOLATILE ORGANIC COMPOUNDS
Phenol
bis(2-Chloroethyl)ether
2-Chlorophenol
2-Methylphenol
2,2'-oxybis(1-Chloropropane)
4-Methylphenol
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
4-Chloroaniline
Hexachlorobutadiene
4-Chloro-3-methylphenol
2-Methylnaphthalene
Hexachlorocyclopentadiene
2,4,6-Trichlorophenol
2,4,5-Trichlorophenol
2-Chloronaphthalene
2-Nitroaniline
Dimethylphthalate
Acenaphthylene
2,6-Dinitrotoluene
3-Nitroaniline
Acenaphthene
2,4-Dinitrophenol
4-Nitrophenol
Dibenzofuran
2,4-Dinitrotoluene
Diethylphthalate
4-Chlorophenyl-phenylether
Fluorene
4-Nitroaniline
4,6-Dinitro-2-methylphenol
N-Nitrosodiphenylamine (1)
4-Bromophenyl-phenylether
Hexachlorobenzene
Pentachlorophenol
Phenanthrene
Anthracene
Di-n-butylphthalate
Fluoranthene
Pyrene
Butylbenzylphthalate
3,3'-Dichlorobenzidine
Benzo(a)anthracene
Chrysene
bis(2-Ethylhexyl)phthalate
Di-n-Octylphthalate
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)pyrene
Indeno(1,2,3-cd)pyrene
Dibenz(a,h)anthracene
Benzo(g,h,i)perylene
Alachlor
Atrazine
Trans-nonachlor
2-Chlorobiphenyl
2,3-Dichlorobiphenyl
Di(2-ethylhexyl)adipate
2, 2', 3, 3', 4, 4', 5-Heptachlorobiphenyl
2, 2', 4, 4', 5, 5'-Hexachlorobiphenyl
2, 2', 3, 3', 4, 5', 6, 6'-Octachlorobiphenyl
2, 2', 3', 4, 5-Pentachlorobiphenyl
Simazine
2, 2', 4, 4'-Tetrachlorobiphenyl
2,4,5-Trichlorobiphenyl

VOLATILE ORGANIC COMPOUNDS
Chloromethane
Bromomethane
Vinyl Chloride
Chloroethane
Methylene Chloride
Acetone
Carbon Disulfide
1,1-Dichloroethene
1,1-Dichloroethane
cis-1,2-Dichloroethene
trans-1,2-Dichloroethene
Chloroform
1,2-Dichloroethane
2-Butanone
Bromochloromethane
1,1,1-Trichloroethane
Carbon Tetrachloride
Bromodichloromethane
1,2-Dichloropropane
cis-1,3-Dichloropropene
Trichloroethene
Dibromochloromethane
1,1,2-Trichloroethane
Benzene
trans-1,3-Dichloropropene
Bromoform
4-Methyl-2-Pentanone
2-Hexanone
Tetrachloroethene
1,1,2,2-Tetrachloroethane
1,2-Dibromoethane
Toluene
Chlorobenzene
Ethylbenzene
Styrene
Xylene (total)
1,3-Dichlorobenzene
1,4-Dichlorobenzene
1,2-Dichlorobenzene
1,2-Dibromo-3-chloropropane
Bromobenzene
n-Butylbenzene
sec-Butylbenzene
tert-Butylbenzene
2-Chlorotoluene
4-Chlorotoluene
Dibromomethane
Dichlorodifluoromethane
1,3-Dichloropropane
2,2-Dichloropropane
1,1-Dichloropropene
Hexachlorobutadiene
Isopropylbenzene
4-Isopropyltoluene
Naphthalene
n-Propylbenzene
1,1,1,2-Tetrachloroethane
1,2,3-Trichlorobenzene
1,2,4-Trichlorobenzene
Trichlorofluoromethane
1,2,3-Trichloropropane
1,2,4-Trimethylbenzene
1,3,5-Trimethylbenzene

TABLE 3: LIST OF THE SEMIVOLATILE ORGANIC COMPOUNDS AND VOLATILE ORGANIC COMPOUNDS THAT WERE SAMPLED FOR IN THE INDOOR AIR.

VOLATILE ORGANIC COMPOUNDS

Compound	PRG (a) Reference Level (ppb)	LA Indoor Air (b) Reference Level (ppb)
Methylene chloride	118	None
1,1,1-Trichloroethane	18300	4.4
Benzene	7	3.63
Toluene	106	None
Tetrachloroethylene	48.9	0.6
Chlorobenzene	458	None
Ethylbenzene	253	1.23
m,p'-Xylene	168	5.58
o-Xylene	168	1.97
Styrene	259	0.86
Isopropylbenzene	1.91	None
n-Propylbenzene	no PRG	None
1,3,5-Trimethylbenzene	no PRG	None
tert-Butyl benzene	no PRG	None
1,2,4- Trimethylbenzene	no PRG	None
sec-Butyl benzene	no PRG	None
p-Isopropyltoluene	no PRG	None
1,3-Dichlorobenzene	no PRG	None
1,4-Dichlorobenzene	5	1.83
1,2-Dichlorobenzene	34.9	None
Trichloroethene	21	None

SEMIVOLATILE ORGANIC COMPOUNDS

Compound	PRG (a) Reference Level (ppb)	LA Indoor Air (b) Reference Level (ppb)
Napthalene	28.62	None
Acenaphtylene	no PRG	0.0018
Acenapthene	34.89	None
Fluorene	22.07	None
Phenanthrene	no PRG	0.0041
Anthracene	150.93	0.0002
Fluoranthene	18.14	0.0003
Pyrene	13.30	0.0003
Benzo(a)anthracene	0.0986	0.00003
Chrysene	9.8540	0.00006
Benzo(b)fluoranthene	0.0892	None
Benzo(k)fluoranthene	0.8916	None
Benzo(a)pyrene	0.00892	0.00006
Indeno(1,2,3-cd)pyrene	0.0814	0.00012
Dibenzo(a,h)anthracene	0.00808	None
Benzo(g,h,i)perylene	no PRG	0.0002
4,4'-DDE	0.1539	None
4,4'-DDD	0.2139	None
4,4'-DDT	0.1380	None
Alpha-BHC	0.00925	None
Beta-BHC	0.0311	None
Gamma-BHC	0.0437	None
Delta-BHC	no PRG	None