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Preliminary Public Health Assessment: Petrochem Recycling Corporation/Ekotek Salt Lake City, Salt Lake County, Utah

Agency for Toxic Substances and Disease Registry

Divisoin of Health Assessment and Consultation

PRELIMINARY Public Health Assessment for

PETROCHEM RECYCLING CORPORATION/EKOTEK
SALT LAKE CITY, SALT LAKE COUNTY, UTAH
CERCLIS NO. UTD093119196
APRIL 7, 1993

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
Agency for Toxic Substances and Disease Registry

PRELIMINARY PUBLIC HEALTH ASSESSMENT

PETROCHEM RECYCLING CORPORATION/EKOTEK

SALT LAKE CITY, SALT LAKE COUNTY, UTAH

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Prepared By

Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation

THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

This Public Health Assessment was prepared by ATSDR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) section 104 (i)(6) (42 U.S.C. 9604 (i)(6), and in accordance with our implementing regulations 42 C.F.R. Part 90). In preparing this document ATSDR has collected relevant health data, environmental data, and community health concerns from the Environmental Protection Agency (EPA), state and local health and environmental agencies, the community, and potentially responsible parties, where appropriate.

In addition, this document has previously been provided to EPA and the affected states in an initial release, as required by CERCLA section 104 (i)(6)(H) for their information and review. The revised document was 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 public health assessment has now been reissued. This concludes the public health assessment 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 conclusions previously issued.

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SUMMARY

The Petrochem/EkoTek site was operated by several owners as a refinery from 1953 until 1978 and as a hazardous waste storage/treatment facility and a petroleum recycling facility from 1978 through 1988. Removal of essentially all petroleum products and hazardous wastes in tanks and drums was accomplished from 1988 - 1991. The process that will lead to the complete clean-up of the facility is ongoing. The site was added to the National Priorities List (NPL) in October 1992.

Exposure of humans to contaminants in soil and air is thought to have occurred near Petrochem. The source(s) of those contaminants in off-site areas is undetermined. Contaminants found in ambient air cannot be fully evaluated for health implications because of the lack of monitoring during plant operations.

Contaminants in the soil are arsenic, barium, cadmium, chromium, lead, manganese, mercury, chlordane, dieldrin, polychlorinated biphenyls (PCBs), bis(2-ethylhexyl)phthalate, di-n-butyl phthalate, pentachlorophenol, and heptachlor epoxide. Children who ingest regularly large amounts (five grams or more a day) of soil contaminated with the highest levels of arsenic and cadmium have some risk for adverse health effects. The arsenic levels are typical for the Salt Lake City area. The maximum levels of barium could also cause health effects in children according to animal studies. The maximum concentrations of other soil contaminants were not a health concern.

There are four ways that humans may have been exposed: surface water, groundwater, soil gas, and waste materials. Surface-water runoff probably transported unknown concentrations of site contaminants to businesses west of the site. Residences and businesses within 1 mile of the site use municipal water for drinking water. Exposure of site and remedial workers to site waste materials may have occurred in the past.

The Petrochem/EkoTek site represents an indeterminate public health hazard because the environmental data reviewed are inadequate for fully assessing the possible impact of this site on public health.

The Agency for Toxic Substances and Disease Registry (ATSDR) recommends that the U.S. Environmental Protection Agency (EPA), in cooperation with the Utah Department of Environmental Quality (UDEQ), better characterize (i.e., what, where, how much, and the source[s] of) off-site groundwater and soil contamination.

ATSDR recommends the following public health actions: testing for biological indicators of exposure, a health statistics review, a community health investigation, and community health and health professions education.

BACKGROUND

In this public health assessment, ATSDR evaluates the public health significance of the Petrochem Recycling Corporation/EkoTek, Inc. site in Salt Lake City, Utah. More specifically, ATSDR reviewed available environmental and health outcome data, and community health concerns to determine whether adverse health effects are possible. In addition, this public health assessment will recommend actions to reduce or prevent possible adverse health effects. ATSDR, in Atlanta, Georgia, is one of the agencies of the U.S. Public Health Service. ATSDR is required by the Superfund law (Comprehensive Environmental Response, Compensation, and Liability Act of 1980 [CERCLA]) as amended by Superfund Amendments and Reauthorization Act of 1986 (SARA) to conduct public health assessments of hazardous waste sites proposed for the National Priorities List (NPL).

A. Site Description and History

The Petrochem/EkoTek site was operated by several owners as a refinery from 1953 until 1978 and later as a hazardous waste storage/treatment facility and a petroleum recycling facility from 1978 through 1988. EPA has identified more than 470 potentially responsible parties including companies in the electronics and aerospace industries and the military (1,2).

Facility operations ceased in 1988 due to a notice of violation from the Utah Bureau of Solid and Hazardous Waste and the Bureau of Air Quality (3). Removal of essentially all petroleum products and hazardous wastes in tanks and drums was accomplished from 1988 - 1991. Soil and groundwater contamination remain, but the extent and kinds of contaminants have not been completely determined. Because contamination remains, the site was added to the National Priorities List (NPL) in October 1992. The full extent and kinds of site-related contamination will be determined through a remedial investigation. The possible ways to complete the clean up of the site will be identified in the feasibility study. The choice of actual clean up (remediation) methodology is usually made known through a document called a record of decision (ROD). Before remediation begins, the public is given an opportunity to review and comment on the ROD.

The Petrochem property occupies 6.6 acres at 1628 North Chicago Street in Salt Lake City, Utah. The property is bordered on the east and west by industrial and commercial properties, on the north by a junkyard and on the south by a residential district. A spur of the Union Pacific Railroad divides the property and connects with the main lines to the west. The property lies between the railroad and U.S. Route 89 and 91 (Figures 1 and 2, Appendix D).

The Petrochem/EkoTek facility collected, transported, and re-refined used oil. The facility also generated, stored, and treated hazardous wastes such as ignitable solvents and sludges containing heavy metals (4). Waste fuels were transported to the facility in rail cars or trucks and transferred to storage and treatment tanks at the site. They used the energy

recovered during the burning of waste oils for its production facility and associated operations. Process heat boilers were fueled primarily by oils (#2 fuel oil and refinery distillate-similar to #2 diesel fuel) and natural gas. Under ideal conditions, excess vapors from loading and unloading waste oils and other solvents were destroyed in a flare system (5). Before September of 1982, acid sludge fumes from the acid sludge truck loading operation were vented to the atmosphere (6).

During the operation of Petrochem/EkoTek, there were approximately 60 aboveground tanks and three retention ponds (two of those ponds were concrete-lined open impoundments) in the northwest section of the property. Waste and sludge piles and an acid sludge pit were in the northeast section of the property (7). Numerous underground tanks have been removed from the property. An underground drain field remains on site. It was used to collect water from the warehouse roof and to intercept spills from off-loading railroad cars. The concrete-lined open impoundments remain on site to catch surface water runoff.

B. Site Visit

ATSDR's first involvement at this site began when Laura Barr, John Crellin, and Susan Muza of ATSDR, and Patrick Bustos and Amy Goldstein of EPA visited the site February 3 - 6, 1992 (8). Tia Leber and Bob O'Brien of UDEQ and Mel Muir of the Salt Lake County Health Department (SLCHD) took ATSDR and EPA staff on a tour of the site on February 4. As described in the Community Health Concerns section, ATSDR, EPA, and UDEQ staff conducted a series of home visits February 4 - 6.

The outer perimeter of the site is securely fenced and a guard was stationed there from the beginning of removal activities in 1988 through March 1992 (9). Since then, security has been provided on a drive-by basis. Essentially all petroleum products and hazardous wastes in tanks and drums have been removed. Soil and groundwater contamination remain as do concrete-lined impoundments for surface runoff. Currently, this surface runoff is discharged to the sanitary sewer. Before the removal, there was extensive runoff from containment ponds on site. The state of Utah issued the facility several notices of violation for exceeding discharge limits. Underground conduits may be continuing to direct contaminants off site (8).

C. Demographics, Land Use, and Natural Resources

The Petrochem/EkoTek site is on the eastern edge of the Salt Lake Valley and the western edge of the Wasatch Mountains. The Great Salt Lake lies approximately 8 miles west of the site.

Demographics

There are approximately 32 residences within several hundred feet south of the site (8). This residential area is within the city limits of Salt Lake City and is identified by the residents

and the city as "Swedetown." A survey of that neighborhood indicated that there are about 150 residents, including 26 children under seven years old (7). The next closest residential area in Salt Lake City is about a ½ mile southwest of the site and is called "Rose Park." The total population within a 1-mile radius of the site is approximately 5000 persons. Two schools are within a 1-mile radius of the site: Rose Park Elementary and Northwest Jr. High School (Figure 1).

Land Use

Heavy industry and light commercial properties are adjacent to Petrochem/EkoTek. In addition a major rail line, the Union Pacific, is adjacent to the site and a spur divides the site. Interstate 15 and U.S. Highways 89 and 91 separate the site from most eastern and western properties. An auto salvage yard lies directly north and a chrome plating facility lies to the east of the site. Just south of the Swedetown residential area, is a metal works company. South of that company, approximately a ¼ mile from the Petrochem/EkoTek site, is an oil refinery. The Rose Park NPL site is approximately a ½-mile west of the site. The Union Pacific Railroad spur terminates in gravel pits east of the site. The Jordan River runs north/south through the Salt Lake Valley approximately 1 mile from the site. There is a golf course about 1 mile west of the site.

Natural Resource Use

The Wasatch National Forest, approximately a ¼ mile to the east of the site, is used for hiking and other recreational purposes. A small community park is within a ¼ mile of the site. About 200 yards west of the site, is a small wetlands area including a small pond that contains mosquito fish (9,10). About ½-mile west of Petrochem are remnants of Warm Springs Lake, which is a large wetlands listed on the National Wetlands Inventory. There are also wetland areas along the Jordan River and at the Great Salt Lake. Those wetland areas are used by large populations of migratory birds. The state capitol is nearly 2 miles southeast of Petrochem/EkoTek. Groundwater resources are discussed in the Groundwater Pathway part of the Pathways Analyses section.

D. Health Outcome Data

Utah maintains birth and death certificate databases and a tumor registry, but no birth defects registry. No health outcome data were requested because of the disparity in population size between the Petrochem area and the smallest unit for which data are available. There is a discussion of how ATSDR selects health outcomes for evaluation in the Health Outcome Data Evaluation part of the Public Health Implications section.

COMMUNITY HEALTH CONCERNS

At the suggestion of a SLCHD staff member, community health concerns were identified through home visits conducted jointly by ATSDR, EPA, and the Utah Department of Environmental Quality (UDEQ) (8). The community survey included an explanation of the role and responsibilities of EPA and ATSDR at NPL sites, and solicitation of health concerns.

The following are health concerns expressed by the residents surveyed.

1. Employees got sick when air emissions from EkoTek were blown onto their place of business. Will there be long-term health effects from that exposure?

2. Was the dust raised during the removal a health hazard?

3. Several members of one family have a history of various respiratory illnesses. Are those illnesses related to Petrochem, another facility (Utah Metal), or environmental problems in the area?

4. Should children play in the dirt in our yards?

5. Are the vegetables grown in my garden safe to eat?

6. Is it safe for my employees to work in the area of my business apparently contaminated by materials from EkoTek?

7. Could EkoTek/Petrochem be the cause of the 21 cases of cancer reported in the last few years among the residents of the 32 households in the Petrochem area?

Those concerns will be addressed in the Community Health Concerns Evaluation part of the Public Health Implications Section. During the home visits, residents and business owners also complained about not receiving results of sampling done on their property. UDEQ staff who accompanied ATSDR on the home visits will provide those data and will ensure that further sampling data are sent promptly to property owners.

ENVIRONMENTAL CONTAMINATION AND OTHER HAZARDS

In conducting an ATSDR public health assessment, the health assessors identify and review all available environmental contamination data from a site. On- and off-site discussions of this section describe sampling that has been done and identify contaminants of concern. The

quality of the environmental data is discussed in the Quality Assurance and Quality Control subsection. Physical and other hazards not related to toxic substances, if any, are described in the Physical and Other Hazards subsection. This introductory section discusses the process for selecting contaminants of concern and Toxic Chemical Release Inventory (TRI) data.

Selection of Contaminants of Concern

ATSDR selects contaminants for further evaluation based upon the following factors:

- comparison of concentrations of contaminants on and off site with values for noncarcinogenic and carcinogenic endpoints,
- sampling plan and field and laboratory data quality, and
- community health concerns.

Identification of a contaminant of concern in the On-Site and Off-Site Contamination subsections does not mean that exposure will result in adverse health effects, only that additional evaluation is necessary. The public health significance, if any, of exposure to the contaminants of concern is evaluated in subsequent sections of the public health assessment.

Comparison values for the public health assessment are contaminant concentrations in specific media that are used to select contaminants for further evaluation. Those values include Environmental Media Evaluation Guides (EMEGs), Cancer Risk Evaluation Guides (CREGs), and other relevant guidelines. CREGs are estimated contaminant concentrations based on a one excess cancer in a million persons exposed over a lifetime. CREGs are calculated from EPA's cancer slope factors. EPA's maximum Contaminant Level Goal (MCLG) is a drinking water health goal. EPA believes that the MCLG represents a level at which no known or anticipated adverse health effect should occur. Proposed Maximum Contaminant Level Goals (PMCLGs) are MCLGs that are being proposed. Maximum Contaminant Levels (MCLs) represent contaminant concentrations that EPA deems protective of public health (considering the availability and economics of water treatment technology) over a lifetime (70 years) at an exposure rate of two liters of water per day. While MCLs are regulatory concentrations, PMCLGs and MCLGs are not. EPA's Reference Dose (RfD) and Reference Concentrations (RfC) are estimates of daily exposures that are unlikely to cause adverse health effects.

The environmental data reviewed in this document came from two EPA documents that report the preliminary investigation (PI) of the site (7,11). Sampling done for PIs is neither comprehensive nor systematic. Thus, the data from a PI is not as useful for the purposes of a public health assessment as the data from a remedial investigation, which is very comprehensive and systematic. The RI for Petrochem is scheduled to be completed in 1994.

The locations of soil and sediment sampling and the monitoring wells are depicted in Figures 2 and 3 of Appendix D.

Review of Toxic Chemical Release Inventory (TRI) Data

The EPA Toxic Chemical Release Inventory (TRI) was searched for information on toxic substances used by industries in the area around the site. No releases were reported under the facility names, Petrochem Recycling Company or EkoTek, Inc. for the years 1987-1989 (12). A search by zip code for the same years showed many releases into the air. However, none of the chemicals released were indicated as a health concern in any media at Petrochem/EkoTek. Contaminants of concern related to the site are discussed below.

A. On-Site Contamination

This section covers contaminants from the Petrochem/EkoTek site that meet ATSDR's guidelines for a contaminant of concern. While some of the contamination is attributable to the site, there are some contaminants, such as heavy metals, that may also have off-site sources. No distinction between sources has been made.

It should be noted that many of the values are estimates. A more accurate assessment of these concentrations is needed to verify levels exceeding ATSDR comparison values. Data quality is discussed in the Quality Assurance and Quality Control section.

Waste Material

The EPA sampled the contents of tanks, drums, and waste piles at the site in 1988 and 1989. They found chlorinated solvents, non-halogenated solvents, phthalate compounds, and polynuclear aromatic hydrocarbons. In addition, low levels of pesticides and high levels of lead were detected. Incinerator ash in soil contained extremely low concentrations of dioxins and furans. Large concentrations of oily waste were cleaned up during removal activities at the site. Since the waste material has been removed from the site and the entry to the plant was restricted when it was in operation, public exposure to the waste material is considered unlikely. Therefore, those data were not summarized in this assessment.

Soil Gas

Soil gas and water headspace analyses were conducted in April and May of 1990 (13). The main compounds detected were the chlorinated solvents trichloroethylene and tetrachloroethylene as well as hydrocarbon-derived compounds. The petroleum compounds (benzene, toluene, and xylene) were found primarily in the main tank area with a number of other locations scattered on and off site.

Soil-gas data are not appropriate for determining health impact because they do not measure possible exposure levels. Health impact could be determined by sampling the ambient air near locations where soil gas is identified.

Soil

Thirteen soil samples were analyzed for contaminants in 1988 and 1989 (7). The soil samples were taken from the upper few inches of soil, primarily in the waste piles and waste containment areas. ATSDR did not find an exact description of sampling depth in the data it reviewed. EPA found the soil samples contaminated with over 40 organic compounds and metals. The contaminants selected for further evaluation (Table 1, Appendix A) were arsenic, barium, beryllium, cadmium, chromium, lead, manganese, mercury, vanadium, bis(2-ethylhexyl)phthalate, di-n-phthalate, pentachlorophenol, PCBs, and chlordane. However, arsenic, beryllium, manganese, and vanadium are within background concentration ranges for the Salt Lake City area. Most of the metals were found throughout the site, while the organic compounds were identified only at a few locations.

Groundwater

Five wells were examined for on-site contaminants in 1990 (7). Arsenic levels in well PC-MW-8 and lead in well PC-MW-7 met ATSDR's guidelines for contaminants of concern. The remaining contaminants were detected at well PC-MW-7, which is technically outside the property boundaries. However, based on the proximity to the property boundary and the hydrogeologic conditions, it was evaluated as an on-site well. Based on sampling results, on-site groundwater contamination is primarily limited to PC-MW-7. The extent of off-site groundwater contamination has not been determined. Other organic solvents (1,1-dichloroethane, 1,2-dichloroethene and 4-methylphenol), whose concentrations did not meet ATSDR's guidelines for contaminants of concern, were detected in this well. Thus the potential exists for chlorinated solvents and polynuclear aromatic hydrocarbons to migrate from the shallow aquifer to the deeper potable aquifer.

Ambient Air

Monitoring of on- and off-site air is described in the Off-Site Contamination section that follows.

B. Off-Site Contamination

Soil Gas

Petroleum compounds were found in soil gas west of the main tank farm and in other scattered locations off site. The soil gas to the west probably originated from petroleum products in the groundwater that were found in excavations to the west. Chlorinated solvents

were also detected off-site in soil gas. This indicates that off-site groundwater needs to be characterized further to determine the extent of contamination.

Soil

In 1989, nine soil samples were taken from off-site locations. One was a background sample and eight were samples taken in residential yards south of the site. The only description of sampling depth was "the upper few inches of soil" (7). Those contaminants selected for further evaluation (Table 3, Appendix A) were arsenic, barium, beryllium, cadmium, chromium, lead, manganese, vanadium, PCBs, chlordane, dieldrin, and heptachlor epoxide. Dieldrin and heptachlor epoxide exceeded comparison values in off-site soils, but not in on-site soils. Beryllium, mercury, bis(2-ethylhexyl)phthalate, di-n-butyl phthalate, and pentachlorophenol did not exceed comparison values in off-site soils, but did in on-site soils. Arsenic, manganese, and vanadium are within background concentration ranges for the Salt Lake City area.

Ambient Air

In October of 1987, an employee of the state of Utah, Department of Health observed a significant plume in the air coming from the Petrochem/EkoTek plant. The plume was accompanied by a strong noxious odor (14). Residents reported past strong noxious odors to ATSDR during home visits. Black smoke was periodically observed coming from on-site burners and furnace stacks (5). Before September of 1982, acid-sludge fumes from the acid-sludge truck loading operation were vented to the atmosphere (6). A 1982 plant inspection report indicated several sources of air emissions: volatile organic releases when flares were broken down, release of strong odors (hydrogen sulfide) when lime was mixed with sludge, and particulate emissions when clay and oil were mixed (15). A sulfur scrubber was installed after 1980 to control sulfur emissions. No analytical data of air emissions during plant operations were found for review.

For several days in November of 1990, EPA sampled volatile and semi-volatile organics in air at five monitoring locations. Releases of acetone and 2-methylnaphthalene were observed. The acetone levels do not meet ATSDR's guidelines for a contaminant of concern. There are currently no criteria on which to base a comparison value for 2-methylnapthalene. Estimates of benzene in on- and off-site air exceeded the comparison value (Table 4, Appendix A). Air was not sampled for metals.

Groundwater

Three off-site monitoring wells served as background for water quality at the site. Contaminant levels in these wells did not meet ATSDR's guidelines for contaminants of concerns as shown in Table 5, Appendix A. The background wells, however, are east of the site, and regional groundwater flow is to the northwest. Excavations west of the site showed

free phase petroleum product on the groundwater table. Therefore, the potential for groundwater contamination from the site has not yet been fully characterized.

C. Quality Assurance and Quality Control

Data presented in Tables 1 through 5 have many qualifiers.
It should be noted that many of the values are estimates. A more accurate assessment of these concentrations is needed to verify levels exceeding ATSDR comparison values. For many values, quality control criteria were not met.

D. Physical and Other Hazards

In the past, ponds containing hazardous wastes overflowed, leaking off site. Some of the waste stored on site was flammable and corrosive. Most physical hazards such as waste ponds and piles have been removed from the site.

PATHWAYS ANALYSES

In this section of the public health assessment, possible exposure pathways are evaluated to help determine whether persons have, are, or will be exposed to contaminants associated with the site. Pathway analysis consists of five elements:

1. identifying contaminants of concern,
2. determining that contaminants have/are/will be transported through an environmental medium,
3. identifying a point of exposure (i.e., a place or situation where humans might be exposed to the contaminated media),
4. determining that there is a plausible route of human exposure (i.e., can the contaminant enter the body?), and
5. identifying an exposed population (i.e., how many people, if any, are at the point of exposure).

An exposure pathway is considered complete when there is evidence that all five elements exist. The presence of a completed pathway indicates that human exposure to contaminants has occurred in the past, is occurring, or will occur in the future. When one or more of the five elements of an exposure pathway are missing, that pathway is considered potential. The presence of a potential exposure pathway indicates that human exposure to contaminants could have occurred in the past, could be occurring, or could occur in the future. An exposure pathway can be eliminated if at least one of the five elements is missing and will never be present. The completed and potential exposure pathways and estimates of the number of exposed individuals for the Petrochem site are presented in Tables 6 - 8, Appendix B.

A. Completed Exposure Pathways

Soil Pathway

Several heavy metals and organic compounds were found in both on- and off-site soil. Since the soil in the residential community to the south is contaminated with some of the same chemicals that are found on site, a completed exposure pathway for ingestion is indicated. Even though the site is fenced, it was accessible through November of 1988 (before fencing). Children have been seen trespassing on site. Surface soil could be ingested while children are playing in residential yards, playgrounds, or while trespassing. The population at risk of ingesting contaminated soils is not as large as the population at risk of exposure to contaminants in air or groundwater. The small number of soil samples taken (9) for the residential area suggests that additional samples are needed for evaluation. To adequately evaluate this pathway, soil in the businesses west of the site and in residential yards south of the site needs to be sampled further.

Ambient Air Pathway

Releases of organics from the Petrochem/EkoTek site have been observed in addition to releases from other sources in the area. The source of benzene documented in air on and surrounding the site has not been defined. There are other potential sources of benzene in the area, such as the operating refinery south of the site. Since releases have occurred, residents in nearby communities and perhaps on-site workers are considered to have been exposed to contaminants via the air pathway.

Petrochem is considered a likely source of past exposures to air contaminants due to air violations recorded at the Utah Bureau of Air Quality, reports by residents, and several sources of on-site air emissions. The Petrochem site could have been the source of this exposure during past operations or during remedial activities. Benzene was identified as a contaminant of concern in that pathway, based on monitoring done after removing the processing units.

The ambient air pathway has not been adequately characterized due to the limited number of samples and the absence of inorganic analyses. In particular, metals data have not yet been gathered; there are several sources of metals in the area. Air monitoring, including collection and evaluation of meteorologic data, needs to be conducted on several different days before the results can be used to evaluate health impact of air-borne volatile organic compounds and particulates. Therefore, without additional sampling, the air pathway cannot be further evaluated.

B. Potential Exposure Pathways

Potential exposure pathways are indicated if exposure to a contaminant could have occurred, could be occurring, or could occur in the future.

Soil Gas Pathway

Soil gas represents a potential exposure pathway because four of the five elements that form a completed pathway exist. The missing element is a point of exposure. No further evaluation can be done because of insufficient ambient air data, as discussed in the On-Site Contamination part of the Environmental Contamination and Other Hazards section. On-site workers or residents might be exposed to volatile chemicals via the soil gas pathway. Although the information needs verification, it indicates exposure to volatile organics.

Surface Water Pathway

Surface water represents a potential exposure pathway because four of the five elements that form a completed pathway exist. The missing element is the information about the level of contaminants.

Surface water drainage may follow the railroad tracks transporting surface contaminants off site. During the site visit, residents reported that runoff from the site and overflow from waste-water ponds flowed into businesses west of the site. Concern was expressed about the possible health effects from those incidents.

Springs flow west under Interstate 15 to the remnants of Warm Springs Lake, which is a large wetlands ½ mile west of the Petrochem site. The springs remain frost-free year around and are a valuable fresh water resource in an otherwise high saline environment. The wetlands host many species of game birds that may later be consumed by humans.

The significance of this pathway is unknown because there are no sampling data from the areas where the runoff and overflows occurred nor from any surface water bodies. Because of insufficient information, the surface water pathway cannot be further evaluated.

Groundwater Pathway

Groundwater represents a potential exposure pathway because four of the five elements that form a completed pathway exist. The missing element is the lack of a point of exposure (i.e., there are no known private drinking water wells in the Petrochem area).

The alluvial aquifer in the site vicinity is unconfined and consists of clay, silt, and fine sand. It has a relatively low permeability and is seldom used as a water supply due to poor water quality. Shallow monitoring wells indicate that depth to groundwater is 10 to 30 feet below ground surface. Groundwater contamination has the potential to migrate west from the Petrochem site because of the warm springs, which flow beneath the site.

The geologic formations comprising the Wasatch Mountain Range consist predominantly of well-compacted dolomites and limestones. Groundwater flow is directed toward the Salt Lake Valley and Salt Lake. There is a confining layer between the shallow alluvial aquifer

and the deeper aquifer; however, it is discontinuous within a 2-mile radius of the site (11). Therefore, the aquifers may be interconnected and the potential exists for contaminants to migrate to the deeper potable aquifer.

There are five municipal wells within a 4-mile radius of the site. They draw groundwater from the deep confined aquifer that has not been tested for contaminants from the site. The closest municipal well is 2.5 miles from Petrochem/EkoTek. Approximately 6,428 people are served by community wells within a 2-mile radius of the site (3). Although drinking water is drawn from the deep aquifers, shallow groundwater is used for irrigation and livestock watering (9). The potential exists for human exposure to any contaminated groundwater.

Approximately 200 private drinking water wells exist within a 4-mile radius of the site, but none within 1 mile. None of the private wells have been sampled for site contaminants. Because there is insufficient off-site data, this exposure pathway can not be further evaluated.

Worker Waste Material Pathway

The waste material on-site represents a potential exposure pathway because four of the five elements that form a completed pathway exist. The missing element is information about the level of contaminants. Workers may have been exposed if they did not use protective clothing and equipment. Since there is insufficient information on contaminant levels, ATSDR cannot further evaluate the worker waste material pathway.

Other Pathways

There are no environmental data available on the food chain exposure pathway. Although there are several contaminants from Petrochem/EkoTek that could bioaccumulate, they are unlikely to bioaccumulate at levels of health concern because the chemicals were not used on crop fields or in areas where animals graze. Suitable habitats for game birds exist near the Petrochem site (8,10). Even if contaminants are available to wildlife, the occasional consumption of wildlife is unlikely to result in health effects.

PUBLIC HEALTH IMPLICATIONS

As discussed in the Pathways Analyses section, soil and ambient air represent completed exposure pathways. The contaminants of concern in the soil exposure pathway are arsenic, barium, beryllium, cadmium, chromium, lead, manganese, mercury, vanadium, PCBs, chlordane, dieldrin, bis(2-ethylhexyl)phthalate, di-n-butyl-phthalate, pentachlorophenol, and heptachlor epoxide. As mentioned in the preceding section, the limited number of off-site soil samples introduces additional uncertainty into the evaluations in this section.

Benzene is the contaminant of concern in the ambient air pathway. The site is only one of several possible sources. As discussed in the Pathways Analyses section, the limited scope of air monitoring precludes further evaluation of this pathway. The potential exposure pathways listed in Table 7 of Appendix B were eliminated from further evaluation in the preceding section.

The Toxicological Evaluation, in this section, will cover possible health hazards from exposure to contaminants of concern in the soil. Community health concerns will be addressed in the Community Health Concerns Evaluation section. As mentioned in the Health Outcome Data part of the Background section, no health outcome data were obtained. The reasons for this are described in the Health Outcome Data Evaluation section.

A. Toxicological Evaluation

Introduction

The toxicological evaluation in a public health assessment is a comparison of the exposure dose for those people in an exposure pathway to ATSDR's Minimal Risk Levels (MRLs) or EPA's Reference Doses (Rfd). The exposure dose is the maximum amount per day, based on the available sampling data, that one might take into their body. The MRLs and Rfds are estimates of daily human exposure to a contaminant below which noncarcinogenic adverse health effects are unlikely to occur (16). That means that any exposure dose below the appropriate MRL or Rfd does not represent a hazard to human health. However, for exposure doses above a MRL or Rfd, there is a wide zone of uncertainty above the MRL or Rfd whether adverse health effects will occur. Therefore, a review of the toxicological literature is done to determine whether the specific exposure situation represents a hazard to public health. The methodology for calculating the exposure doses is described in Appendix D.

The risk of carcinogenic health effects is also evaluated in this section. The limitations and methodology for the carcinogenic evaluation are described in Appendix D.

The Possibility of Health Consequences

The results of the comparisons of exposure doses to health guidelines are in Table 9, Appendix D. None of the adult exposure doses for the contaminants of concern exceeded the health guideline for the contaminant, so adverse health effects are unlikely to occur in adults. The exposure doses for children and pica children exceeded the health guideline for arsenic, barium, cadmium, bis(2-ethylhexyl)phthalate, PCBs, and heptachlor epoxide. The exposure doses for pica children exceeded the health guideline for chromium, manganese, mercury, vanadium, chlordane, di-n-butyl phthalate, dieldrin, and pentachlorophenol. The exposure doses for beryllium for adults, children, and pica children did not exceed the health guideline.

Cancer risk from ingestion of contaminated soil was calculated for beryllium, PCB, chlordane, dieldrin, bis(2-ethylhexyl)phthalate, di-n-butyl-phthalate, pentachlorophenol, and heptachlor epoxide. See Appendix D for a description of how the cancer risk was calculated. The calculated maximum risk from 70 years of daily ingestion of soil contaminated with the maximum concentrations of those chemicals does not represent an increased risk of cancer. Because risk calculations could not be done for arsenic and chromium, possible carcinogenic effects for them will be discussed further.

The possibility of health consequences due to exposure doses is described in the following paragraphs. Exposure to arsenic, cadmium, or barium in off-site soil may result in adverse health consequences under certain circumstances. However, those conclusions are based on the highest levels of the contaminant found in residential soil south of the site. Thus, they may not be indicative of the consequences of ingesting soil from other areas in Swedetown because the levels may be higher, lower, or unknown. Also, as mentioned in the Pathways Analyses section, the limited nature of sampling makes those conclusions uncertain.

Health assessors determine health consequences by comparing the exposure dose to the results of human epidemiologic evaluations of exposure to a chemical. If human evaluations are not available, then information from properly conducted animal studies are used. The type of data used for an evaluation is indicated for each chemical.

Arsenic

Adverse health effects may occur in children who ingest large amounts of soil (pica-5 grams of soil/day or more) contaminated at the maximum concentration, but not in other children or adults. This is based on the results of epidemiologic evaluations of long-term human exposures to arsenic (21). It is unknown whether there are any children in the Petrochem area who display the pica or dirt-eating behavior.

Arsenic is considered a human carcinogen (20,21). However, ingestion of the maximum levels of arsenic in off-site soils does not represent a risk for carcinogenic effects. This conclusion is based on a comparison of the exposure dose for adults to the lowest observed effect level observed in epidemiologic investigations of human exposures (21).

While arsenic levels found in the Swedetown area may cause health effects in pica children, those levels both on and off site in the Petrochem area are typical for the Salt Lake City area. Arsenic, therefore, is not considered site-related and neither are the possible adverse health effects due to ingestion of arsenic-contaminated soil.

Barium

Adverse health effects may occur in children based on a comparison of the exposure doses to the results of the animal studies (22). There is a great deal of uncertainty in this conclusion

because of the limited number of samples, and from the difficulty in predicting health effects observed in animals and humans.

Cadmium

Adverse health effects may occur in children who ingest large amounts of soil (pica-5 grams of soil/day or more) contaminated at the maximum concentrations of cadmium in on-site and residential soil. For the maximum concentrations in on-site soil, the exposure dose for pica children was 10 times greater than the level in which no health effects were observed in long-term human exposures (23). For the maximum concentrations in residential soil, the exposure dose for pica children was about the same as the level in which no health effects were observed. For non-pica children, the exposure dose for on-site soil was three times less than the level in which no health effects were observed, and 23 times less for residential soil.

While adverse health effects are possible, it is very unlikely that a child could have frequented the site long or often enough to ingest five grams of soil a day. Access to the site is now restricted. It is unknown whether there are any children in the residential area near Petrochem who display pica behavior. The exposure dose for pica children is about four times less than the level in which the adverse health effects were first observed in humans (23).

Chromium

Health effects are unlikely to occur from exposure to the maximum levels of chromium in residential soil in the Petrochem area based on animal studies (24). The exposure dose for pica children was 10 times lower than the level in which no health effects were observed in long-term animal studies (24).

Chromium is considered a human carcinogen for the inhalation route of exposure, but not for ingestion (24). Therefore, ingestion of chromium-contaminated soil does not represent a risk for carcinogenic effects.

Lead

Three literature reviews have evaluated the relationship between concentrations of lead in soil and blood lead levels in children (25-27). All three concluded that soil lead levels of 1000 parts per million (ppm) would increase concentrations in blood from 0.6 to 65 micrograms/deciliter (μg/dL) with an average increase of 4-5 μg/dL. The wide range was due to different sources of lead, exposure conditions, and exposed populations. The health effects associated with such an increase depend partly on the existing body burden of lead.

Actual health effects depend on factors such as the age and nutritional status of the child contacting the soil, the frequency of contact, the rate of soil ingestion, the type of lead, and the characteristics of the soil. The limited nature of the sampling and the fact that only one

of nine samples had detectable levels preclude making any conclusions about possible health consequences from ingesting lead.

Manganese

Adverse health effects do not appear possible from exposure to the maximum levels of manganese in residential soil based on animal studies (28). The exposure dose for pica children was 100 times lower than the level in which health effects were observed in long-term animal studies (28).

Vanadium

Health effects do not appear possible from exposure to the maximum levels of vanadium in Swedetown residential soil based on animal studies (29). The exposure dose for pica children is 50 times lower than the level in which no effects were observed in animals (29).

Polychlorinated Biphenyls (PCBs)

Studies of exposed workers clearly indicate that PCBs can affect the liver, skin, and eyes, especially after long-term exposures (30). There is some evidence that associates PCB exposure in workers with respiratory, gastrointestinal, hematological, muscular and skeletal, developmental, and neurological effects. However, data are not adequate to establish a cause-effect relationship. The routes of exposure in the studies mentioned above were inhalation or dermal exposures rather than ingestion. In addition, exposure levels in the studies were all much higher than those at the Petrochem site.

Data from long-term animal studies were used for this evaluation. The studies indicate that developmental effects occur at levels at least ten times lower than other effects (30).

Noncarcinogenic health effects due to exposure to PCBs in residential soil are unlikely to occur. The levels in which no effects were observed for the three developmental studies of monkeys are at least 10 times greater than the exposure doses for pica children (31-33). Monkeys and humans are very similar in their responses to toxic chemicals, which allows comparisons without adjustment for inter-species differences (34).

Chlordane

Adverse health effects from exposure to the maximum levels of chlordane in residential soil do not appear to be possible based on a comparison of the exposure dose to the no effects levels from animal studies (35). The exposure dose for pica children is 30 times lower than the level in which no effects were observed in animal studies (35).

Dieldrin

Adverse health effects from exposure to the maximum levels of dieldrin in residential soil do not appear to be possible based on animal studies (36). The exposure dose for pica children is 70 times lower than the level in which no effects were observed in animal studies (36).

Heptachlor Epoxide

Data from long-term human exposures and animal studies to heptachlor epoxide are not adequate for this evaluation (37). However, results from animal studies in which exposures were 14-365 days long (intermediate) are adequate for this evaluation.

Health effects do not appear to be possible from intermediate length exposures to the maximum levels of dieldrin in residential soil. The exposure dose for pica children is 10,000 times lower than the level in which no effects were observed in animal studies (37).

Mercury

Data from long-term human exposures to inorganic mercury are not adequate for this evaluation (38). However, results from long-term animal studies are adequate. Health effects do not appear possible from exposure to the maximum levels of mercury in on-site soil. The exposure dose for pica children is 160 times lower than the level in which no effects were observed in animal studies (38). In addition, because those levels are for on-site mercury, it is unlikely that a child could have frequented the site long or often enough to ingest five grams of soil a day. Access to the site is now restricted.

Bis(2-ethylhexyl)phthalate

Data from human exposures to bis(2-ethylhexyl)phthalate are not considered adequate for this evaluation, but animal data from long-term exposures are (39). Adverse health effects from exposure to the maximum levels of bis(2-ethylhexyl)phthalate in on-site soil do not appear possible based on a comparison of the exposure dose to the no effects levels from animal studies and the unlikelihood of regular on-site exposure of children. The exposure dose for pica children is 15 times lower and for children is 333 times lower than the level in which adverse health effects were first observed in animal studies (39). In addition, because those levels are for bis(2-ethylhexyl)phthalate on-site, it is unlikely that a child could have frequented the site long and often enough to ingest five grams of soil a day. Access to the site is now restricted.

Di-n-butyl-phthalate

Data from long-term human exposures and animal studies to di-n-butyl-phthalate are not adequate for this evaluation (40). However, results from animal studies in which exposures were 14-365 days long (intermediate) are adequate for this evaluation. Adverse health effects

from exposure of intermediate length to the maximum levels of di-n-butyl-phthalate in on-site soil do not appear possible based on a comparison of the exposure dose to the no effects levels from animal studies. The exposure dose for pica children is 260 times lower than the level in which no effects were observed in animal studies (40).

Pentachlorophenol

Data from human exposures to pentachlorophenol are not considered adequate for this evaluation, but animal data from long-term exposures are (41). Adverse health effects from exposure to the maximum levels of pentachlorophenol in on-site soil do not appear possible based on a comparison of the exposure dose to the no effects levels from animal studies. The exposure dose for pica children is 60 times lower than the level in which no effects were observed in animal studies (41).

Mixtures of contaminants

The preceding paragraphs evaluated the possible health consequences from exposure to each of the contaminants of concern in residential soil. Many of the contaminants are simultaneously present in the soil, so exposure includes a mixture rather than individual chemicals. Currently, there is no accepted method for determining possible health effects from chemical mixtures.

B. Health Outcome Data Evaluation

In a public health assessment, available health outcome databases are identified for the area near the site. From those data, ATSDR selects health outcomes for further evaluation based on biologically plausibility or community health concerns.

For biological plausibility, the decision to evaluate health outcome data depends on whether a completed exposure pathway exists for a chemical suspected of causing the health outcome of concern. The selection of a noncarcinogenic health outcome is based on a review of the toxicologic literature for that contaminant of concern.

Designating a chemical as a carcinogen (for purposes of health outcome data evaluation) is based on the following:

a. classification by the National Toxicology Program (NTP)[1] in its Annual Report on Carcinogens as a "known human carcinogen" or "reasonably anticipated to be a carcinogen"; or

b. classification by the International Agency for Research on Cancer (IARC)[2] as a 1, 2A, or 2B carcinogen; or

c. classification by the United States Environmental Protection Agency (EPA)[3] as an A, B1, or B2 carcinogen.

A latency period of at least 10 years between exposure and diagnosis has been observed in most studies of human cancer. If exposure began less than 10 years before the latest data available, analysis of health outcome data for cancer incidence or mortality is not likely to be useful, particularly if the exposure level is low.

Even when health outcomes do not meet ATSDR's guidelines for biological plausibility, health outcome data can be evaluated to address community health concerns.

An important factor in requesting health outcome data in any situation is the difference in size between the population at risk of exposure to site contaminants and the smallest population unit for which health outcome data are available. For example, adverse health effects due to a site would likely not be observed if the population at risk is 100 and the population unit for which health outcome data are available is 100,000.

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[1] The National Toxicology Program in its Annual Report on Carcinogens classifies a chemical as a "known human carcinogen" based on sufficient human data. Its classification of a chemical as being "reasonablely anticipated to be a carcinogen" is based on limited human or sufficient animal data.

[2]IARC defines a class 1 carcinogen as a substance which studies in humans indicate a causal relationship between the agent and human cancer. Class 2 carcinogens are those reasonably anticipated to be carcinogens. For a 2A classification, there is limited evidence of carcinogenicity from human studies which indicate that a causal interpretation is credible, but not conclusive. A classification of 2B indicates that there is sufficient evidence of carcinogenicity from studies in experimental animals.

[3]In EPA's classification scheme, a chemical is considered a class A or human carcinogen based on sufficient evidence from studies of humans. A substance is considered class B1 if there is limited evidence from human studies. B2 is used when evidence for carcinogenicity is inadequate or non-existent based on human studies, but sufficient based on animal studies.

For the Petrochem site, no health outcome data were requested because of the disparity in population size between the Petrochem area and the smallest unit for which data are available.

C. Community Health Concerns Evaluation

Community health concerns are addressed as follows:

1. Employees got sick when air emissions from EkoTek were blown onto their place of business. Will there be long-term health effects from this exposure?

The business owner who raised that concern mentioned that employees became ill several times a year for 10 years while the petroleum recycling facility operated. Symptoms were relatively mild and recovery was rapid. Based on that information, long-term health effects are unlikely because exposures were infrequent. The human body would be able to get rid of nearly all chemicals received under such circumstances, which would greatly reduce the chance for long-term effects.

2. Was the dust that was raised during the removal a health hazard?

It might have been a health hazard for those actually performing the removal activities if they did not use the appropriate protective equipment. Data available to ATSDR are not sufficient to evaluate the hazard to those living or working in the area around Petrochem. Information is needed on the number of times that dust was raised, the areas from which dust was raised, and the direction the wind was blowing during removal.

3. Several members of the same family have a history of various respiratory illnesses. They asked whether those illnesses could be related to Petrochem, another facility (Utah Metal), or other environmental problems in the area.

A number of respiratory illnesses can be caused or aggravated by environmental contaminants. The Petrochem site could have been a source of some illness when it was in operation. The petroleum refining facility south of Petrochem and Utah Metal could be current sources of contamination.

4. Can children play in the dirt in our yards?

Based on the data reviewed in this public health assessment, children can safely play in residential yards as long as they do not have the habit of eating dirt (pica).

5. Are the vegetables grown in area gardens safe to eat?

Yes, they are. Small amounts of the contaminants may be on or in the vegetables. Washing will remove contaminants on the surface of vegetables. The amount of contaminants in the flesh of the vegetables would be very small given the low levels of contaminants in the soil.

6. Is it safe for employees to work in the areas of those businesses apparently contaminated by materials from the site?

Assuming that the areas are contaminated, workers can reduce or eliminate their exposure by washing their hands before eating or smoking. Workers should not stir up the dirt so that it creates dust that can be inhaled. Working in the area should be safe if employees take such preventive measures.

7. Could Petrochem/EkoTek be the cause of the 21 cases of cancer reported in the last few years among the residents of the 32 households in the Petrochem area?

Environmental contaminants such as those that were released from EkoTek/Petrochem and other facilities could cause specific types of cancer. In order to know whether the facilities could be the cause of some of the cancers in the Petrochem area would require information on the age, length of residence, type of cancer, and date of diagnosis of each cancer patient. Data would also be needed on the number and age of the persons who lived in the area when the cancer cases occurred. The data would determine whether there is more cancer in the Petrochem area than what is expected according to the cancer rate for Salt Lake City. If an excess of cancer were confirmed then identification of possible causes including environmental contaminants would then be done. Identifying, obtaining, and evaluating the above described data goes beyond the scope of a public health assessment.

As described in the Recommendations section of this public health assessment, it has been determined that a health statistics review and community health investigation are needed to address concerns about cancer.

In addition, the Utah Department of Health's Bureau of Epidemiology and the Utah Cancer Registry study cancer clusters throughout the state. They may be able to address this concern about cancer. For more information, contact the Bureau of Epidemiology.

CONCLUSIONS

1. The Petrochem/EkoTek site represents an indeterminate public health hazard because the environmental data reviewed are inadequate for fully assessing the possible impact of this site on public health. The extent of off-site groundwater and soil contamination has not been determined.

2. The maximum levels of arsenic and cadmium in residential soil could result in adverse health effects in children who ingest five or more grams of contaminated soil a day for more than a year. However, there may not be any children in the Petrochem area who ingest that much soil. In addition, the levels of arsenic around Petrochem are typical (i.e., background) for the Salt Lake City area.

3. The maximum levels of barium could also cause health effects in children according to animal studies. Because this conclusion is based on animal studies, it is uncertain that any health effects will occur, due to the difficulties in predicting human health effects from animal data.

4. Based on the preliminary data reviewed for this assessment, none of the other contaminants were at concentrations that represent a health hazard. None of the contaminants appear to represent a risk for carcinogenic effects.

5. There are two completed exposure pathways at the Petrochem site. One is a soil ingestion pathway and the other is via ambient air.

6. There are four potential exposure pathways - surface water, groundwater, soil gas, and waste materials. The surface water pathway probably transported unknown concentrations of site contaminants to businesses west of the site. Residences and businesses within 1 mile of the site use municipal water for drinking water. Exposure of site and remedial workers to site waste materials may have occurred in the past.

7. Off-site residential soil, groundwater, and air need further characterization (i.e., what, where, how much, and the source(s) of contamination). The characterization could include additional sampling or evaluation of existing data.

8. The appropriate health outcome data were not available to evaluate reports of cancer in the Petrochem area.

RECOMMENDATIONS

Site Characterization Recommendations

ATSDR recommends that EPA, in cooperation with UDEQ, do the following to better characterize off-site groundwater, residential soil, and air.

1. Identify the potential for and extent of contamination of groundwater. That should be done by placing and sampling monitoring wells hydrologically downgradient from the site. If off-site contamination extends to areas of private well use, ATSDR recommends identifying and sampling the private wells. Analytes for sampling should include arsenic, lead, benzene and other volatile organic compounds (VOCs), and polynuclear aromatic hydrocarbons (PAHs).

2. Sample the surface soil (0-3") for heavy metals including arsenic, mercury, and lead; PCBs; chlordane; phthalates; VOCs; and PAHs at the businesses and residences immediately adjacent to the site. Particularly, sample the businesses to the west that received surface water drainage from the site. Additional sampling of residential yards south of the site, in Swedetown, should be done to further evaluate the potential for exposure.

3. Ambient air should be monitored near locations where surface soil gas contaminants are identified. Ambient air should be monitored for VOCs and heavy metals in particulates during remedial activities.

HARP Recommendations

The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, requires ATSDR to perform public health actions needed at hazardous waste sites. To determine if public health actions are needed, ATSDR's Health Activities Recommendation Panel (HARP) has evaluated the data and information developed in the Petrochem Public Health Assessment.

HARP determined the following:

1. Because people may have been exposed to contaminants at levels that may cause illness or disease, biologic indicators of exposure testing is needed.

2. A health statistics review and community health investigation are needed to help address community concerns about cancer.

3. Community health and health professions education is indicated. These activities will assist the community in understanding their potential for exposure, how to

prevent or mitigate the effects of exposure, or assess the occurrence of adverse health outcomes in the community. The health professions education would also improve the knowledge, skill and behavior of health professionals in diagnosing, treating, or educating patients possibly exposed to hazardous substances in the environment.

Public Health Actions

This section identifies those completed, ongoing, or planned actions by ATSDR or other agencies, which implement the recommendations in this public health assessment.

1. ATSDR, in cooperation with appropriate public health agencies, will evaluate the feasibility and resources to pursue implementing the health actions determined by HARP.

2. The Utah Tumor Registry and Utah Department of Health are reviewing their health statistics databases.

Public Comments

The public health assessment for the Petrochem/EkoTek site, Salt Lake City, Utah was available for public review and comment from November 10 through December 8, 1992. A summary of the comments received can be found in Appendix E.

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APPENDICES

APPENDIX A - ENVIRONMENTAL CONTAMINANT DATA

Explanation of Environmental Contaminant Data Tables

Listing a contaminant in the data tables that follow does not mean that it will cause adverse health effects from exposures. Instead, the list indicates which contaminants will be further evaluated in the public health assessment.

The data tables include the following abbreviations:

- **CREG** = Cancer Risk Evaluation Guide
- **EMEG** = Environmental Media Evaluation Guide
- **PMCLG** = Proposed Maximum Contaminant Level Goal
- **ppm** = parts per million
- **mg/kg/day** = milligrams per kilogram per day
- **$\mu g/m^3$** = micrograms per cubic meter of air
- **RfD** = Reference Dose
- **CMRL** = Chronic Minimal Risk Level
- **IMRL** = Intermediate Minimal Risk Level
- **FREQ > CV** = the number of times a concentration exceeded the comparison value compared to the number of times it was analyzed.

Sources of Data

Sources of those tables are references 7 and 11.

Samples were collected in 1988 - 1989.

TABLE 1 - ON-SITE SOIL				
CONTAMINANT	CONCENTRATION RANGE	COMPARISON VALUE (CV) FOR INGESTION		FREQ >CV
	ppm	ppm	Source	
Arsenic*	2.3j - 18.4	0.6	EMEG	14/14
Barium	144 - 3170	140	Rfd	14/14
Beryllium*	ND - [0.94]	0.16	CREG	10/14
Cadmium	ND - 36.1j	0.4	EMEG	9/14
Chromium	7.2 - 453	10	EMEG	10/14
Lead	98.5 - 1870j	None	**	N/A
Manganese*	88.6 - 387	200	Rfd	4/14
Mercury	ND - 4.0	1.6	Rfd	1/14
Vanadium*	[3.1] - 22.5	14	Rfd	2/14
Bis(2-ethylhexyl) phthalate	ND - [1300]j	40	Rfd	2/13
Di-n-butyl-phthalate	ND - 480j	200	Rfd	1/13
Pentachlorophenol	ND - [91]	5.8	CREG	2/13
PCB:Aroclor-1260	ND - 1.6j	0.09	CREG	3/13
Total Chlordane	ND -[4.000]j	0.5	CREG	2/13
Dieldrin	ND	0.04	CREG	0/5
Heptachlor epoxide	ND	0.08	CREG	0/5

j- the associated numerical value is an estimated quantity because quality control criteria were not met. However, presence of the material is reliable.

[] - the associated numerical value is an estimated quantity because the amount detected is below the contract required detection limit (CRDL). Presence of the material is reliable.

* the concentration range is within background for soils in the Salt Lake City area (42).

** There are no MRLs, Rfds, or cancer slope factors. Whenever lead is found at a site, it is further evaluated because of lead's well-documented ability to cause health effects in children at low concentrations.

The Contract Required Detection Limit (CRDL) of 4.7-11.3 ppm antimony is above a comparison value of 0.8 ppm based on Rfd. The CRDL of selenium is sometimes above the comparison value.

TABLE 2 - ON-SITE GROUNDWATER				
CONTAMINANT	**CONCENTRATION RANGE**	**COMPARISON VALUE (C.V.) FOR INGESTION**		**FREQ > C.V.**
	ppb	**ppb**	**Source**	
Arsenic	ND - 30.9	10	EMEG	1/5
Lead	ND - [2.0]	0.0	PMCLG	1/5
Vinyl chloride *	ND - 27	0.02	CREG	1/5
Benzene *	ND - 12	1.21	CREG	1/5

[] - the associated numerical value is an estimated quantity because the amount detected is below the contract required detection limit (CRDL). Presence of the material is reliable.

The Contract Required Detection Limit of 3.3 ppb thallium is above a comparison value of 0.4 ppb, based on the Life Time Health Advisory.

* Sampling location PC-MW-07

Contaminants not exceeding comparison values were not listed.

TABLE 3 - OFF-SITE SOIL/SEDIMENT				
CONTAMINANT	**CONCENTRATION RANGE**	**COMPARISON VALUE (CV) FOR INGESTION**		**FREQ >CV**
	ppm	**ppm**	**Source**	
Arsenic*	4.0 - 21.5	0.6	EMEG	9/9
Barium	111 - 4480	140	Rfd	8/9
Beryllium*	ND - [0.95]	0.16	CREG	8/9
Cadmium	ND - 4.7	0.4	EMEG	8/9
Chromium	7.9 - 38.4	0.4	EMEG	8/9
Lead	31.7j - 552j	None	**	N/A
Manganese	187 - 713	200	Rfd	8/9
Mercury	ND - 0.49	1.6	Rfd	0/9
Vanadium*	11.6 - 28.7	14	Rfd	7/9
Bis(2-ethylhexyl) phthalate	ND - 0.84j	40	Rfd	0/8
Di-n-butyl-phthalate	ND - 1.5j	200	Rfd	0/8
Pentachloro-phenol	ND - [0.73]j	5.8	CREG	0/8
PCB:Aroclor -1260	ND - 1.2j	0.09	CREG	4/9
Total Chlordane	ND - 3.3	0.5	CREG	1/13
Dieldrin	ND - 0.14j	0.04	CREG	1/9
Heptachlor epoxide	ND - 1.1	0.08	CREG	2/9

j - the associated numerical value is an estimated quantity because quality control criteria were not met. However, presence of the material is reliable.

[] - the associated numerical value is an estimated quantity because the amount detected is below the contract required detection limit (CRDL). Presence of the material is reliable.

* the concentration range is within background for soils in the Salt Lake City area (42).

** A comparison value cannot be calculated for lead because there are no MRLs, Rfds, or cancer slope factors. Whenever lead is found at a site, it is further evaluated because of lead's well-documented ability to cause health effects in children at low concentrations in the environment.

The Contract Required Detection Limit of 4.8- 5.6 ppm antimony is above a comparison value of 0.8 ppm based on Rfd. The CRDL of selenium is sometimes above the comparison value.

TABLE 4 - ON- AND OFF-SITE AIR				
CONTAMINANT	**CONCENTRATION RANGE**	**COMPARISON VALUE (CV) FOR INHALATION**		**FREQ >CV**
	$\mu g/m^3$	$\mu g/m^3$	**Source**	
Benzene	ND - 18j off-site air	0.1	CREG	1/5
Benzene	ND - 25j on-site air	0.1	CREG	7/20
j- the associated numerical value is an estimated quantity because quality control criteria were not met. However, presence of the material is reliable.				

TABLE 5 - OFF-SITE GROUNDWATER					
CONTAMINANT	**CONCENTRATION RANGE**	**COMPARISON VALUE FOR INGESTION**			**FREQ**
	ppb	**ppb**	**mg/kg/day**	**Source**	
none exceeding comparison values in three monitoring wells					
The Contract Required Detection Limit of 3.3 ppb thallium is above a comparison value of 0.4 ppb based on LTHA.					

APPENDIX B - PATHWAYS ANALYSES

TABLE 6. COMPLETED EXPOSURE PATHWAYS

PATHWAY NAME	EXPOSURE PATHWAY ELEMENTS					TIME
	SOURCE	ENVIRONMENTAL MEDIA	POINT(S) OF EXPOSURE	ROUTE OF EXPOSURE	EXPOSED POPULATION	
Surface Soil	P/E* and others	Surface soil	On-site Soil, Residential Yards, Playgrounds	Ingestion	Children in residences immediately east and south of P/E, particularly if pica. Adults to a lesser extent	Past Present Future
Ambient Air	P/E and others	Air- general air quality may be poor due to industries.	On Site, Off Site	Inhalation	All workers and residents in the general vicinity of P/E.	Primarily Past

* P/E = Petrochem/EkoTek

TABLE 7. POTENTIAL EXPOSURE PATHWAYS

PATHWAY NAME	EXPOSURE PATHWAY ELEMENTS					TIME
	SOURCE	ENVIRONMENTAL MEDIA	POINT OF EXPOSURE	ROUTE OF EXPOSURE	EXPOSED POPULATION	
Surface Water	P/E*	Water	On site near RR or past containment overflows. Ponded water.	Skin Contact Ingestion Inhalation	Workers, Trespassers, Possibly adjacent residents E of P/E.	Past
Groundwater	P/E	Water	Municipal or private well use	Ingestion	Salt Lake City Residents	Future
Worker Waste Material	P/E	Waste Material	Waste Piles	Skin Contact Ingestion Inhalation	Workers Trespassers	Past
Soil Gas	P/E	Soil	Waste Piles, on- and off- site soils	Inhalation	Remedial Workers	Future

* P/E = Petrochem/EkoTek

TABLE 8 - ESTIMATED POPULATION FOR COMPLETED AND POTENTIAL EXPOSURE PATHWAYS

Exposed Populations and Potentially Exposed Populations			**Affected by a Completed or Potential Exposure Pathway* For:**					
Location		Approx.No. of Persons	Heavy Metals ex. Pb, Cr, Ar	Chlorinated Solvents	PCB's	Phthalates	Pesticides	Benzene and other volatile organics
Residents and Workers from Nearby Homes and Businesses	Both on- and off-site exposure	Unknown	Soil *Air* *GW*	Soil *GW*	Soil	Soil	Soil	Air *GW*
	Off-site exposure	200	Soil *Air*	Soil-limited	Soil	Not exposed	Soil	Air *GW*
Site Workers		<100	Soil *Air* *GW*	Soil *GW*	Soil	Soil	Soil	Air

* *potential exposure pathways are shown in italics*
GW = groundwater

APPENDIX C - COMPARISON OF ESTIMATED EXPOSURE DOSE TO HEALTH GUIDELINES FOR INGESTION AND CALCULATION OF CANCER RISK

TABLE 9 - COMPARISON OF ESTIMATED EXPOSURE DOSE TO HEALTH GUIDELINES FOR INGESTION

CONTAMINANT	EXPOSURE PATHWAY	HEALTH GUIDELINE IN MG/KG/DAY	SOURCE	EXCEEDED BY ESTIMATED EXPOSURE DOSE
Arsenic	soil	0.0003	Rfd[1]	children and pica children
Barium	soil	0.07	Rfd	children and pica children
Beryllium	soil	0.005	Rfd	no
Cadmium	soil	0.0002	CMRL	pica children[2]
Chromium	soil	0.005	Rfd	pica children[2]
Lead	soil	none[3]		
Manganese	soil	0.1	Rfd	pica children[2]
Mercury	soil	0.0008	IMRL	pica children[2]
Vanadium	soil	0.003	IMRL[4]	pica children[2]
Polychlorinated biphenyls (PCBs)	soil	0.000005	CMRL[5]	children and pica children
Chlordane	soil	0.0006	CMRL	pica children[2]
Dieldrin	soil	0.00005	CMRL	pica children[2]
Heptachlor epoxide	soil	0.000013	Rfd	children and pica children
Bis(2-ethylhexyl) phthalate	soil	0.02	Rfd	children and pica children
Di-n-butyl-phthalate	soil	0.1	Rfd	pica children
Pentachlorophenol	soil	0.03	Rfd	pica children

Explanation of Table 9

1 - Rfd is reference dose.

2 - Pica children are assumed to ingest five grams of soil per day.

3 - Currently, there are no health guidelines available for lead in soil. Whenever lead is found at a site, it is further evaluated because of lead's well-documented ability to cause health effects in children at low concentrations in the environment.

4 - IMRL is intermediate minimal risk level.

5 - CMRL is chronic minimal risk level.

Calculation of Exposure Doses for Soil Ingestion

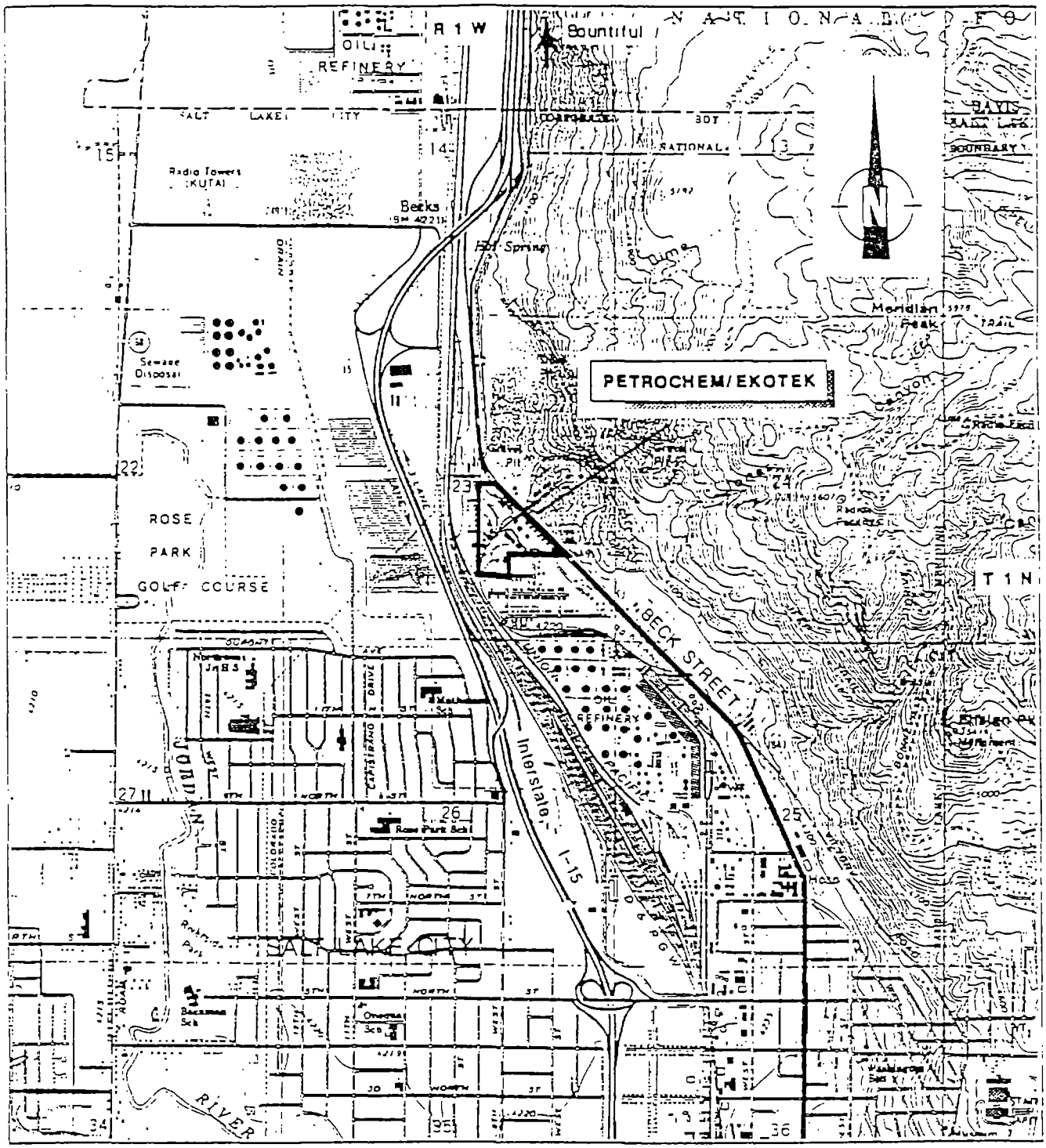
The exposure doses for soil ingestion were calculated in the following manner. The maximum concentration for a contaminant was multiplied by the soil ingestion rate for adults, 0.0001 kg/day; children, 0.0002 kg/day, or pica children, 0.005 kg/day. (The habit of ingesting large amounts of soil is called pica.) This product was divided by the average weight for an adult, 70 kg (154 pounds) or for a child, 10 kg (22 pounds). These calculations assume that there is frequent daily exposure to soil contaminated at the maximum level. A qualitative summary of these results can be found in Table 9, Appendix C.

Calculation of Risk of Carcinogenic Effects

Carcinogenic risk from soil ingestion was calculated through the following. The maximum concentration of a contaminant was multiplied by the soil ingestion rate for adults of 0.0001 kg/day, then this result is divided by the average adult body weight of 70 kg. This product is multiplied by the EPA's Cancer Slope Factor for the contaminant. The result represents the maximum risk for cancer after 70 years of exposure to the maximum concentration of the contaminant. Cancer slope factors were available for beryllium, PCB, chlordane, dieldrin, bis(2-ethylhexyl)phthalate, di-n-butyl-phthalate, pentachlorophenol, and heptachlor epoxide (20).

The actual risk of cancer is probably lower than the calculated number. The method used to calculate EPA's Cancer Slope Factor assumes that high dose animal data can be used to estimate the risk for low dose exposures in humans (17). The method also assumes that there is no safe level for exposure (18). There is little experimental evidence to confirm or refute those two assumptions. Lastly, the method computes the 95% upper bound for the risk, rather the average risk, which results in there being a very good chance that the risk is actually lower, perhaps several orders of magnitude (19).

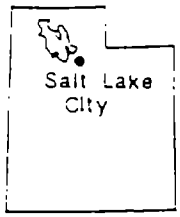
APPENDIX D - FIGURES 1 THROUGH 3



Source: Salt Lake City North Quadrangle, Utah, USGS, 1975

0 1/2 1 Mile

LOCATION MAP



LEGEND

Site location

Source: Ecology & Environment Inc., Denver, CO
EPA HRS package

FIELD INVESTIGATIONS OF UNCONTROLLED HAZARDOUS WASTE SITES
TASK REPORT TO THE E.P.A.

TITLE:
PETROCHEM/EKOTEK
Salt Lake City, Utah
SITE LOCATION MAP

T.D.D. F08-8909-15

FIG. 1

Date: 10/89 Drawn by: RSM Scale: _____

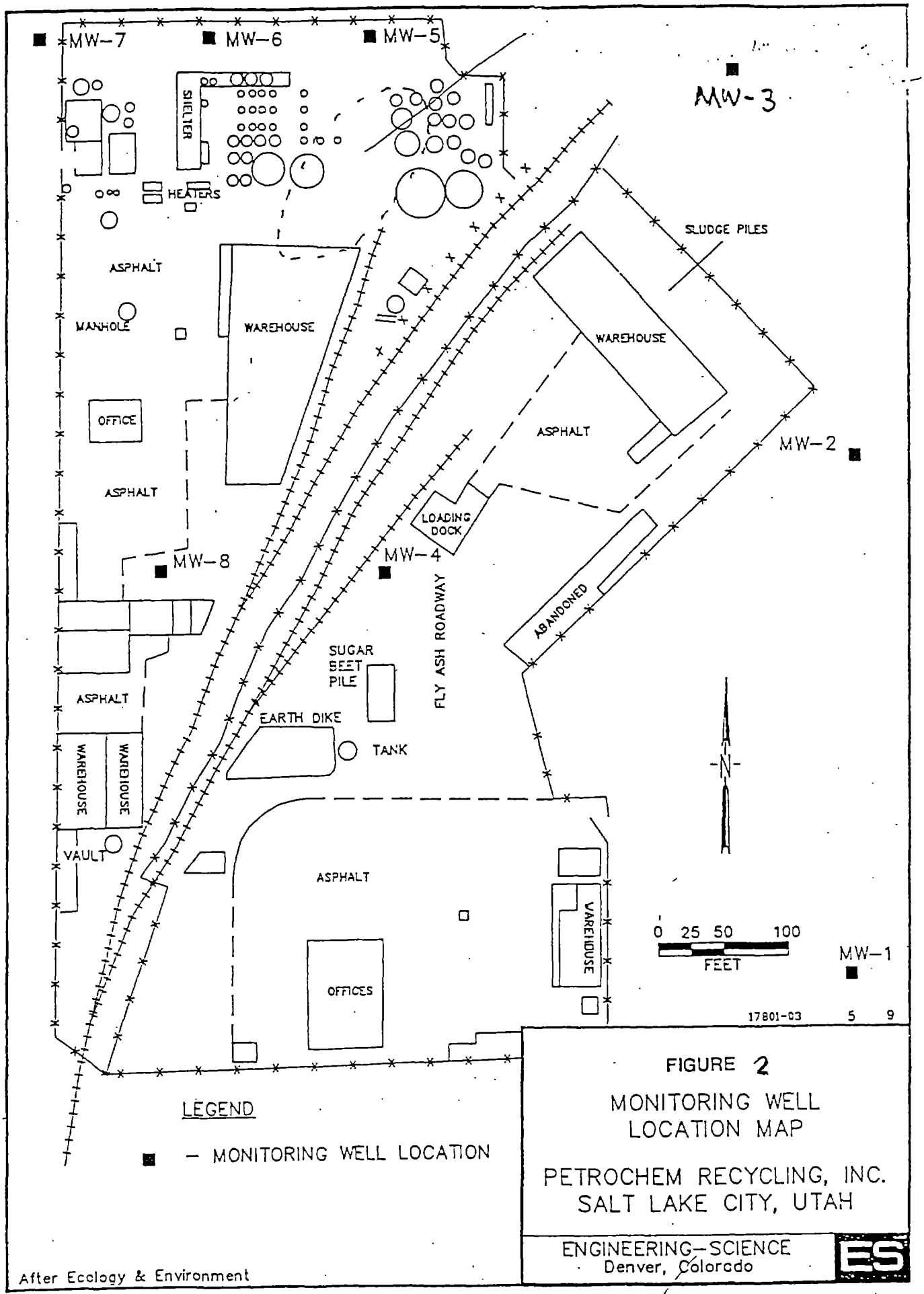


FIGURE 2

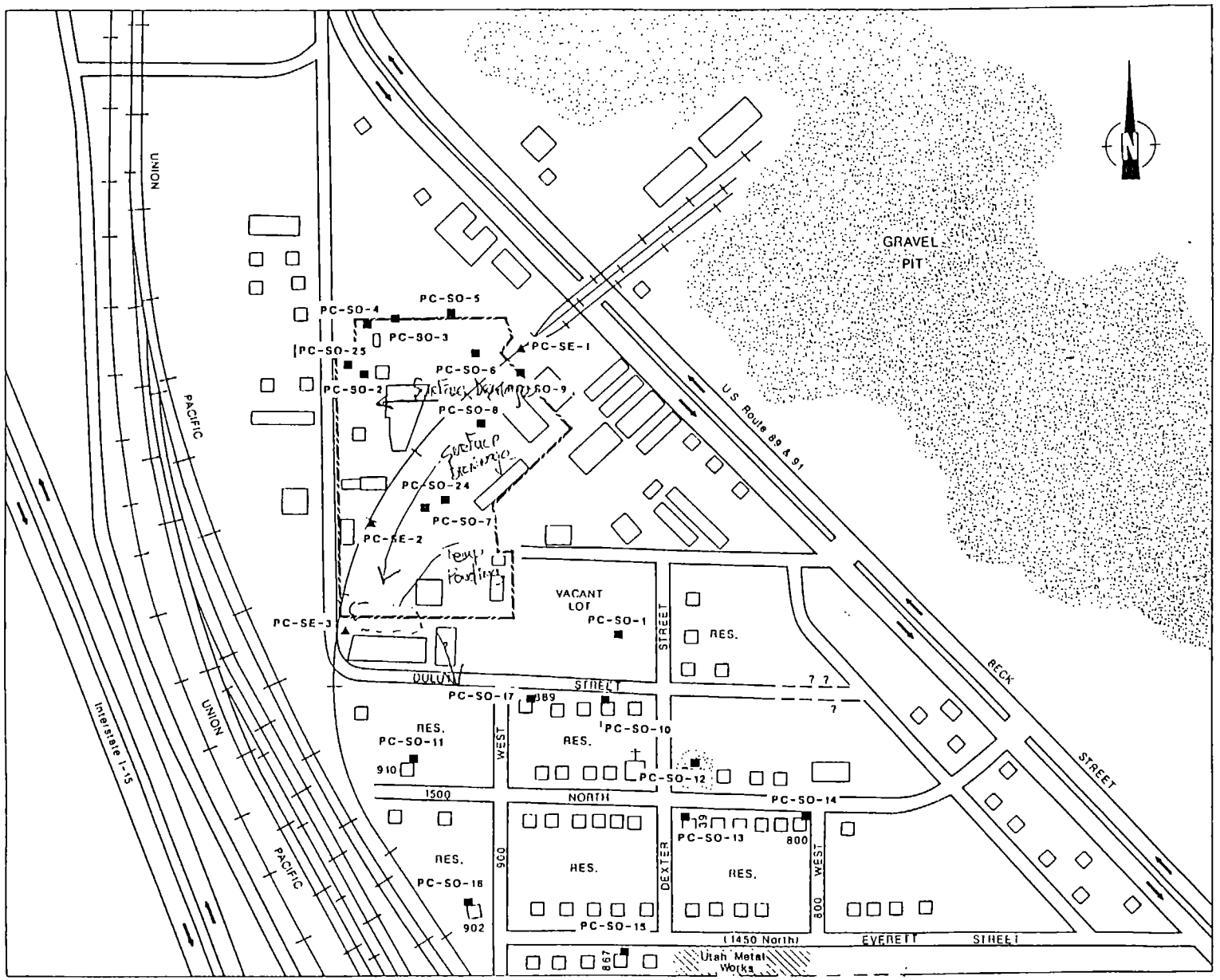
MONITORING WELL LOCATION MAP

PETROCHEM RECYCLING, INC.
SALT LAKE CITY, UTAH

ENGINEERING–SCIENCE
Denver, Colorado

ES

After Ecology & Environment



LEGEND

- Site boundary area
- ■ Soil sample
- ▲ Sediment sample

FIGURE 3

FIELD INVESTIGATIONS OF UNCONTROLLED HAZARDOUS WASTE SITES
TASK REPORT TO THE E.P.A.

TITLE:
PETROCHEM-EKOTEK
Salt Lake City, Utah
SOIL & SEDIMENT
SAMPLE LOCATION MAP
T.D.D. F08-8009-15

ecology & environment, inc.
DENVER, COLORADO

Date: 02/90 Drawn by: RSM Scale:

APPENDIX E - PUBLIC COMMENTS

RESPONSE TO COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD FOR PETROCHEM PUBLIC HEALTH ASSESSMENT

The Petrochem Public Health Assessment was available for public review and comment from November 10, 1992 through December 8, 1992. The Public Comment Period was announced in local newspapers; the resident and business owners in the Swedetown area were notified by letter. Copies of the public health assessment were made available for review at the Rose Park Branch Library, the Non-Fiction Reference Section of the Salt Lake City Public Library, and the Utah Department of Environmental Quality. In addition, the public health assessment was sent to seven persons or organizations who requested copies. Comments were received from one person, EPA, and UDEQ.

Comments and responses are summarized below. The comment letters can be requested from ATSDR through the Freedom of Information Act.

COMMENT: In general it appears that the population of Swedetown is too small to be significant to most of your formulas. The surface samples are only expected to give you preliminary evidence. So I am skeptical that your results claim that is no threat to human health except for Pica kids.

RESPONSE: *Except for health outcome data, the evaluations in the public health assessment are not dependent on population size. However, the toxicological evaluations are very dependent on the quality and quantity of the environmental sampling data. Because of the overall inadequacy of the environmental data for this site, ATSDR could not determine whether the site represents a health hazard and made recommendations to fill the data gaps.*

ATSDR appreciates your skepticism. Our conclusions are only valid for the limited data we evaluated for Swedetown residential area and were not intended to mean that the site is safe. The data are inadequate for such a determination. To better identify the possible health threat, ATSDR recommends that additional sampling of the residential area be done.

COMMENT: One wonders if this site is not a serious threat, how can so many millions of dollars be spent on it's behalf?

RESPONSE: *As stated above, the environmental data are inadequate for determining whether the Petrochem site is currently a health hazard. This site was a health hazard in the past, which is why it was closed and the worst areas of contamination removed. Any remaining areas of contamination on site and any contaminants that moved off-site should be identified during the remedial investigation and then cleaned up.*

COMMENT: In order to place the previous investigations/results in their proper context, ATSDR should include in the Summary section a brief description of the Superfund process, and where the Petrochem/Ekotek site stands in that process. It should also be pointed out that earlier investigations were not intended to be comprehensive and that the information found lacking in the earlier stages will be addressed during the upcoming Remedial Investigation for the site.

RESPONSE: *These are very good suggestions. The Background section of the public health assessment will be revised to include information on the Superfund process. A brief mention will also be made in the Summary. The purpose of earlier environmental investigations and that a RI will be done will be mentioned in the Environmental Contamination and Other Hazards section.*

COMMENT: Page 1, paragraph and Page 2, paragraph 2. The last sentences should be changed to state "the site was **added to** the National Priorities List in **October 1992.**"

RESPONSE: *Thanks for this new information. The public health assessment will be revised accordingly.*

COMMENT: Page 3, paragraph 4. The second sentence should read "Since then security has been provided on a **drive-by** basis.

RESPONSE: *The public health assessment has been revised to reflect this change.*

COMMENT: The following is an example of contradictory statements within the public health assessment. In the Summary, page 1, paragraph 2, it is stated that the "ambient air pathway cannot be fully evaluated for health implications because of the lack of monitoring during plant operations." In the Recommendations, page 27, it is stated that "...people may have been exposed to contaminants at levels that may cause illness or disease..." However, in the response to Community Health Concerns Evaluation, page 23, question 1, an evaluation of health implication is made in spite of the lack of air monitoring data and potential exposure to contaminants which may have caused illness or disease. It may be ATSDR's belief that long-term health effects are unlikely; the Utah's Department of Environmental Quality (UDEQ) does not share in this confidence in the presence of all the uncertainties.

RESPONSE: *These statements are not contradictory. In a public health assessment, ATSDR evaluates the possible health impact of the entire site, and the environmental data for each media. For Petrochem, the site was determined to be an indeterminate public health hazard because data were inadequate. Likewise,*

the environmental data for the air pathway were inadequate for a full evaluation.

However, the soil sampling data were adequate, though barely so, for evaluating health implications for this media. This lead to the conclusion that the maximum levels of arsenic, cadmium, and barium in residential soil might result in adverse health effects in some children. The statement in the Recommendations that people may have been exposed is based on these conclusions.

The response to question 1 in the Community Health Concerns Evaluation section is not contradictory. It is based on a specific question posed by a business owner. The question was whether employees would suffer long-term effects from the short-term acute illnesses they experienced from emissions from the plant while it was in operation. It was reported that those illnesses were experienced several times a year for 10 years and that symptoms were mild and recovery was rapid. Given this specific exposure scenario, long-term effects are unlikely. However, given another scenario, such as daily low level exposures, it is not possible to exclude the possibility of long-term effects.

The commenter states that "It may be ATSDR's belief that long-term health effects are unlikely; UDEQ does not share in this confidence in the presence of all the uncertainties." ATSDR response to question 1 relates only to the question and exposure scenario posed by the business owner. As stated previously, the possibility of long-term effects from other exposure situations can not be eliminated.

COMMENT: The following is another example of contradictory statements within the public health assessment. Page 1, paragraph 5 states the following: "...the extent and sources of off-site contamination of the residential soil and ground water are unknown.", and, "...there are many estimates in the data obtained which are inadequate for determining public health implications." Yet earlier in paragraph 3 of the Summary section, the statement is made that "...maximum concentrations of other soil contaminants (other than arsenic and barium) were not a health concern. Such a statement cannot be made if the data reviewed is inadequate for determining public health implications.

RESPONSE: *As stated earlier, ATSDR evaluates the possible health impact of the entire site, and the environmental data for each media. For Petrochem, the site was determined to be an indeterminate public health hazard because of the inadequacy of the data. However, the soil sampling data were adequate, though barely so, for evaluating health implications for this media.*

ATSDR does not consider this approach contradictory. Environmental data often are adequate for one media but not for an entire site. ATSDR has a responsibility to make health evaluations for any media where the data is adequate, even though, as is the case with Petrochem, the source of contamination is uncertain.

COMMENT: The following is a third example of contradictory statements within the public health assessment. The Summary, page 1 and in the Conclusions, page 25, states that the site represents "an indeterminate public health hazard because the environmental data reviewed are inadequate for fully assessing the possible impact of this site on public health" and "extent of off-site groundwater and soil contamination has not been determined." Even though insufficient data exists to assess the impact on public health, the authors encourage the residents to eat the vegetables out of their gardens, acknowledging that "small amounts of contaminants may be on or in the vegetables", and permitting the children to play in the dirt. Because of the uncertainties surrounding this site until further testing is done, UDEQ does not agree with ATSDR's response to questions 4 and 5 on page 24.

RESPONSE: *As with the other two examples given by the commenter of contradictions, the problem is whether the entire site is being evaluated or a specific media. The soil data are adequate to make the responses to questions 4 (permitting children to play in the dirt) and 5 (stating that vegetables are safe to eat).*

COMMENT: It was stated in UDEQ's previous comments on the Initial Release for the Health Assessment that despite the title, **Possible Health Consequences of the Exposure Doses** (page 17), no health consequences are noted. What are the symptoms of exposure to the contaminants of concern? The description of the possible health effects from exposure to barium was better in the Initial Release HA than in the current HA.

RESPONSE: *Possible health consequences (i.e., that adverse health effects may occur) are noted for arsenic, barium, and cadmium. The listing of possible symptoms is an uncertain exercise when animal data are being used to predict whether human health effects will occur. Since most of the discussions of possible health consequences were based on animal data, it was decided to be consistent for all the discussions and not list possible symptoms.*

COMMENT: The typical/natural levels for inorganics referred to in the report are based on a table summarizing "background" soil samples from approximately 23 pre-remedial Site Investigations in the Salt Lake City area (reference #42). This summary has its limitations and was not intended to represent actual background conditions for the Salt Lake area. Indeed, the variability in the concentrations for most of the compounds indicate that a much larger sample

size would be required in order to determine representative background concentrations. Conclusions such as the one made for arsenic concentrations (page 17, paragraph 4, first sentence) based on reference #42 should be changed accordingly.

RESPONSE: *The data from the 23 pre-remedial Site Investigations was given to ATSDR by UDEQ as "background data." UDEQ stated in their comments on the initial release of the Petrochem Public Health Assessment, "The levels of arsenic found in residential soils are at background levels for the Salt Lake Valley." The data appear to be adequate for the purpose they are used for in the document. "Naturally occurring" in the first sentence of paragraph 4 on page 17 has been deleted.*

COMMENT: Page 27, paragraphs 4 and 5. What biological indicators of exposure are recommended by HARP? Petrochem has been inactive for over 4 years; what biological indicator proposed will determine ambient exposure to site-related contaminants after 4 years of inactivity? Who will conduct this testing? Who will be responsible for conducting the health statistics review and community health investigation to community concerns about cancer?

RESPONSE: *The biological indicators of exposure recommended by HARP would be those appropriate for the known exposures (i.e., metals in soil). It is not known whether these exposures are site-related.*

As far as what biological indicators would indicate exposure to site-related contaminants after four years of inactivity, this would be any indicator for which exposure is still occurring. The type and extent of off-site movement of site contaminants and the possibility of exposure to them, hopefully, will be answered by the Remedial Investigation.

The biological indicator testing and the other public health actions, if needed, can be done by the State of Utah, either using their or ATSDR funds, as available, or by ATSDR. The State of Utah has already begun to address the community concerns about cancer.

COMMENT: Overall the document is difficult to understand. There are numerous discrepancies and contradictions that remain that should be addressed in a general re-write of this document. The authors should recognize that their audience is the general public and provide an adequate level of explanation, making sure that the discussions in the text supports their conclusions/recommendations. Discussions, such as the one on page 17 regarding arsenic, leave the reader with more questions than answers. Sections such as this need to be re-written in clear concise language.

RESPONSE: *Many of the general concerns mentioned have already been addressed in earlier responses. The three specific examples of contradictions given, are not contradictions. No examples of discrepancies were given, so a response can not be made.*

Every effort has been made to write public health assessments that can be useful, informative, and understandable to the general public. The document was reviewed by technical experts, professional editors, and administrators within ATSDR. In addition, the residents, business owners, and others have been communicated with regularly throughout the development of the public health assessment. Suggestions for improving the readability of the public health assessment (in general) are welcomed. Please send recommendations to: Director, Division of Health Assessment and Consultation, ATSDR, Mail Stop E-32, 1600 Clifton Road, Atlanta, GA 30333.

COMMENT: Summary/3: The list of soil contaminants should be prefaced with a statement that this list is based upon existing sampling, and should not be presented as a complete list. EPA must repeat the comment it made on 31 August 1992 in a review letter for an earlier draft of this report. While a great deal of information is known about the now-removed primary sources of contamination at the Site, relatively little is known about the remaining contamination of the Site soils and ground water. Even less is known concerning the potential pathways for contamination to migrate from the Site, and the exposure pathways which may affect off-site receptors. These information needs are the primary purpose for conducting a Remedial Investigation and Feasibility Study (RI/FS), which is now underway.

RESPONSE: *The list of contaminants in the soil exposure pathway in the Summary is not described as being complete or incomplete. The sources of the sampling data are described in the Environmental Contamination and Other Hazards section (page 7, paragraph 1) and the limitations of those data are mentioned numerous times in the public health assessment, especially paragraph 5 of the summary.*

COMMENT: Summary/5: ATSDR recommends that EPA and UDEQ better characterize off-site ground water and soil contamination. This implies that off-site contamination exists, and that it is the result of Site activities. During the RI, pathways for contamination to migrate from the Site will be investigated. However, the Site is located in an industrial area, and there are many potential sources of off-site contamination other than the Petrochem Site. Off-site soil contamination is especially difficult to attribute to a particular source. Unless off-site contamination can be scientifically attributed to the Site, EPA has no authority with respect to the Site to address such contamination. Therefore, ATSDR's recommendation should be modified.

RESPONSE: *ATSDR is required by the Superfund Amendments and Reauthorization Act of 1986 (SARA) to release a public health assessment on a site within one year after a site is proposed for the National Priorities List (NPL). This often means that the public health assessment has to be written before comprehensive environmental sampling such as found in an RI is conducted. The Petrochem Preliminary Public Health Assessment is identified as "Preliminary" because of the lack of those comprehensive data. For Petrochem, the site was determined to be an indeterminate public health hazard because of the inadequacy of most of the data. However, the soil sampling data were adequate, though barely so, for evaluating health implications for this media.*

ATSDR has a responsibility to make health evaluations for any media where the data is adequate, even though, as is the case with Petrochem, the source of soil contamination is uncertain. The recommendation for further characterization was made to help determine the role of the site, if any, in contributing to off-site contamination. In addition, ATSDR has a responsibility to recommend further sampling that would quantify possible human exposures, even if those exposures are not site-related.

Recommendation 2 in the Recommendations section was written with those two goals in mind. Sampling at the perimeter of the site, as recommended, is a common way of identifying whether contaminants have moved off-site. As documented in the public health assessment, there is good anecdotal evidence that contaminants have been moved off-site to the west. Additional sampling in the residential area of Swedetown is needed to better quantify the contaminant levels and the health risk. The source of those contaminants is uncertain.

The commenter raises a concern about EPA's lack of authority to perform sampling not related to the site. It has been the experience of ATSDR that EPA or state environmental agencies usually have the authority and responsibility, though not always the funding, to perform environmental sampling when the source is uncertain. Recommendation 2 identifies the need for additional sampling but in no way obligates any agency to perform that sampling. SARA mandates that ATSDR identify additional sampling needs in the public health assessment.

ATSDR will be contacting EPA and the Utah Department of Environmental Quality (UDEQ) before this document goes final to identify whether they can commit to perform any of the recommended sampling. Commitments to implement or actual implementation of any of the recommendations by ATSDR, EPA, UDEQ, or other agencies will be placed in a Public Health Actions section.

COMMENT: Page 2/paragraph 2: The Site was added to the National Priorities List on October 14, 1992.

RESPONSE: *The public health assessment has been revised to include this new information.*

COMMENT: Page 9/paragraph 2: With respect to soil gas and off-site contamination, EPA must repeat its 31 August 1992 comment. EPA fails to see the relevance of chlorinated solvents being discovered in off-site soil gas. No link, such as a potential pathway, has been made between the Site and these off-site gases. In addition, ATSDR states that the presence of off-site soil gas indicates that off-site groundwater needs to be characterized further. This implies without a scientific basis that the Site has contaminated both off-site soil gas and off-site ground water. This entire paragraph should be deleted.

RESPONSE: *This commenter stated earlier that, "...relatively little is known about the remaining contamination of the Site soils and ground water. Even less is known concerning the potential pathways for contamination to migrate from the Site, and the exposure pathways which may affect off-site receptors. These information needs are the primary purpose for conducting a Remedial Investigation and Feasibility Study (RI/FS)..." The recommendation to further characterize off-site groundwater is one of the ways to fill those information needs. The finding of chlorinated solvents in soil gas off-site demonstrates the need for further characterization since chlorinated solvents have been found on site. Sampling such as done during an RI will likely indicate whether there is a link.*

COMMENT: Page 11/paragraph 2: Regarding the soil pathway with respect to off-site soil, EPA must firmly repeat its 31 August 1992 comment. As described above in Comment No. 2, relatively little is known about on-site contamination. Until the RI/FS is thoroughly underway and on-site characterization has been completed, any speculation relating off-site soil contamination to the Site will remain inconclusive. Contaminants have been found in off-site soil, some of which are also found in on-site soil. However, given the industrial nature of the area, one cannot automatically attribute this contamination to the Site, as this report implies. Therefore, ATSDR should revise its conclusion of a completed exposure pathway with relation to off-site soils. While off-site contamination does exist, within the context of this report the determination of a completed exposure pathway implies the source of contamination is the Petrochem Site. In addition, the comment may well prove unnecessary. However, if the RI/FS data indicates that this off-site sampling is indeed necessary, EPA shall ensure that a thorough sampling investigation is conducted to protect the nearby community and environment. This issue of off-site soil should be revised not only in this paragraph, but in all similar paragraphs throughout the document.

RESPONSE: *The second sentence of this paragraph has been deleted to help clarify this issue. However, as described on pages 10-11 of the public health assessment, ATSDR considers an exposure pathway complete when there is good evidence of human exposure. The source of the contaminants does not have to be ascertained for an exposure pathway to be considered complete. ATSDR mentions throughout the document the possible contribution of other sources to soil contamination off-site.*

COMMENT: Page 12/paragraph 5: EPA strongly objects to the conclusion of soil gas as a potential exposure pathway. ATSDR agreed in a 19 October 1992 letter to EPA with EPA's comment that until the source of off-site soil gases is identified, no link can be made between the gases and the Site. ATSDR should delete this conclusion, not only in this paragraph, but also in all similar text throughout the document.

RESPONSE: *Similar to completed pathways, the source of contamination need not be known for ATSDR to consider a potential exposure pathway to exist.*

COMMENT: Page 17/paragraph 1: ATSDR discusses possible health consequences resulting from exposure to off-site contaminated soil. As described above in Comments No. 2 and 5, there are several potential sources for off-site soil contaminants other than the Petrochem Site. However, this paragraph implies that exposure to this off-site soil can be attributed to Petrochem. This paragraph should be revised, and also any similar paragraphs in the text.

RESPONSE: *The fourth sentence of this paragraph has been revised as follows to remove this implication.*

> Thus they may not be indicative of the consequences of ingesting soil from other areas in Swedetown ~~near the Petrochem site~~ because the levels ~~are~~may be either lower or unknown.

COMMENT: Page 26/Recommendation 2: ATSDR states that the soil of adjacent businesses and residences and the nearby Swedetown residences should be sampled. This recommendation should be deleted. ATSDR agreed in a 19 October 1992 letter with EPA's original comment that characterization, including comprehensive sampling, of off-site residential soil, ground water and air is premature and may well prove to be unnecessary.

RESPONSE: *ATSDR agreed with the original comment and deleted the sentence quoted. The original comment was "Your statements in paragraph 4 of the Summary that 'off-site residential soil, groundwater, and air need (emphasis added) further characterization including comprehensive sampling' are premature and may well prove to be unnecessary." We did not mean to indicate that further*

characterization was unnecessary. As described in an earlier response, ATSDR has a responsibility to make such recommendations.

COMMENT: Page 27/Recommendation 3: ATSDR recommends that ambient air be monitored near locations where surface soil gas contaminants are identified. As described above in Comment No. 6, EPA and ATSDR have previously agreed that any off-site air sampling is premature.

RESPONSE: *ATSDR did not intend its response to a comment on a specific sentence in the Summary section of the Initial Release to include other parts of the document. We apologize for any misunderstanding that may have occurred.*

Recommendation 3 is another of the information needs identified by the commenter that can be addressed in an RI.