Public Health Assessment for

ALARIC INCORPORATED
TAMPA, HILLSBOROUGH COUNTY, FLORIDA
EPA FACILITY ID: FLD012978862
MAY 4, 2001

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

PUBLIC HEALTH ASSESSMENT

ALARIC INCORPORATED

TAMPA, HILLSBOROUGH COUNTY, FLORIDA

EPA FACILITY ID: FLD012978862

Prepared by:

Florida Department of Health
Bureau of Environmental Epidemiology
Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

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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FOREWORD

The Agency for Toxic Substances and Disease Registry, ATSDR, was established by Congress in 1980 under the Comprehensive Environmental Response, Compensation, and Liability Act, also known as the *Superfund* law. This law set up a fund to identify and clean up our country's hazardous waste sites. The Environmental Protection Agency, EPA, and the individual states regulate the investigation and clean up of the sites.

Since 1986, ATSDR has been required by law to conduct a public health assessment at each of the sites on the EPA National Priorities List. The aim of these evaluations is to find out if people are being exposed to hazardous substances and, if so, whether that exposure is harmful and should be stopped or reduced. If appropriate, ATSDR also conducts public health assessments when petitioned by concerned individuals. Public health assessments are carried out by environmental and health scientists from ATSDR and from the states with which ATSDR has cooperative agreements. The public health assessment program allows the scientists flexibility in the format or structure of their response to the public health issues at hazardous waste sites. For example, a public health assessment could be one document or it could be a compilation of several health consultations the structure may vary from site to site. Nevertheless, the public health assessment process is not considered complete until the public health issues at the site are addressed.

Exposure: As the first step in the evaluation, ATSDR scientists review environmental data to see how much contamination is at a site, where it is, and how people might come into contact with it. Generally, ATSDR does not collect its own environmental sampling data but reviews information provided by EPA, other government agencies, businesses, and the public. When there is not enough environmental information available, the report will indicate what further sampling data is needed.

Health Effects: If the review of the environmental data shows that people have or could come into contact with hazardous substances, ATSDR scientists evaluate whether or not these contacts may result in harmful effects. ATSDR recognizes that children, because of their play activities and their growing bodies, may be more vulnerable to these effects. As a policy, unless data are available to suggest otherwise, ATSDR considers children to be more sensitive and vulnerable to hazardous substances. Thus, the health impact to the children is considered first when evaluating the health threat to a community. The health impacts to other high risk groups within the community (such as the elderly, chronically ill, and people engaging in high risk practices) also receive special attention during the evaluation.

ATSDR uses existing scientific information, which can include the results of medical, toxicologic and epidemiologic studies and the data collected in disease registries, to determine the health effects that may result from exposures. The science of environmental health is still developing, and sometimes scientific information on the health effects of certain substances is not available. When this is so, the report will suggest what further public health actions are needed.

Conclusions: The report presents conclusions about the public health threat, if any, posed by a site. When health threats have been determined for high risk groups (such as children, elderly, chronically ill, and people engaging in high risk practices), they will be summarized in the conclusion section of the report. Ways to stop or reduce exposure will then be recommended in the public health action plan.

ATSDR is primarily an advisory agency, so usually these reports identify what actions are appropriate to be undertaken by EPA, other responsible parties, or the research or education divisions of ATSDR. However, if there is an urgent health threat, ATSDR can issue a public health advisory warning people of the danger. ATSDR can also authorize health education or pilot studies of health effects, fullscale epidemiology studies, disease registries, surveillance studies or research on specific hazardous substances.

Community: ATSDR also needs to learn what people in the area know about the site and what concerns they may have about its impact on their health. Consequently, throughout the evaluation process, ATSDR actively gathers information and comments from the people who live or work near a site, including residents of the area, civic leaders, health professionals and community groups. To ensure that the report responds to the community's health concerns, an early version is also distributed to the public for their comments. All the comments received from the public are responded to in the final version of the report.

Comments: If, after reading this report, you have questions or comments, we encourage you to send them to us.

Letters should be addressed as follows:

Attention: Chief, Program Evaluation, Records, and Information Services Branch, Agency for Toxic Substances and Disease Registry, 1600 Clifton Road (E56), Atlanta, GA 30333.

TABLE OF CONTENTS

1.0 SUMMARY

The Alaric Inc., hazardous waste site is at 2110 North 71st Street in Tampa, Hillsborough County, Florida. This site came to the attention of the Florida Department of Environmental Protection (FDEP) in 1986 when the Hillsborough County Health Department (HCHD) detected high concentrations of chlorinated solvents in the on-site supply well. The property owner immediately closed the on-site well and the City of Tampa extended municipal water to the site and the surrounding commercial and residential areas. Between 1988 and 1998, FDEP collected soil and groundwater samples to identify the nature of the contaminants and to delineate the vertical and horizontal extent of the contamination. The Florida Department of Health (FDOH), Bureau of Environmental Epidemiology, evaluated the data from these reports in the preparation of this Public Health Assessment.

FDEP detected tetrachloroethylene and 1,2-dichloroethylene in on-site subsurface soil. However, the concentrations of the contaminants do not exceed the respective Agency for Toxic Substances and Disease Registry (ATSDR) comparison value for soil. On-site surface soil and off-site subsurface soil contained no detectable contaminants. FDOH concludes that exposure to soil either on or off the site is unlikely to cause illness.

In addition, FDEP detected 1,2-dichloroethylene, tetrachloroethylene, trichloroethylene and vinyl chloride in groundwater from both the surficial and Floridan aquifers. FDEP detected each of these contaminants at concentrations that exceed the respective ATSDR comparison value. With the exception of vinyl chloride, which was only detected off the site, each of the contaminants was detected beneath the site and south of the site. Off-site groundwater data suggests that the contaminants are moving southward with the direction of groundwater flow. The edge of the contamination in the Floridan aquifer appears to be just south of the CSX rail-line, approximately one-tenth of a mile from the site. The nearest private residential wells are to the north and are not likely affected by the Alaric Inc., hazardous waste site. A seafood distributor, with a nonfunctional supply well, and a correctional facility, which receives municipal water, are south of the site.

Although no complete exposure pathway exists and the completion of an exposure pathway is unlikely, FDOH evaluated the potential health effects of residential use of contaminated groundwater. Both on- and off-site groundwater contained tetrachloroethylene concentrations that, if regularly consumed by children, could introduce a health risk. Comparable doses caused hyperactivity in mice. Consumption of contaminated water is unlikely to cause illness in adults, since adults are less sensitive than children. Shower-use of on- or off-site groundwater could likely produce irritating air concentrations of tetrachloroethylene.

FDOH classifies the Alaric Inc., hazardous waste site as "no public health hazard" because no completed exposure pathways exist for the site. In addition, the completion of an exposure pathway is unlikely since most of the residents and businesses receive municipal water and the contamination is migrating away from the residential areas. As a protective measure, FDOH recommends (1) the drilling of private wells on and south of the site be restricted, and (2) the movement of the contamination within the surficial and Floridan aquifers continue to be monitored.

2.0 PURPOSE

The purpose of this report is to assess the public health threat of the Alaric Inc., hazardous waste site. In this report, the Florida Department of Health (FDOH), under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), assesses the past, current and future public health threats that could result from exposure to chemicals in the environment at and around the Alaric Inc., hazardous waste site. This report assesses and identifies exposure pathways, identifies actions to minimize exposures, and identifies appropriate follow-up health actions. This is the first assessment of this site by either FDOH or ATSDR. ATSDR, in Atlanta, GA, is a federal agency within the U.S. Department of Health and Human Services and provides the entire financial support for this project.

3.0 BACKGROUND

The Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) authorizes ATSDR to conduct public health assessments of hazardous waste sites. Specifically, FDOH and ATSDR decide whether illness is possible from exposure to contaminants from the site and recommends actions to reduce or prevent these exposures and therefore, the illnesses.

3.1 Site Description and History

The 1.72 acre Alaric Inc., site is at 2110 North 71st Street in Orient Park, Tampa, Hillsborough County, Florida. Figures 1 and 2 (Appendix A) show the location of the Alaric Inc., site and show the businesses in the surrounding area. Immediately east of the site is Helena Chemical Co. (HCC), which until 1981, manufactured, stored and distributed pesticides, herbicides and fertilizers. The production and handling of pesticides have since ceased at this site and the focus of HCC today is dry and liquid fertilizers (FDEP, 1998). HCC also owns the three acres of land immediately south of the Alaric Inc., site. A CSX rail-line forms the southern border of the HCC property. A company that refurbishes pay telephones is to the northwest. A masonry company and a battery recycler are immediately to the north, and a woodcrafting business is to the west. A seafood distributor and metal recycler are south of the rail-line (Figure 2, Appendix A).

Before 1973, the site and surrounding areas were vacant lots of oak trees. From historic photos, the building on the site first appears between 1972 and 1976. Historic reports show that from 1973 to 1981, Concrete Equipment and Supply (CES) occupied the property. CES built, repaired and refinished concrete mixing equipment. Florida Department of Environmental Protection (FDEP) reported that CES used degreasing and cleaning agents. However, FDEP did not determine the nature of the solvents used. Neighboring businesses reported that CES conducted the cleaning operations on unpaved areas on the south and west sides of the property.

From 1981 to 1986, two businesses shared the site and the building. Alaric Inc. recycled plastics and made special acrylic coatings and synthetic marble. The distillation procedure

that Alaric Inc. used required large amounts of water, which the on-site production well supplied. Dana Marine Labs packaged and distributed marine varnishes and lacquers. Use of chlorinated solvents was not associated with either of these operations. Currently, an aluminum enclosure facility occupies the property.

In 1986, Alaric Inc. prepared a site management plan as part of its application for a small quantity generator permit. In response, the Hillsborough County Health Department (HCHD) tested the on-site supply well. HCHD detected chlorinated solvents at concentrations that exceed the acceptable groundwater standards. Following the discovery of groundwater contamination at the Alaric Inc., site and contamination one-third of a mile to the west from another site, the City of Tampa extended municipal water service to the area. In addition, the owner of Alaric Inc. closed the on-site well. Several potential sources for the contamination exist in the area. As stated, for eight years CES conducted degreasing operations on the property. However, since FDEP could not determine the makeup of the solvents used, CES cannot be named as the definitive source. Flag Sulfur, which previously occupied the HCC property, reportedly used chlorinated solvents in the production of pesticides. In addition, FDEP detected chlorinated solvents in the soil of several of the businesses surrounding the Alaric Inc., site (FDEP, 1998).

In 1998, IT Corporation, under FDEP contract, completed a contamination assessment of the Alaric Inc., site. The purpose of this report was to determine the source of contamination and to delineate the vertical and horizontal extent of soil and groundwater contamination, both on and off the site (FDEP, 1998). Contractors collected sub-surface soil samples, surficial aquifer samples, and both shallow and deep Floridan aquifer samples.

Site-visit

On October 19, 1999, Davis Daiker and Randy Merchant with the FDOH, Bureau of Environmental Epidemiology, visited the Alaric Inc., property at 2110 North 71st Street and the surrounding area. They observed the site among several small businesses and the HCC property. The northern area of the site is cleared for parking (Figure 3, Appendix A). An intact fence surrounds the property. Driving through the area, they observed the southern edge of the Orient Park residential area more than 500 feet to the north. Because of the commercial/industrial nature of the immediate area and the presence of an intact fence, they concluded that trespass on the Alaric Inc., site is unlikely.

Demographics, Land Use and Natural Resource Use

3.3.1 Demographics- Based on the 1990 census, approximately 2700 people reside within one mile of the Alaric Inc., site (Table 1, Appendix B). Of this population, 26% are below the age of 17. Of this population, 62% are white, 21% are black and 17% are Hispanic or from other racial/ethnic groups. To the south, the nearest "housing" facility is a correctional facility, which houses about 175 individuals and receives municipal water. It is important to note that the heavily populated census districts within one mile of the site are north of the site, up-gradient to the direction of groundwater flow.

3.3.2 Land Use- As previously mentioned, the land use in this area is mixed residential/commercial/industrial. Several EPA Superfund sites exist in this area and include

Helena Chemical Co. to the east, Stauffer Chemical Co. to the southeast, and the 62nd Street Landfill to the west. The nearest residential development is approximately 500 feet north of the site. The area south of the site is predominantly commercial. One elementary school is 0.5 miles to the northwest. Several other schools exist more than one mile from the site.

3.3.3 Natural Resource Use- This region of Florida has both the surficial and Floridan aquifers. The surficial aquifer is encountered between 0.5 and 5 feet below the surface and is between 15 and 20 feet thick. Groundwater in the surficial aquifer flows to the southwest (FDEP, 1998). Below the surficial aquifer lies a semipermeable clay layer. This clay layer is approximately 12 feet thick and separates the surficial from the Floridan aquifer. However, since this clay layer is semipermeable, constituents and contaminants of the surficial aquifer can migrate into the Floridan aquifer. The Floridan aquifer lies beneath the clay layer and can be several hundred feet thick. Groundwater in the Floridan aquifer flows to the southeast (FDEP, 1998). In this region of Florida, most potable wells are drilled into the Floridan aquifer since the surficial aquifer in this region gives a low-yield of poor quality water. As mentioned, the City of Tampa supplies drinking water for this region. FDEP only identified two potable wells within 500 yards of the Alaric Inc., site. One of these wells is the closed on-site supply well. The other nearby potable well is up gradient from the site. More important, the census block containing the site and the census blocks south of the site, in the direction of groundwater flow, report very few private wells. The census block immediately south of the site contains a correctional facility (175 inmates) which receives City of Tampa municipal water. The nearest municipal supply well is more than 1.25 miles from the site.

The Tampa Bypass Canal is 0.5 miles southeast of the site. This canal is not a source of drinking water for the area and commercial fishing is prohibited from this body. However, some area residents may consume fish from this body of water. Little agriculture or hunting occurs in this area.

4.0 DISCUSSION

Uncertainties are inherent in the public health assessment process. These uncertainties fall into four categories: 1) science is never 100% certain, 2) the inexactness of the risk assessment process, 3) the incompleteness of the information collected thus far, and 4) differences in opinion as to the implications of the information (NJDEP, 1990). These uncertainties are addressed in Public Health Assessments by using worst-case assumptions when estimating or interpreting health risks. They also incorporate uncertainties by using wide safety margins when setting health-related threshold values. The assumptions, interpretations, and recommendations made throughout this Public Health Assessment err in the direction of protecting public health.

4.1 Environmental Contamination

We used the following ATSDR standard comparison values (ATSDR 1992a; 1999a) in order of priority to select potential contaminants of concern at this site:

1 CREG - Cancer Risk Evaluation Guide - calculated from EPA's cancer slope factor and is the contaminant concentration estimated to result in no more than one excess cancer per one million persons exposed over a lifetime.

2. EMEG - Environmental Media Evaluation Guide - derived from the ATSDR's Minimal Risk Level (MRL) using standard exposure assumptions, such as, ingestion of two liters of water per day and body weight of 70 kg for adults. MRLs are estimates of daily human exposure to a chemical generally for a year or longer likely to be without an appreciable risk of noncancerous illnesses.

3. RMEG - Reference Dose Media Evaluation Guide - derived from EPA's Reference Dose (RfD) using standard exposure assumptions. RfDs are estimates of daily human exposure to a chemical likely to be without an appreciable risk of noncancerous illness, generally for a year or longer.

4. LTHA - Lifetime Health Advisory - EPA's estimate of the concentration of a drinking-water contaminant at which illnesses are not expected to occur over lifetime exposure. LTHA's provide a safety margin to protect sensitive members of the population.

5. SCTL or GWCTL - Soil Clean-up Target Level or Groundwater Clean-up Target Level as determined by the Florida Department of Environmental Protection. This value is used only when no values exist for #1 through #4.

We use ATSDR standard comparison values to select chemicals for further consideration, not for determining the possibility of illness. Identification of a contaminant of concern (COC) in this section does not mean that exposure will cause illness. Identification of COCs serves to narrow the focus of the Public Health Assessment to those contaminants that are most important to public health. When we select a COC in one medium (i.e., soil), we report that contaminant in all other media (i.e., groundwater). We evaluate the COC in subsequent sections and estimate whether exposure is likely to cause illness. FDOH considered the data from the 1988 Groundwater Investigation, the 1998 Contamination Assessment Report and the latest contamination data in the preparation of this Public Health Assessment. FDOH presents the summarized data in Tables 2 through 6 (Appendix B).

Through sampling of soil and groundwater from both the surficial and Floridan aquifers, FDEP identified the major contaminants and characterized the extent of on-site and off-site contamination. Since the intermediate clay layer is discontinuous, contaminants can migrate from the surficial aquifer to the Floridan aquifer, Therefore, in the preparation of this assessment, FDOH considered the surficial and Floridan aquifers as a single source of groundwater.

4.1.1 On-Site Contamination - For this public health assessment, "on-site" refers to the area within the Alaric Inc., property boundaries as shown in Figures 3 and 4 (Appendix A).

In the preparation of the 1988 Contamination Assessment Report, FDER collected three samples from the top 12 inches of on-site soil. Analysis of these surface soil samples failed

to detect any contamination (FDER, 1988). In the 1998 contamination assessment, FDEP collected 13 soil samples from 3 to 4 feet below the surface (FDEP, 1998). Five of these samples contained tetrachloroethylene. However, the concentrations are well below the ATSDR soil comparison value. Two regions on the southern portion of the site contained the highest tetrachloroethylene concentrations. Both of these regions correspond to the reported locations of prior degreasing activities of CES. For this health assessment, on-site soil contamination has been adequately characterized. The locations of the soil samples are shown in Figure 3 (Appendix A). Tables 2 and 3 (Appendix B) list the maximum concentrations detected and the frequency that each contaminant was detected. Since FDEP detected no contaminants in soil at concentrations that exceed the ATSDR soil comparison value, FDOH selected the COCs in the on-site (Tables 2 and 3, Appendix B) soil based on the off-site groundwater contamination data.

In the preparation of the Contamination Assessment (1998), FDEP collected on-site groundwater samples of by both installing monitoring wells and using "direct-push" technology. Direct-push technology allowed FDEP to sample from the same location but at increasing depths. On-site groundwater in both the surficial and Floridan aquifers contained tetrachloroethylene, *cis*-1,2-dichloroethylene and trichloroethylene at concentrations above the respective ATSDR comparison value for groundwater. Based on the data from the 25 on-site groundwater samples, FDOH chose *cis*-1,2-dichloroethylene, tetrachloroethylene, and trichloroethylene as COCs in on-site groundwater. Table 4 (Appendix B) lists the maximum concentrations detected and the frequency that each contaminant was detected. Groundwater samples from the west and southeast of the building contained the highest contaminant concentrations. Overall, shallow (i.e., surficial aquifer) groundwater samples contained higher concentrations of contaminants than deeper samples. For this health assessment, on-site groundwater has been adequately characterized. The locations of the on-site groundwater samples are given in Figure 4 (Appendix A). A cross next to a well location indicates at least one sample from that well had a concentration of either tetrachloroethylene or trichloroethylene that exceeded the respective ATSDR comparison value. Of the 25 on-site groundwater samples collected, 17 contained tetrachloroethylene and 16 contained trichloroethylene at concentrations above the respective ATSDR comparison value (Table 4, Appendix B).

4.1.2 Off-site Contamination - For this public health assessment, we define "off-site" as the area outside the Alaric Inc., property boundaries (Figure 2, Appendix A).

Soil samples taken 3 to 4 feet below the surface and outside the property bounds of the site contained none of the contaminants detected in on-site subsurface soil (Table 5, Appendix A) (FDEP, 1998). Figure 3 (Appendix A) shows the locations of the off-site soil samples. FDEP did not collect off-site surface soil samples. For this health assessment, off-site soil has been adequately assessed. FDOH selected COCs in the off-site soil based on off-site groundwater contamination data.

FDEP collected off-site groundwater samples using monitoring wells and "direct-push". Off-site groundwater from south of the site contained *trans*-1,2-dichloroethylene, *cis*-1,2-dichloroethylene, tetrachloroethylene, trichloroethylene and vinyl chloride at concentrations that exceed the respective ATSDR groundwater comparison value. In the surficial aquifer, the highest tetrachloroethylene and trichloroethylene concentrations were detected south of

the site. The Floridan aquifer also contained these same contaminants, with the maximum tetrachloroethylene and trichloroethylene concentrations detected southwest of the site. Based on the location of the contaminants in both the surficial and Floridan aquifers, it appears that the contaminants are moving with the predicted direction of groundwater flow and descending through the surficial aquifer to the Floridan aquifer. More important, it appears that the groundwater flow is moving the contaminants away from the more densely populated areas. The edge of the contaminant plume is at least to the rail-line (Figure 2, Appendix A), where the Floridan aquifer, but not the surficial, contained tetrachloroethylene, trichloroethylene and dichloroethylene. In general, the greater the distance from the site that a sample was collected, the greater the occurrence of contamination of the Floridan aquifer. This is presumably due to the high density of these chlorinated solvents. Table 6 (Appendix B) lists the maximum concentrations detected and the frequency that each contaminant was detected. For this health assessment, off-site groundwater has been adequately characterized. Figure 4 (Appendix A) shows the locations of the off-site groundwater samples. A cross next to a well location indicates at least one sample from that well contained a contaminant concentration that exceeded the respective ATSDR comparison value. Of the 43 off-site groundwater samples, 25 contained tetrachloroethylene and 24 contained trichloroethylene at concentrations above the ATSDR comparison value (Table 6, Appendix B).

In April 2000, the United States Corps of Engineers collected on and off-site groundwater samples from the previously installed monitoring wells. This round of sampling confirmed (1) the contamination of both the surficial and Floridan aquifers with chlorinated solvents, (2) the horizontal migration of the contaminants to the south, and (3) the vertical migration of the contaminants from the surficial aquifer to the Florida aquifer.

4.1.3 Chemicals of Concern- FDOH chose *cis*-1,2-dichloroethylene, *trans*-1,2-dichloroethylene, tetrachloroethylene, trichloroethylene, and vinyl chloride as COCs for this site based on the presence of these contaminants in on- and off-site groundwater.

Quality Assurance and Quality Control

FDOH has reviewed the data and the quality assurance and quality control measures that were taken in the gathering of the referenced data. FDOH believes that the data is sufficient to support the conclusions made in the original documents for which the data was gathered, and the conclusions made in this document. Appropriate chain-of-custody and data reporting procedures were followed and appropriate laboratory, equipment and sample controls were analyzed. The completeness and reliability of the referenced information determine the validity of the analyses and conclusions drawn in this public health assessment.

Physical Hazards

No on- or off-site physical hazards were observed during the October 19, 1999 site visit.

Pathway Analysis

To estimate whether nearby residents have been exposed to contaminants from the site, we evaluated the environmental and human components of exposure pathways. Exposure

pathways consist of five elements: a source of contamination (e.g., chemical spill), transport through an environmental medium (e.g., contaminated water), a point of exposure (e.g., tap water), a route of human exposure (e.g., oral), and an susceptable population (e.g., area residents).

We eliminate an exposure pathway if at least one of the five elements is missing and will never be present. Completed and potential exposure pathways are further evaluated. A completed pathway has all five elements and exposure to a contaminant has occurred, is occurring, or will occur. A potential pathway is lacking at least one of the five elements, but that element may be present in the future. For both complete and potential pathways, an estimate of the likely dose of each chemical of concern is calculated and this dose serves as the basis for the toxicological evaluation.

4.4.1 Complete Exposure Pathways - No completed pathways exist for this site.

4.4.2 Potential Exposure Pathways - FDOH evaluated two potential exposure pathways in this health assessment. The first pathway is the domestic use of on-site groundwater by future residents. The second potential exposure pathway is the domestic use of off-site groundwater. For both pathways, an exposed population is currently absent. In addition, the completion of either of these exposure pathways is very unlikely due to 1) the site lies among a very industrialized/commercialized area, 2) both pathways depend on the drilling of a private well, and 3) the contaminants are migrating toward a more commercial/industrial area. Table 7 (Appendix B) gives a summary of these potential exposure pathways.

4.4.3 Eliminated Exposure Pathways - FDOH has eliminated the exposure of trespassers to contaminated soil, since soil samples contained no contaminants at concentrations exceeding the acceptable comparison values.

4.5 Public Health Implications- In this section, we calculate the dose of a chemical that both adults and children could potentially receive by all likely routes of exposure. We then review the toxicological profile for each contaminant of concern (COC) and determine if the estimated dose could cause illness. For this site, we calculated the potential doses from exposure to on-site and off-site groundwater (Tables 8 and 9, Appendix B).

4.5.1 Toxicological Evaluation - In this section, we discuss illnesses that could occur following exposure to COCs at this site. To evaluate the risks of illness, ATSDR has developed Minimal Risk Levels (MRLs) for contaminants commonly found at hazardous waste sites. A MRL is a conservative estimate of daily human exposure to a contaminant below which noncancerous illnesses are unlikely to occur. The calculation of the MRL is based on animal and human studies, when available. It is calculated very conservatively because the goal of the MRL is to protect public health. MRLs exist for each route of exposure, such as ingestion and inhalation, and for different lengths of exposure, such as acute (less than 14 days), intermediate (15 to 364 days), and chronic (greater than 365 days). ATSDR presents these MRLs in Toxicological Profiles. Toxicological Profiles are chemical-specific and provide information on the health effects, environmental transport, human exposure, and regulatory status of a specific chemical.

To apply the MRL, we estimate the daily dose for each COC using standard exposure parameter estimates (i.e., average volume of water consumed per day, average shower time). Using these estimates, we calculate the number of milligrams of contaminant ingested per day (mg/day) and then divide by the average human body weight. The dose is expressed as the number of milligrams of chemical per kilogram of body weight per day (mg/kg/day). In calculating the potential dose, we assume people are exposed to the maximum concentration detected for each contaminant in each medium. In Tables 8 and 9 (Appendix B), we summarize the estimated dose for each exposure pathway using the maximum COC concentration. Bold text in Tables 8 and 9 (Appendix B) indicates that the dose exceeds the appropriate MRL. It is important to note that although MRLs are derived to protect health, a dose above the MRL does not necessarily mean that it will cause illness.

The exposure parameters for each exposure scenario are given below the tables. The values used are standard values for this type of analysis (EPA, 1991; 1997). For groundwater, we estimated the dose of chemical that could be ingested from drinking, absorbed through the skin during showering, and the air concentration that could be inhaled during showering.

4.5.1.1 *Cis*-1,2-dichloroethylene and *trans*-1,2-dichloroethylene- Neither of these compounds was detected in soil samples at concentrations above the respective comparison value. Therefore, exposure to these compounds in soil or dust is unlikely to cause illness.

The estimated oral doses of *cis*-dichloroethylene was equal to the oral MRL. The estimated dose of *trans*-dichloroethylene only slightly exceed the oral MRL (Tables 8 and 9, Appendix B). Therefore, FDOH concludes that ingestion of these compounds in groundwater is unlikely to cause illness.

FDOH estimated that the use of on- or off-site groundwater for showering could produce an air concentration of these chemicals that would exceed the inhalation MRL (Tables 8 and 9, Appendix B). Because of the short duration of exposure in the shower and the absence of any reported effects at concentrations fifteen times higher than those estimated for this site (ATSDR, 1996), FDOH does not anticipate any illness from these compounds.

Little information exists to suggest that these low doses of either of these compounds cause cancer.

4.5.1.2 Trichloroethylene- Trichloroethylene was not present in soil samples at concentrations above the comparison value and therefore, exposure to trichloroethylene in soil and dust is unlikely to cause illness.

The dose of trichloroethylene that a child or adult could receive from consumption of on- or off-site groundwater does exceed the oral MRL (Tables 8 and 9, Appendix B). Although the estimated doses for this site exceed the oral MRL, FDOH does not anticipate any illness because the dose used to derive the MRL is 50-times higher than the highest dose estimated for a child (Fredricksson et al., 1993). Many studies have shown that doses much higher than the MRL have no toxicity in adult animals (ATSDR, 1997b).

FDOH estimated that use of on or off-site groundwater for showering could generate an air concentration of trichloroethylene that would exceed the inhalation MRL. FDOH does not anticipate illness from this exposure pathway because of the short duration.

Trichloroethylene is classified as a possible human carcinogen. In animal studies, doses up to 1,000 times those estimated with this site increased kidney and liver tumors. However, no conclusive evidence exists to suggest that consumption of these doses of trichloroethylene at this site would cause cancer.

4.5.1.3 Tetrachloroethylene- Tetrachloroethylene was not present in soil samples at concentrations above the comparison value and therefore, exposure to tetrachloroethylene in soil and dust is unlikely to cause illness.

The doses of tetrachloroethylene that a child or adult could receive from consumption of on- and off-site groundwater do exceed the oral MRL (Tables 8 and 9, Appendix B). FDOH estimates that a child could receive a dose over twice the dose that produced hyperactivity when treated as young mice (Fredriksson et al., 1993). Therefore, based on the effects observed in mice, FDOH concludes that children should not consume on- or off-site groundwater. The doses estimated for adults also exceeds the MRL. FDOH, however, does not anticipate tetrachloroethylene to cause illness in adults because in animal studies, doses three-times the dose estimated for adults caused no health effects.

FDOH estimates that the use of either on or off-site groundwater for showering could result in an air concentration of tetrachloroethylene that would exceed the inhalation MRL. Short-term air exposure to tetrachloroethylene has been associated with eye and respiratory irritation and dizziness (ATSDR, 1997a). FDOH does not anticipate illness beyond irritation due to the short duration of exposure.

The U.S. Department of Health and Human Services has classified tetrachloroethylene as a "probable" carcinogen. Given the weak carcinogenicity of tetrachloroethylene, the short-term inhalation exposures, FDOH does not anticipate exposure to tetrachloroethylene in groundwater to cause cancer.

4.5.1.4 Vinyl chloride- Vinyl chloride was not present in soil samples at concentrations above the comparison value and therefore, exposure to vinyl chloride in soil and dust is unlikely to cause illness.

Vinyl chloride was only detected in off-site groundwater and was present at concentrations that would deliver an oral dose to either an adult or child in excess of the oral MRL (Table 9, Appendix B). The estimated dose to a child would be one-forth of the dose that caused a mild change in the liver of rats exposed for a lifetime (Til et al., 1983). Therefore, these low doses of vinyl chloride could cause mild liver changes in both adults and children.

The use of off-site groundwater for showering would produce an estimated air concentration of vinyl chloride that would exceed the inhalation MRL. The estimated air concentration of vinyl chloride from showering with contaminated groundwater is 10 times less than the lowest dose known to cause illness in humans. Because of the 10-fold difference in dose

and the short exposure duration, FDOH does not anticipate non-cancer illness from exposure to vinyl chloride in shower air.

Vinyl chloride is classified as a "known human carcinogen". Based on the low concentrations detected and the infrequency that vinyl chloride was detected, FDOH estimates that only prolonged exposure by ingestion or inhalation could cause a mild increase in the risk of liver cancer (ATSDR, 1997c).

4.5.1.5 Mixtures- The literature on the effects of exposure to mixtures focuses on high doses and reports that doses well in excess of typical environmental concentrations are required to produce the effects associated with mixtures. Except for tetrachloroethylene, all of the contaminants associated with this site are present at levels far below levels where the effects of mixtures could be anticipated. Therefore, ATSDR considers that the mixture effect of these contaminants is not likely to be of public health concern.

4.5.2 Children and Other Unusually Susceptible Populations - ATSDR and FDOH, through ATSDR's Child Health Initiative, recognize that the unique vulnerabilities of infants and children demand special emphasis in communities faced with the contamination of their environment. Children are at a greater risk than adults from certain kinds of exposure to hazardous substances emitted from waste sites. They are more likely exposed because they play outdoors and because they often bring food into contaminated areas. They are shorter than adults, which means they breathe dust, soil, and heavy vapors close to the ground. Children are also smaller, resulting in higher doses of chemical exposure per body weight. The developing body systems of children can sustain permanent damage if toxic exposures occur during critical growth stages. Most important, children depend completely on adults for risk identification and management decisions, housing decisions, and access to medical care. The only school within one mile of the Alaric Inc., site, is to the northwest. Children are a special consideration in regards to this site because young animals are more sensitive to the behavioral effects of tetrachloroethylene and trichloroethylene.

5.0 COMMUNITY HEALTH CONCERNS

On December 5, 2000, FDOH mailed fact sheets to approximately 450 homes within 0.5 miles of the Alaric Inc., site. The purpose of the fact sheet was threefold. First, the fact sheet educated nearby residents about this hazardous waste site and the work FDOH had done. Second, the fact sheet informed nearby residents where they could obtain a copy of the draft public health assessment report. Third, the fact sheet served to gather comments and concerns from nearby residents about this site. Section 5.1 addresses each of the concerns that FDOH received in response to the fact sheet.

5.1 Resident Concerns-

"I have well water for drinking and wonder if my water is safe to drink. I live more than 1.0 mile directly west of the area". Based on the groundwater data from 1998, the

contamination in both the surficial and Floridan aquifers is migrating south. Therefore, the Alaric Inc., site will not likely affect private water supplies west of the site.

FDOH also received comments from Bruder Stephens, Inc. (BSI), an independent consulting firm representing the owner of the property. BSI suggested that FDOH reconsider several statements which implied a single source for the contamination. After re-evaluating the FDEP environmental documents, FDOH included other potential sources of the contamination in the background section (Section 2.0).

5.2 Contact Information-

Florida Department of Health
Dr. Davis H. Daiker
Ms. Beth Copeland
877-798-2772 (toll-free)

Environmental Protection Agency
Mr. Brad Jackson
404-562-8925

Hillsborough County Health Department
Mr. Jim Phillips
813-307-8015 ext. 5981

6.0 CONCLUSIONS

FDOH classifies the Alaric Inc., hazardous waste site as "no public health hazard". FDOH based this classification on the absence of a completed exposure pathway in the past and current time-frames and the unlikelihood of a completed pathway in the future. The completion of an exposure pathway is dependent on the drilling of a residential well on the site or in the highly commercial area south of the site. Therefore, the completion of this exposure pathway is easily preventable.

FDOH makes the following conclusions for the Alaric Inc. hazardous waste site.

1 On-site groundwater contains tetrachloroethylene at a concentration that could cause illness if regularly consumed. Ingestion of groundwater by children would deliver a dose comparable to the dose that caused hyperactivity in mice. In addition, use of on-site groundwater for showering could generate irritating air concentrations of tetrachloroethylene for both children and adults.

2 Off-site groundwater south of the site contains tetrachloroethylene at a concentration higher than that detected on-site. A similar health risk

is anticipated for ingestion of off-site groundwater by children. Also, shower-use of off-site groundwater could generate irritating air concentrations of tetrachloroethylene. Vinyl chloride was detected twice at concentrations that could increase the risk of liver cancer if use of groundwater continued.

3. Exposure to soil on or off the site is not likely to cause illness

7.0 RECOMMENDATIONS

Because the potential exposure pathways that could cause illness and cancer are dependent on the residential use of contaminated groundwater, the following recommendations focus on the prevention of these exposures.

1. Restrict the installation of new drinking water wells within a one-half mile radius south of the site.

2. Continue to monitor the horizontal movement of contaminated groundwater.

8.0 PUBLIC HEALTH ACTION PLAN

This section describes what ATSDR and FDOH plan to do at this site. The purpose of a Public Health Action Plan is to reduce any existing health hazards and to prevent any from occurring in the future. ATSDR and FDOH will do the following:

1. FDOH, Bureau of Environmental Epidemiology, will recommend FDEP to restrict permits for private wells in or near the area of groundwater contamination.

2. FDOH, Bureau of Environmental Epidemiology, will continue to work with EPA and FDEP to ensure that any site clean-up protects public health.

The conclusions and recommendations in this report are based on the information reviewed. When additional information becomes available, FDOH, Bureau of Environmental Epidemiology, will evaluate it and determine what additional recommendations, if any, to make.

9.0 SITE TEAM/AUTHORS

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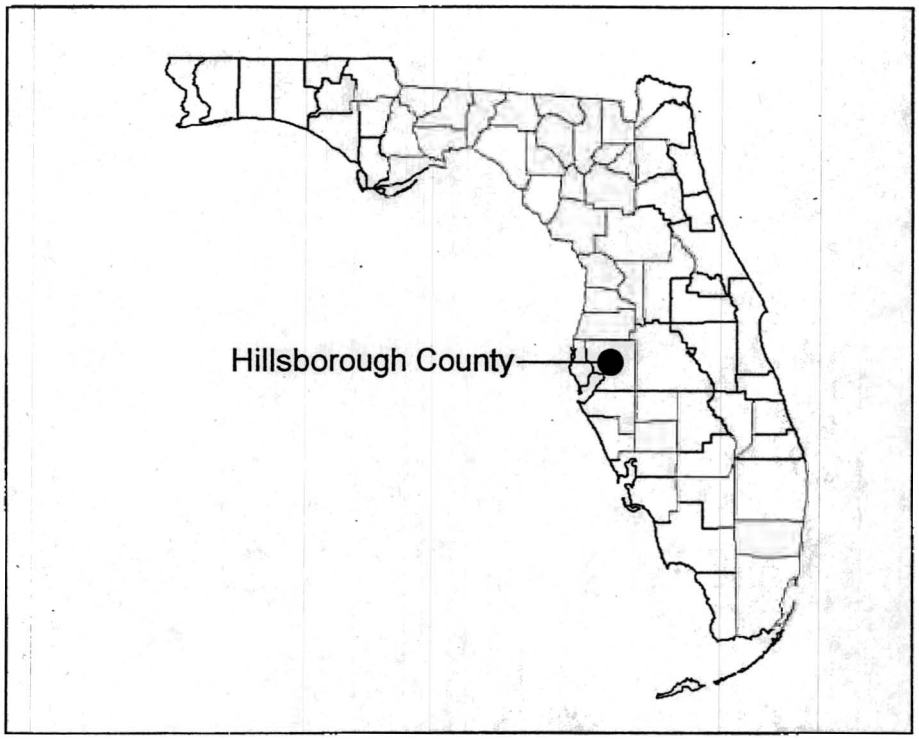
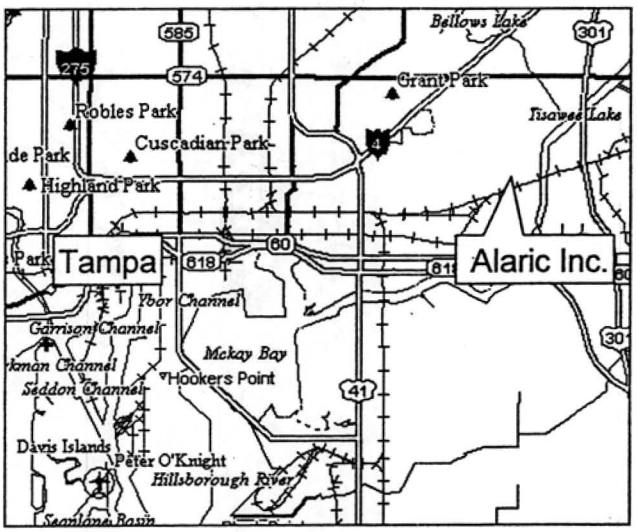
APPENDIX A. FIGURES





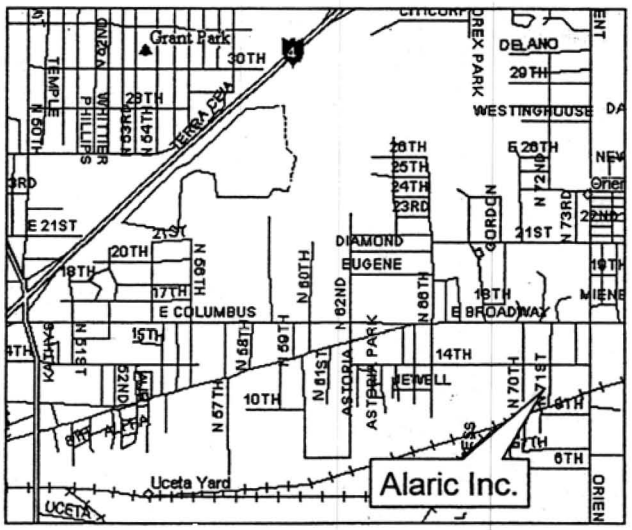
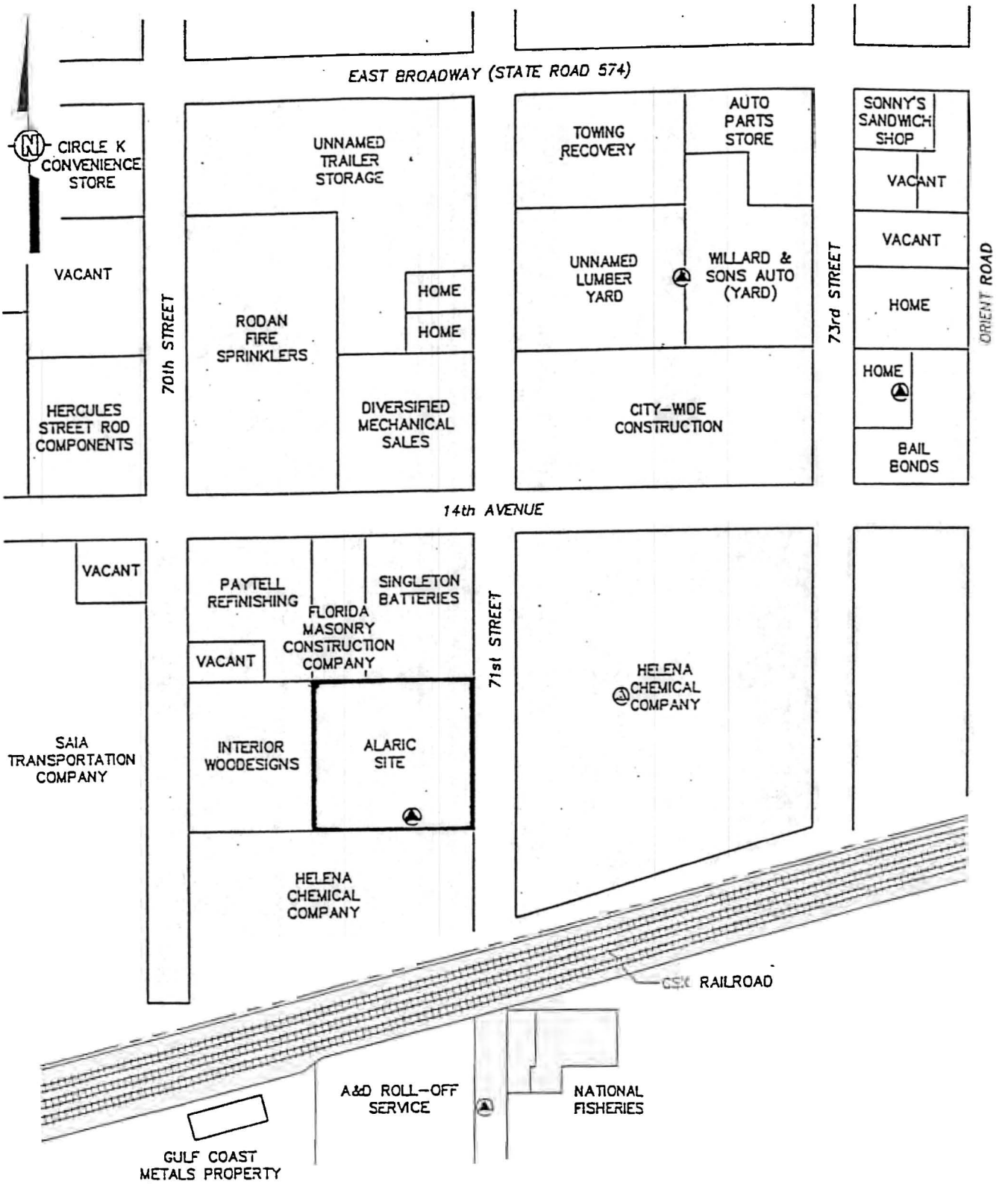


FIGURE 1. SITE LOCATION IN FLORIDA



LEGEND:

PRIVATE WATER WELL LOCATION

FIGURE 2. SITE SURROUNDINGS

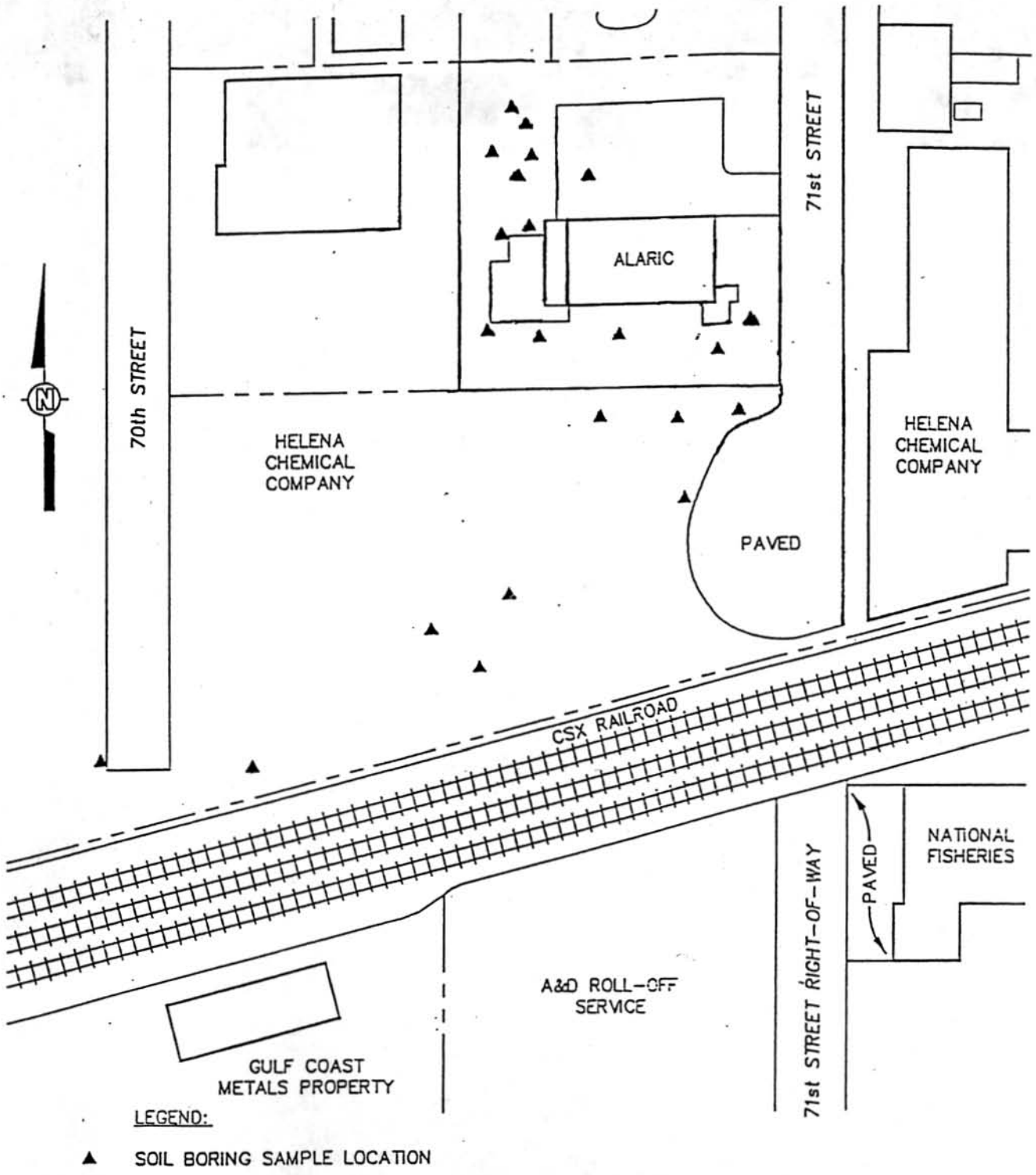
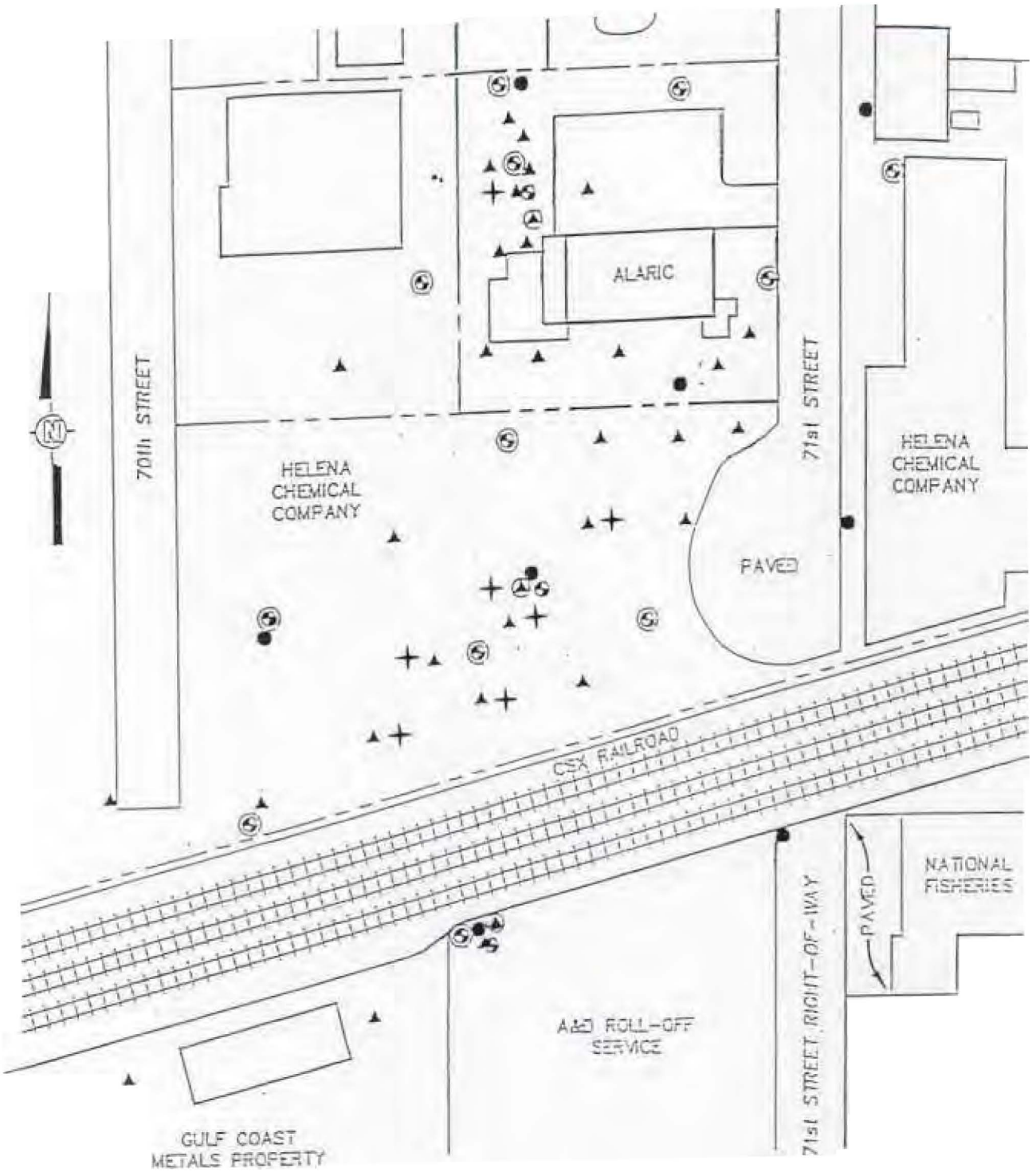


FIGURE 3. SOIL SAMPLE LOCATIONS



LEGEND:

- SHALLOW MONITORING WELL LOCATION
- INTERMEDIATE MONITORING WELL LOCATION
- DEEP MONITORING WELL LOCATION
- 120' DEEP MONITORING WELL LOCATION
- DIRECT PUSH SAMPLE LOCATION

FIGURE 4. GROUNDWATER SAMPLE LOCATIONS

APPENDIX B. TABLES

Table 1. Total Population Estimation Table

Pathway Types	Estimated Total Population in Potential Exposure Pathways*	Minimum Population*	Maximum Population*
Potential Pathways On-site	0	0	50
Potential Pathways Off-site	2700	0	5000
Total Potential On and Off-site	**2700**	**0**	**5000**
Completed Pathways On-site	0	0	0
Completed Pathways Off-site	0	0	0
Total Completed On and Off-site	**0**	**0**	**0**
Potential and Completed Pathways On-site	0	0	50
Potential and Completed Pathways Off-site	0	0	5000
Total Potential and Completed On and Off-site	**2700**	**0**	**5000**

Table 2. Maximum concentrations in on-site surface soil (1 foot bgs)

Contaminants of Concern	Maximum Concentration (µg/kg)	Sample I.D.	# Greater Than Comparison Value/ Total # of Samples	Comparison Value*	
				(µg/kg)	Source
cis 1,2-Dichloroethylene	N.D.	---	0/3	$20x10^6$ (Ch EMEG)	ATSDR
trans 1,2- Dichloroethylene	N.D.	---	0/3	$10x10^6$ (Ch EMEG)	ATSDR
Tetrachloroethylene	N.D.	—	0/3	500,000 (Ch. RMEG)	ATSDR
Trichloroethylene	N.D.	---	0/3	60,000 (CREG)	ATSDR
Vinyl Chloride	N.D.	---	0/3	300 (CREG)	ATSDR

bgs- below ground surface
* Comparison values used to select chemicals for further scrutiny, not for determining the possibility of illness.
µg/kg = micrograms per kilogram of soil
N.D.- Not detected
Ch.- refers to the child concentration standard

Table 3. Maximum concentrations in on-site sub-surface soil (3-4 feet bgs)

Contaminants of Concern	Maximum Concentration (µg/kg)	Sample I.D.	# Greater Than Comparison Value/ Total # of Samples	Comparison Value*	
				(µg/kg)	Source
cis 1,2-Dichloroethylene	10	SB010	0/13	$20x10^6$ (Ch. EMEG)	ATSDR
trans 1,2- Dichloroethylene	N.D.	---	0/13	$10x10^6$ (Ch. EMEG)	ATSDR
Tetrachloroethylene	2180	SB015	0/13	500,000 (Ch. RMEG)	ATSDR
Trichloroethylene	N.D.	---	0/13	60,000 (CREG)	ATSDR
Vinyl Chloride	N.D.	---	0/13	300 (CREG)	ATSDR

bgs- below ground surface
* Comparison values used to select chemicals for further scrutiny, not for determining the possibility of illness
µg/kg = micrograms per kilogram of soil
N.D.- Not detected
Ch.- refers to the child concentration standard

Table 4. Maximum contaminant concentrations in on-site groundwater

Contaminants of Concern	Maximum Concentration (µg/L)	Well I.D.	# Greater Than Comparison Value/ Total # of Samples	Comparison Value*	
				(µg/L)	Source
cis 1,2- Dichloroethylene	1300	DP002	8/25	70 (LTHA)	ATSDR
trans 1,2- Dichloroethylene	67	DP009	0/25	100 (LTHA)	ATSDR
Tetrachloroethylene	70000	DP001	17/25	0.7 (CREG)	ATSDR
Trichloroethylene	17000	DP001	16/25	3 (CREG)	ATSDR
Vinyl Chloride	N.D.	---	0/25	0.02 (CREG)	ATSDR

µg/L = micrograms per liter

* Comparison values used to select chemicals for further scrutiny, not for determining the possibility of illness.

N.D.- Not detected

Table 5. Maximum concentrations in off-site sub-surface soil (3-4 feet bgs)

Contaminants of Concern	Maximum Concentration (µg/kg)	Sample I.D.	# Greater Than Comparison Value/ Total # of Samples	Comparison Value*	
				(µg/kg)	Source
cis 1,2-Dichloroethylene	N.D.	SB010	0/9	$20x10^6$ (Ch EMEG)	ATSDR
trans 1,2- Dichloroethylene	N.D.	---	0/9	$10x10^6$ (Ch EMEG)	ATSDR
Tetrachloroethylene	N.D.	SB015	0/9	500,000 (Ch. RMEG)	ATSDR
Trichloroethylene	N.D.	---	0/9	60,000 (CREG)	ATSDR
Vinyl Chloride	N.D.	---	0/9	300 (CREG)	ATSDR

bgs- below ground surface

* Comparison values used to select chemicals for further scrutiny, not for determining the possibility of illness.

µg/kg = micrograms per kilogram of soil

N.D.- Not detected

Ch.- refers to the child concentration standard

Table 6. Maximum contaminant concentrations in off-site groundwater

Contaminants of Concern	Maximum Concentration (µg/L)	Well I.D.	# Greater Than Comparison Value/ Total # of Samples	Comparison Value*	
				(µg/L)	Source
cis 1,2- Dichloroethylene	5000	DP014	15/43	70 (LTHA)	ATSDR
trans 1,2- Dichloroethylene	4500	DP015	1/43	100 (LTHA)	ATSDR
Tetrachloroethylene	134000	DP014	25/43	0.7 (CREG)	ATSDR
Trichloroethylene	9500	DP014	24/43	3 (CREG)	ATSDR
Vinyl Chloride	60	DP015	2/43	0.02 (CREG)	ATSDR

µg/L = micrograms per liter

* Comparison values used to select chemicals for further scrutiny, not for determining the possibility of illness.

Table 7. Potential exposure pathways showing each of the five components of the pathway.

Pathway Name	Exposure Pathway Elements					Time
	Source	Environmental/ Exposure Media	Point of Exposure	Route of Exposure	Exposed Population	
On-site Groundwater	Contaminated On-Site Soil	Groundwater	On-site wells/ Tap water	Ingestion, skin absorption and inhalation	On-site residents	Future
Off-site Groundwater	Contaminated On-Site Soil	Groundwater	Off-site wells/ Tap water	Ingestion, skin absorption and inhalation	Off-site residents	Future

Table 8. Calculated dose (mg/kg/day) or exposure concentration from residential use of on-site groundwater

Contaminant of Concern (maximum on-site concentration)	Oral MRL (mg/kg/day)	Groundwater-Ingestion		Groundwater-Dermal		Inhalation MRL (mg/m^3)	Groundwater-Inhalation	
		Child	Adult	Child	Adult		Child	Adult
*cis*1,2-Dichloroethylene (1.3 mg/L)	0.3	0.09	0.04	0.001	0.0009	0.8	**13**	**13**
trans-1,2-Dichloroethylene (0.067mg/L)	0.2	0.004	0.002	0.0003	0.0002	0.8	0.67	0.67
Tetrachloroethylene (70 mg/L)	0.05	**5**	**2**	**2**	**1**	0.27	**700**	**700**
Trichloroethylene (17 mg/L)	0.2	**1**	**0.5**	0.1	0.08	0.55	**170**	**170**
Vinyl Chloride (N.D.)	0.00002	N.S.	N.S.	N.S.	N.S.	0.078	N.S.	N.S.

These doses were calculated using Risk Assistant software and accepted values for groundwater consumption, shower inhalation exposure and dermal exposure parameters (EPA, 1991). Bold text indicates that an estimated dose exceeds the appropriate MRL.

N.S.- Not significant

N.D.- Not detected

The above doses were calculated using an average shower time of 0.2 hours, an average bathroom volume of 9 m^3, a water flow rate of 600 liters per hour and the following values:

Adult body weight-	70 kg	Child body weight-	15 kg
Adult water consumption-	2 liters/day	Child water consumption-	1 liter/day
Adult skin surface area-	23,000 cm^2	Child skin surface area-	7,200 cm^2

mg/kg/day= milligram of contaminant per kilogram body weight per day

mg/m^3= milligram of contaminant per cubic meter air

Table 9. Calculated dose (mg/kg) or exposure concentration from residential use of off-site groundwater

Contaminant of Concern (maximum off-site concentration)	Oral MRL (mg/kg/day)	Groundwater-Ingestion		Groundwater-Dermal		Inhalation MRL (mg/m^3)	Groundwater-Inhalation	
		Child	Adult	Child	Adult		Child	Adult
cis 1,2-Dichloroethylene (5.0 mg/L)	0.3	0.3	0.1	0.005	0.003	0.9	**50**	**50**
trans-1,2-Dichloroethylene (4.5 mg/L)	0.2	**0.3**	0.1	0.02	0.02	0.9	**45**	**45**
Tetrachloroethylene (134 mg/L)	0.05	**9.0**	**4**	**4**	**2**	0.27	**1340**	**1340**
Trichloroethylene (9.5 mg/L)	0.2	**0.6**	**0.3**	0.07	0.05	0.55	**95**	**95**
Vinyl Chloride (0.06 mg/L)	0.00002	**0.004**	**0.002**	**0.0001**	**0.00008**	0.078	**0.6**	**.6**

These doses were calculated using Risk Assistant software and accepted values for groundwater consumption, shower inhalation exposure and dermal exposure parameters (EPA, 1991). Bold text indicates that an estimated dose exceeds the appropriate MRL.

The above doses were calculated using an average shower time of 0.2 hours, an average bathroom volume of 9 m^3, a water flow rate of 600 liters per hour and the following values:

Adult body weight-	70 kg	Child body weight-	15 kg
Adult water consumption-	2 liters/day	Child water consumption-	1 liter/day
Adult skin surface area-	23,000 cm^2	Child skin surface area-	7,200 cm^2

mg/kg/day= milligram of contaminant per kilogram body weight per day

mg/m^3= milligram of contaminant per cubic meter air

APPENDIX C. RISK OF ILLNESS, DOSE RESPONSE/THRESHOLD, AND UNCERTAINTY IN PUBLIC HEALTH ASSESSMENTS

Risk of Illness

In this health assessment, the risk of illness is the chance that exposure to a hazardous contaminant is associated with a harmful health effect or illness. The risk of illness is not a measure of cause and effect; only an in-depth health study can identify a cause and effect relationship. Instead, we use the risk of illness to decide if a follow-up health study is needed and to identify possible associations.

The greater the exposure to a hazardous contaminant (dose), the greater the risk of illness. The amount of a substance required to harm a person's health (toxicity) also determines the risk of illness. Exposure to a hazardous contaminant above a minimum level increases everyone's risk of illness. Only in unusual circumstances, however, do many people become ill.

Information from human studies provides the strongest evidence that exposure to a hazardous contaminant is related to a particular illness. Some of this evidence comes from doctors reporting an unusual incidence of a specific illness in exposed individuals. More formal studies compare illnesses in people with different levels of exposure. However, human information is very limited for most hazardous contaminants, and scientists must frequently depend upon data from animal studies. Hazardous contaminants associated with harmful health effects in humans are often associated with harmful health effects in other animal species. There are limits, however, in only relying on animal studies. For example, scientists have found some hazardous contaminants are associated with cancer in animals, but lack evidence of a similar association in humans. In addition, humans and animals have differing abilities to protect themselves against low levels of contaminants, and most animal studies test only the possible health effects of high exposure levels. Consequently, the possible effects on humans of low-level exposure to hazardous contaminants are uncertain when information is derived solely from animal experiments.

Dose Response/Thresholds

The focus of toxicological studies in humans or animals is identification of the relationship between exposure to different doses of a specific contaminant and the chance of having a health effect from each exposure level. This dose-response relationship provides a mathematical formula or graph that we use to estimate a person's risk of illness. The actual shape of the dose-response curve requires scientific knowledge of how a hazardous substance affects different cells in the human body. There is one important difference between the dose-response curves used to estimate the risk of non-cancer illnesses and those used to estimate the risk of cancer: the existence of a threshold dose. A threshold dose is the highest exposure dose at which there is no risk of illness. The dose-response curves for non-cancer illnesses

include a threshold dose that is greater than zero. Scientists include a threshold dose in these models because the human body can adjust to varying amounts of cell damage without illness. The threshold dose differs for different contaminants and different exposure routes, and we estimate it from information gathered in human and animal studies. In contrast, the dose-response curves used to estimate the risk of cancer assume there is no threshold dose (or, the cancer threshold dose is zero). This assumes a single contaminant molecule may be sufficient to cause a clinical case of cancer. This assumption is very conservative, and many scientists believe a threshold dose greater than zero also exists for the development of cancer.

Uncertainty

All risk assessments, to varying degrees, require the use of assumptions, judgements, and incomplete data. These contribute to the uncertainty of the final risk estimates. Some more important sources of uncertainty in this public health assessment include environmental sampling and analysis, exposure parameter estimates, use of modeled data, and present toxicological knowledge. These uncertainties may cause risk to be overestimated or underestimated to a different extent. Because of the uncertainties described below, this public health assessment does not represent an absolute estimate of risk to persons exposed to chemicals at or near Alaric Inc., site.

Environmental chemistry analysis errors can arise from random errors in the sampling and analytical processes, resulting in either an over- or under-estimation of risk. We can control these errors to some extent by increasing the number of samples collected and analyzed and by sampling the same locations over several different periods. The above actions tend to minimize uncertainty contributed from random sampling errors.

There are two areas of uncertainty related to exposure parameter estimates. The first is the exposure-point concentration estimate. The second is the estimate of the total chemical exposures. In this assessment we used maximum detected concentrations as the exposure point concentration. We believe using the maximum measured value to be appropriate because we cannot be certain of the peak contaminant concentrations, and we cannot statistically predict peak values. Nevertheless, this assumption introduces uncertainty into the risk assessment that may over- or under-estimate the actual risk of illness. When selecting parameter values to estimate exposure dose, we used default assumptions and values within the ranges recommended by ATSDR or EPA. These default assumptions and values are conservative (health protective) and may contribute to the over-estimation of risk of illness. Similarly, we assumed the maximum exposure period occurred regularly for each selected pathway. Both assumptions are likely to contribute to the over-estimation of risk of illness.

There are also data gaps and uncertainties in the design, extrapolation, and interpretation of toxicological experimental studies. Data gaps contribute uncertainty because information is either not available or is addressed qualitatively. Moreover, the available information on the interaction among chemicals found at the site, when present, is qualitative (that is, a description instead of a number) and we cannot apply a mathematical formula to estimate the dose. These

data gaps may tend to underestimate the actual risk of illness. In addition, there are great uncertainties in extrapolating from high-to-low doses, and from animal-to-human populations. Extrapolating from animals to humans is uncertain because of the differences in the uptake, metabolism, distribution, and body organ susceptibility between different species. Human populations are also variable because of differences in genetic constitution, diet, home and occupational environment, activity patterns, and other factors. These uncertainties can result in an over- or under-estimation of risk of illness. Finally, there are great uncertainties in extrapolating from high to low doses, and controversy in interpreting these results. Because the models used to estimate dose-response relationships in experimental studies are conservative, they tend to over estimate the risk. Techniques used to derive acceptable exposure levels account for such variables by using safety factors. Currently, there is much debate in the scientific community about how much we over estimate the actual risks and what the risk estimates really mean.

APPENDIX D. ATSDR PLAIN LANGUAGE GLOSSARY OF ENVIRONMENTAL HEALTH TERMS REVISED -15 DEC 99

Absorption: How a chemical enters a person's blood after the chemical has been swallowed, has come into contact with the skin, or has been breathed in.

Acute Exposure: Contact with a chemical that happens once or only for a limited period of time. ATSDR defines acute exposures as those that might last up to 14 days.

Additive Effect: A response to a chemical mixture, or combination of substances, that might be expected if the known effects of individual chemicals, seen at specific doses, were added together.

Adverse Health Effect: A change in body function or the structures of cells that can lead to disease or health problems.

Antagonistic Effect: A response to a mixture of chemicals or combination of substances that is less than might be expected if the known effects of individual chemicals, seen at specific doses, were added together.

ATSDR: The **A**gency for Toxic **S**ubstances and **D**isease **R**egistry. ATSDR is a federal health agency in Atlanta, Georgia that deals with hazardous substance and waste site issues. ATSDR gives people information about harmful chemicals in their environment and tells people how to protect themselves from coming into contact with chemicals.

Background Level: An average or expected amount of a chemical in a specific environment. Or, amounts of chemicals that occur naturally in a specific environment.

Biota: Used in public health, things that humans would eat – including animals, fish and plants.

CAP: See **C**ommunity **A**ssistance **P**anel.

Cancer: A group of diseases which occur when cells in the body become abnormal and grow, or multiply, out of control

Carcinogen: Any substance shown to cause tumors or cancer in experimental studies.

CERCLA: See **C**omprehensive **E**nvironmental **R**esponse, **C**ompensation, and **L**iability **A**ct.

Chronic Exposure: A contact with a substance or chemical that happens over a long period of time. ATSDR considers exposures of more than one year to be *chronic.*

Completed Exposure Pathway: See **Exposure Pathway.**

Community Assistance Panel (CAP): A group of people from the community and health and

environmental agencies who work together on issues and problems at hazardous waste sites.
Comparison Value: (CVs) Concentrations or the amount of substances in air, water, food, and soil that are unlikely, upon exposure, to cause adverse health effects. Comparison values are used by health assessors to select which substances and environmental media (air, water, food and soil) need additional evaluation while health concerns or effects are investigated.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): **CERCLA** was put into place in 1980. It is also known as **Superfund.** This act concerns releases of hazardous substances into the environment, and the cleanup of these substances and hazardous waste sites. ATSDR was created by this act and is responsible for looking into the health issues related to hazardous waste sites.

Concern: A belief or worry that chemicals in the environment might cause harm to people.

Concentration: How much or the amount of a substance present in a certain amount of soil, water, air, or food.

Contaminant: See **Environmental Contaminant.**

Delayed Health Effect: A disease or injury that happens as a result of exposures that may have occurred far in the past.

Dermal Contact: A chemical getting onto your skin. (see **Route of Exposure**).

Dose: The amount of a substance to which a person may be exposed, usually on a daily basis. Dose is often explained as "amount of substance(s) per body weight per day".

Dose / Response: The relationship between the amount of exposure (dose) and the change in body function or health that result.

Duration: The amount of time (days, months, years) that a person is exposed to a chemical.

Environmental Contaminant: A substance (chemical) that gets into a system (person, animal, or the environment) in amounts higher than that found in **Background Level**, or what would be expected.

Environmental Media: Usually refers to the air, water, and soil in which chemicals of interest are found. Sometimes refers to the plants and animals that are eaten by humans. **Environmental Media** is the second part of an **Exposure Pathway**.

Environmental Protection Agency (EPA): The federal agency that develops and enforces environmental laws to protect the environment and the public's health.

Epidemiology: The study of the different factors that determine how often, in how many people, and in which people will disease occur.

Exposure: Coming into contact with a chemical substance.(For the three ways people can come in contact with substances, see **Route of Exposure**.)

Exposure Assessment: The process of finding the ways people come in contact with chemicals, how often and how long they come in contact with chemicals, and the amounts of chemicals with which they come in contact.

Exposure Pathway: A description of the way that a chemical moves from its source (where it began) to where and how people can come into contact with (or get exposed to) the chemical.

ATSDR defines an exposure pathway as having 5 parts:

1. Source of Contamination
2. Environmental Media and Transport Mechanism,
3. Point of Exposure,
4. Route of Exposure, and
5. Receptor Population.

When all 5 parts of an exposure pathway are present, it is called **a Completed Exposure Pathway**. Each of these 5 terms is defined in this Glossary.

Frequency: How often a person is exposed to a chemical over time; for example, every day, once a week, twice a month.

Hazardous Waste: Substances that have been released or thrown away into the environment and, under certain conditions, could be harmful to people who come into contact with them.

Health Effect: ATSDR deals only with **Adverse Health Effects** (see definition in this Glossary).

Indeterminate Public Health Hazard: The category is used in Public Health Assessment documents for sites where important information is lacking (missing or has not yet been gathered) about site-related chemical exposures.

Ingestion: Swallowing something, as in eating or drinking. It is a way a chemical can enter your body (See **Route of Exposure**).

Inhalation: Breathing. It is a way a chemical can enter your body (See **Route of Exposure**).

LOAEL: **L**owest **O**bserved **A**dverse **E**ffect **L**evel. The lowest dose of a chemical in a study, or group of studies, that has caused harmful health effects in people or animals.

Malignancy: See **Cancer**.

MRL: **M**inimal **R**isk **L**evel. An estimate of daily human exposure – by a specified route and length of time -- to a dose of chemical that is likely to be without a measurable risk of adverse, noncancerous effects. An MRL should not be used as a predictor of adverse health effects.

NPL: The **N**ational **P**riorities **L**ist. (Which is part of **Superfund**.) A list kept by the U.S. Environmental Protection Agency (EPA) of the most serious, uncontrolled or abandoned hazardous waste sites in the country. An NPL site needs to be cleaned up or is being looked at to see if people can be exposed to chemicals from the site.

NOAEL: **N**o **O**bserved **A**dverse **E**ffect **L**evel. The highest dose of a chemical in a study, or group of studies, that did not cause harmful health effects in people or animals.

No Apparent Public Health Hazard: The category is used in ATSDR's Public Health Assessment documents for sites where exposure to site-related chemicals may have occurred in the past or is still occurring but the exposures are not at levels expected to cause adverse health effects.

No Public Health Hazard: The category is used in ATSDR's Public Health Assessment documents for sites where there is evidence of an absence of exposure to site-related chemicals.

PHA: **P**ublic **H**ealth **A**ssessment. A report or document that looks at chemicals at a hazardous waste site and tells if people could be harmed from coming into contact with those chemicals. The PHA also tells if possible further public health actions are needed.

Plume: A line or column of air or water containing chemicals moving from the source to areas further away. A plume can be a column or clouds of smoke from a chimney or contaminated underground water sources or contaminated surface water (such as lakes, ponds and streams).

Point of Exposure: The place where someone can come into contact with a contaminated environmental medium (air, water, food or soil). For examples: the area of a playground that has contaminated dirt, a contaminated spring used for drinking water, the location where fruits or vegetables are grown in contaminated soil, or the backyard area where someone might breathe contaminated air.

Population: A group of people living in a certain area; or the number of people in a certain area.

PRP: **P**otentially **R**esponsible **P**arty. A company, government or person that is responsible for causing the pollution at a hazardous waste site. PRP's are expected to help pay for the clean up of a site.

Public Health Assessment(s): See **PHA**.

Public Health Hazard: The category is used in PHAs for sites that have certain physical features or evidence of chronic, site-related chemical exposure that could result in adverse health effects.

Public Health Hazard Criteria: PHA categories given to a site which tell whether people could be harmed by conditions present at the site. Each are defined in the Glossary. The categories are:

Urgent Public Health Hazard
Public Health Hazard
Indeterminate Public Health Hazard
No Apparent Public Health Hazard
No Public Health Hazard

Receptor Population: People who live or work in the path of one or more chemicals, and who could come into contact with them (See **Exposure Pathway**).

Reference Dose (RfD): An estimate, with safety factors (see **safety factor**) built in, of the daily, life-time exposure of human populations to a possible hazard that is not likely to cause harm to the person.

Route of Exposure: The way a chemical can get into a person's body. There are three exposure routes:

- breathing (also called inhalation),
- eating or drinking (also called ingestion), and
- or getting something on the skin (also called dermal contact).

Safety Factor: Also called **Uncertainty Factor.** When scientists don't have enough information to decide if an exposure will cause harm to people, they use "safety factors" and formulas in place of the information that is not known. These factors and formulas can help determine the amount of a chemical that is not likely to cause harm to people.

SARA: The **S**uperfund **A**mendments and **R**eauthorization **A**ct in 1986 amended CERCLA and expanded the health-related responsibilities of ATSDR. CERCLA and SARA direct ATSDR to look into the health effects from chemical exposures at hazardous waste sites.

Sample Size: The number of people that are needed for a health study.

Sample: A small number of people chosen from a larger population (See **Population**).

Source (of Contamination): The place where a chemical comes from, such as a landfill, pond, creek, incinerator, tank, or drum. Contaminant source is the first part of an **Exposure Pathway**.

Special Populations: People who may be more sensitive to chemical exposures because of certain factors such as age, a disease they already have, occupation, sex, or certain behaviors (like cigarette smoking). Children, pregnant women, and older people are often considered special populations.

Statistics: A branch of the math process of collecting, looking at, and summarizing data or information.

Superfund Site: See **NPL.**

Survey: A way to collect information or data from a group of people (**population**). Surveys can be done by phone, mail, or in person. ATSDR cannot do surveys of more than nine people without approval from the U.S. Department of Health and Human Services.
Synergistic effect: A health effect from an exposure to more than one chemical, where one of the chemicals worsens the effect of another chemical. The combined effect of the chemicals acting together are greater than the effects of the chemicals acting by themselves.

Toxic: Harmful. Any substance or chemical can be toxic at a certain dose (amount). The dose is what determines the potential harm of a chemical and whether it would cause someone to get sick.

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

Tumor: Abnormal growth of tissue or cells that have formed a lump or mass.

Uncertainty Factor: See **Safety Factor.**

Urgent Public Health Hazard: This category is used in ATSDR's Public Health Assessment documents for sites that have certain physical features or evidence of short-term (less than 1 year), site-related chemical exposure that could result in adverse health effects and require quick intervention to stop people from being exposed.

CERTIFICATION

This Alaric Inc., site Public Health Assessment was prepared by the Florida Department of Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health assessment was begun.

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

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