Public Health Assessment

Public Comment Release

Old ESCO Manufacturing
Greenville, Hunt County, Texas

EPA FACILITY ID: TXD980513808

Prepared for ATSDR by the
Texas Department of State Health Services

March 26 through April 30, 2010

Prepared under a Cooperative Agreement with the
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

This Public Health Assessment-Public Comment Release 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's Cooperative Agreement Partner 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. This document represents the agency's best efforts, based on currently available information, to fulfill the statutory criteria set out in CERCLA section 104 (i)(6) within a limited time frame. To the extent possible, it presents an assessment of potential risks to human health. Actions authorized by CERCLA section 104 (i)(11), or otherwise authorized by CERCLA, may be undertaken to prevent or mitigate human exposure or risks to human health. In addition, ATSDR's Cooperative Agreement Partner will utilize this document to determine if follow-up health actions are appropriate at this time.

This document has previously been provided to EPA and the affected state in an initial release, as required by CERCLA section 104 (i) (6) (H) for their information and review. Where necessary, it has been revised in response to comments or additional relevant information provided by them to ATSDR's Cooperative Agreement Partner. This revised document has now been released for a 30-day public comment period. Subsequent to the public comment period, ATSDR's Cooperative Agreement Partner will address all public comments and revise or append the document as appropriate. The public health assessment will then be reissued. This will conclude the public health assessment process for this site, unless additional information is obtained by ATSDR's Cooperative Agreement Partner which, in the agency's opinion, indicates a need to revise or append the conclusions previously issued.

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Please address comments regarding this report to:

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Prepared by:

The Texas Department of State Health Services
Under a Cooperative Agreement with the
U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry

This information is distributed by the Agency for Toxic Substances and Disease Registry for comment under applicable information quality guidelines. It does not represent and should not be construed to represent final agency conclusions or recommendations.

Foreword

The Agency for Toxic Substances and Disease Registry (ATSDR) was established under the mandate of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980. This act, also known as the "Superfund" law, authorized the U. S. Environmental Protection Agency (EPA) to conduct clean-up activities at hazardous waste sites. EPA was directed to compile a list of sites considered potentially hazardous to public health. This list is termed the National Priorities List (NPL). Under the Superfund law, ATSDR is charged with assessing the presence and nature of health hazards to communities living near Superfund sites, helping prevent or reduce harmful exposures, and expanding the knowledge base about the health effects that result from exposure to hazardous substances [1].

In 1984, amendments to the Resource Conservation and Recovery Act of 1976 (RCRA) – which provides for the management of hazardous waste storage, treatment, and disposal facilities – authorized ATSDR to conduct public health assessments at these sites when requested by the EPA, states, tribes, or individuals. The 1986 Superfund Amendments and Reauthorization Act (SARA) broadened ATSDR's responsibilities in the area of public health assessments and directed ATSDR to prepare a public health assessment (PHA) document for each NPL site. In 1990, federal facilities were included on the NPL. ATSDR also conducts public health assessments or public health consultations when petitioned by concerned community members, physicians, state or federal agencies, or tribal governments [1].

The aim of these evaluations is to determine if people are being exposed to hazardous substances and, if so, whether that exposure is potentially harmful and should be eliminated or reduced. Public health assessments are carried out by environmental health scientists from ATSDR and from the states with which ATSDR has cooperative agreements. Because each NPL site has a unique set of circumstances surrounding it, the public health assessment process allows flexibility in document format when ATSDR and cooperative agreement scientists present their findings about the public health impact of the site. The flexible format allows health assessors to convey important public health messages to affected populations in a clear and expeditious way, tailored to fit the specific circumstances of the site. [Note: Appendix A provides a list of abbreviations and acronyms used in this report and Appendix B provides information regarding the public health assessment process.]

Comments

If you have any questions, comments, or unanswered concerns after reading this report, we encourage you to send them to us. Letters should be addressed as follows:

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Summary

INTRODUCTION

The Old Electrical Service Company (Old ESCO) site is a former electrical transformers and high-voltage switchgear facility located in Greenville, Hunt County, Texas. The former facility is located at 500 Forrester Street on approximately 5 acres of land and consists of one large building and a small shed, as well as open land. Although the doors to the main building are locked and the windows are barred, access to the site property and the small shed was not restricted until the Environmental Protection Agency (EPA) installed a perimeter fence around the facility and property in November 2008.

Old ESCO began operations in 1945 and operated at this property until approximately 1970 when it relocated to another facility in Greenville. The facility manufactured, repaired, and refurbished electrical transformers and high-voltage switchgear for electrical distribution. The site came under initial review in July 1980 when the Texas Department of Water Resources[1] received and investigated a complaint that transformer oil had been disposed of at the site. Their investigation indicated concentrations of Polychlorinated Biphenyls (PCBs) as high as 85,000 mg/kg in surface soils near the building and parking lot. The Old ESCO site was proposed to the National Priorities List (NPL) on March 19, 2008 and was added to the final NPL on September 3, 2008.

Data evaluated in this Public Health Assessment (PHA) include sampling results for on-site and off-site soil, drainage ditch sediment, creek sediment and surface water, groundwater monitoring wells, paint chips, pecans, transformer oil, on-site containers, and asbestos. Based upon the data and information provided by the EPA, the contaminants and the primary routes of exposure that warranted closer evaluation in this PHA were the consumption of PCB- and lead-contaminated soil and PCB-contaminated sediments.

[1] a predecessor agency of the Texas Commission on Environmental Quality (TCEQ)

CONCLUSIONS	DSHS and ATSDR reached three conclusions in this health assessment:
Conclusion 1	Based upon the soil results for lead and PCBs, DSHS and ATSDR conclude that touching or accidentally eating soil from residential areas in close proximity to the Old ESCO site will not harm people's health because people are not being exposed to levels of PCBs or lead that exceed health-based screening values.
Basis for conclusion	In 2008 and 2009, EPA removed soil known to be contaminated with PCBs in all residential yards and adjoining ditch lines. This eliminated exposure to PCBs at levels of concern in residential yards near the Old ESCO site that were remediated in 2008 and 2009.
Next steps	No public health actions are needed for people living in the residential areas.
Conclusion 2	DSHS and ATSDR conclude that on-site soil and soil being stored in the Old ESCO building will not harm people's health because people do not have access to the contaminated soil.
Basis for conclusion	A perimeter fence has been installed and access to the site is restricted to EPA and TCEQ personnel.
Next steps	No public health actions are needed.
Conclusion 3	DSHS and ATSDR conclude that touching or accidentally eating on-site and off-site soil in the past is not expected to harm people's health because either PCB levels are below levels of health concern or because contact with contaminated soil would not have been frequent enough to cause adverse health effects.
Basis for conclusion	Based upon the soil sampling data and the average concentration of PCBs detected in off-site soil, DSHS and ATSDR find that the levels of PCBs in soil are below levels known to result in non-cancer harmful health effects. Also, DSHS and ATSDR do not consider the PCB levels found in the soil to present an increased cancer risk. The areas with the highest levels of PCBs in soil are located on-site and employees of the facility could have come into contact with contaminated soil. If contact with the soil (touching) did occur, it would have been infrequent and is not likely to cause adverse health effects.
Next steps	No public health actions are needed.

FOR MORE INFORMATION	If you have concerns about your health, you should contact your health care provider. You may also call Texas Department of State Health Services at (800) 588-1248 and ask to speak with someone in the health assessment program.

Purpose and Health Issues

This public health assessment (PHA) was prepared for the Old Electrical Service Company (Old ESCO) site in accordance with the Interagency Cooperative Agreement between the Agency for Toxic Substances and Disease Registry (ATSDR) and the Texas Department of State Health Services (DSHS). In preparing this PHA, no independent samples were collected and/or analyzed. DSHS and ATSDR used sample data previously collected by the United States Environmental Protection Agency (EPA). The primary contaminants of concern associated with Old ESCO are the class of compounds known as polychlorinated biphenyls (PCBs), as well as lead. The primary routes of exposure evaluated in this PHA are the consumption of PCB- and lead-contaminated soil and PCB-contaminated sediment. This PHA presents conclusions about whether a health threat is present for the identified routes of exposure.

Background

Site Description

The Old ESCO site is a former electrical transformers and high-voltage switchgear facility located in Greenville, Hunt County, Texas. The former facility is located at 500 Forrester Street on approximately 5 acres of land and consists of one large building and a small shed, as well as open land [2]. Deteriorated asbestos-containing material (ACM) was located within the building [3]. The site is bounded to the north by Forrester Street, to the south by the US Highway 67 frontage road, to the east by residential properties, and to the west by the US Highway 67 frontage road [Figure 1] [4]. Residential properties are also located across Forrester Street from the facility. The building is abandoned [4]. Although the doors to the main building are locked and the windows are barred, access to the site property and the small shed was not restricted [5] until the EPA installed a perimeter fence around the facility and property on November 6, 2008 [6].

The property was used by Hunt County for equipment storage of such items as used tires, miscellaneous office equipment, and bales of hay [5]. An EPA site visit in November 2004 identified several 55-gallon drums and 5-gallon containers of unknown materials in the main building and small shed. Three transformers were observed on the east side of the property. The transformers were on a concrete pad with no additional containment. Staining was visible on one transformer and the underlying concrete pad. The smaller containers of unknown materials were no longer present on site during the February 2005 site visit. Hunt County was in the process of demolishing and removing debris from the northern portion of the main building [2].

Soil sampling was conducted to determine the extent of contamination; PCBs and lead were identified as the contaminants of concern. Based on extensive sampling data, the area of observed contamination for this site includes the facility property, residential areas to the north and east of the facility, and areas to the west of the facility [2]. A discussion of the PCB and lead concentrations in these areas is included in this report.

Site History

Old ESCO began operations in 1945 and operated at this property until approximately 1970 when it relocated to another facility in Greenville. The facility manufactured, repaired, and refurbished electrical transformers and high-voltage switchgear for electrical distribution. Other operations at the site included metal fabrication, welding, grinding, sandblasting, silver electroplating, and painting [2].

The site came under initial review in July 1980 when the Texas Department of Water Resources[2] received and investigated a complaint that transformer oil had been disposed of at the site. Their investigation indicated concentrations of PCBs as high as 85,000 mg/kg in surface soils near the building and parking lot [2]. Between 1984 and 1986, four monitoring wells were installed on the property to assess the potential for migration of PCBs from the soil to the shallow groundwater. These wells were tested in November 1987, and no contamination was detected in the groundwater [4].

URS Corporation (under a contract with the TCEQ) conducted a Phase I Environmental Site Assessment in February 2003. This investigation included limited surface soil and groundwater sampling (using low-flow purging and sampling techniques); results indicated that PCBs were on site in both surface soil and groundwater [4].

A Phase II Environmental Site Assessment was conducted in June 2003 by URS Corporation (under a contract with the TCEQ). Additional groundwater and surface soil samples, as well as subsurface soil samples, were collected and analyzed for PCBs and metals. Results indicated that PCBs were present in subsurface soil at depths of 1 foot, 4 feet, and 15 feet. PCBs and metals were also detected in the surface soil and groundwater. URS recommended the site be fenced to limit site access and that additional investigations be conducted to delineate the extent of PCB contamination [4].

In November 2004, Weston Solutions, Inc. (Weston), the EPA Superfund Technical Assessment and Response Team (START-2) contractor, conducted a removal assessment of the Old ESCO site [5]. Activities associated with this assessment are discussed in this document and include the following:

- the collection and analysis of on- and off-site soil and sediment samples
- the collection and analysis of on-site groundwater samples
- the collection and analysis of transformer oil samples
- the collection and analysis of on-site paint chip samples
- an asbestos survey and limited bulk asbestos sampling
- pinpointing the location, identifying the contents, and sampling of any drums and containers containing unknown materials
- the collection and analysis of pecan samples from an adjacent residence

[2] a predecessor agency of the Texas Commission on Environmental Quality (TCEQ)

An asbestos survey was conducted on February 15, 2005 by ECS-Texas, LLP. ACM was identified in various building materials including floor tile and mastic, joint compound, wall texture, sealant tape on HVAC ductwork, heat resistant panels inserted inside high heat light fixtures, window glazing, and mastic applied to the parapet roof flashings [7].

An additional removal assessment was conducted by START-3 in 2007 [2]. Activities associated with this assessment are discussed in this document and include the following:

- additional sampling to further delineate the extent of contamination (horizontally and vertically)
- identification of "hot-spots" on- and off-site
- determination of background concentrations of PCBs in the area.

The EPA hosted an availability session on March 15, 2008, to inform the residents that the Old ESCO site was being proposed to the National Priorities List (NPL). Inclusion on the NPL allows federal funds and personnel to become available to further assess the nature and extent of the public health and environmental risks associated with the site. The EPA also informed community members about activities completed and planned, and addressed community questions. The Old ESCO Manufacturing site was proposed to the NPL on March 19, 2008 [8].

On August 9, 2008, the main building was damaged by arsonists. The majority of the building was not impacted; however, the fire occurred in the area containing ACM. On August 27, 2008, the EPA and its contractors completed asbestos abatement of the building and removal of debris from within the building [3].

The Old ESCO Manufacturing site was added to the final NPL on September 3, 2008 [9]. The EPA and its contractors began removing PCB-contaminated soil from residential properties immediately adjacent to the site on the east side on September 9, 2008 [6]. All contaminated soil was removed from residential properties adjacent to the site on the east side and property restoration was completed by December 1, 2008. Approximately 4,000 cubic yards of soil with PCBs exceeding 50 mg/kg are currently being stored inside the Old ESCO building for future disposal as hazardous waste [6].

The EPA and its contractors collected additional environmental data as a part of their remedial investigation [10]. Soil samples from residential yards and highway rights-of-way to the north and further east of the site, groundwater from the on-site monitoring wells, and sediment and surface water samples from Horse Creek and Cowleech Fork of the Sabine River were collected in March through May 2009 and analyzed for PCBs. With this data, the extent of contamination has been delineated for all residential and non-residential properties and adjoining ditches. All known residential properties and adjoining ditch lines with PCB contamination exceeding 1 mg/kg have been remediated. As of the end of 2009, the EPA's remaining areas of concern include the Old ESCO property, non-residential ditch lines, non-residential properties, and the Sabine River and Horse Creek and their tributaries.

Site Visit

The DSHS Health Assessment and Toxicology Program visited the Old ESCO site on March 15, 2008. DSHS personnel met with representatives from the ATSDR, the EPA, the TCEQ, and Weston. The EPA and Weston provided a site tour of the property to DSHS personnel who also walked the perimeter of the building. The building was locked and windows were barred; however, there was evidence of prior trespassing into the building (graffiti on walls). The door to the small shed was open and contained old clothes as well as other miscellaneous items. There was no fence to prevent access to the site at that time. Ground cover on-site consisted of overgrown vegetation and asphalt/gravel parking areas.

At the time of the on-site visit, City of Greenville employees were repairing a sewer line that runs through the western edge of the property. The EPA indicated that the employees were aware of the PCB contamination in the soil and knew how to protect themselves from exposure to contaminated soil.

Following the on-site tour, the team walked the neighborhood to the east of the facility. Most properties have well manicured lawns and flower beds. One property has a garden, and another property does not have good ground cover where children play. Surface soil results in these areas indicate less than 1 mg/kg PCBs. Many of the properties east of the site have children's play equipment, indicating children either live or visit the area. The team also visited with community members that were outside.

Representatives from the DSHS and the ATSDR attended an availability session on March 15, 2008, hosted by the EPA for the community living around the site. The DSHS discussed the public health assessment process and answered questions from community members.

Representatives from the DSHS conducted an additional site visit on March 24, 2009. A wooden (privacy) fence was installed between the site and the adjacent residential properties. A chain link fence was installed at the perimeter of the site on all other sides. Debris and ACM had been removed from the building and property, and contaminated soil removed from the residential properties was stored inside the building. Representatives from DSHS also attended an EPA community meeting on March 24, 2009, and answered questions from community members regarding health effects related to PCB-exposure.

Representatives from DSHS attended an additional EPA community meeting on September 23, 2009. At this meeting, EPA presented results of the remedial investigation to the community and provided information about additional removal actions. DSHS staff answered questions from community members regarding health effects related to PCB-exposure.

Demographics

The 2000 United States Census reported the total population for Hunt County and the city of Greenville as 76,596 and 23,960 respectively [11]. The Census reported 1,136 people residing in 470 housing units within a 1-mile radius of the site. At the time of the census, 130 children under the age of six and 273 women of child-bearing age (15 to 44 years old) resided in this area [Figure 2]. The 1-mile radius of the site includes a large mobile home community. Based on the results of soil sampling conducted by the EPA in that area, the mobile home community is not affected by the site.

Land and Natural Resource Use

The Old ESCO site is located in a mixed rural/residential area on the eastern boundary of Greenville, Texas. Areas to the north and east consist of single-family residences with mixed grass and tree cover. Areas to the west and south are partially covered with grass and pavement [2].

The general topography of the property slopes to the west-southwest. A drainage ditch (north drainage ditch) runs along the northern border of the property, along Forrester Road. A small drainage ditch (east drainage ditch) is located on the east side of the building and flows south, emptying into a drainage ditch adjacent to the frontage road of US Highway 67 (south drainage ditch). The north and south drainage ditches flow toward and converge at the southwest boundary of the property. The confluent ditches flow southwest and exit the property on the north side of the frontage road, continue to the southwest under US Highway 67, and empty into an unnamed creek [2]. This creek flows southwest and converges with the Cowleech Fork of the Sabine River [5].

The site is located within the Blackland Prairie Land Resource Area. Soil types for this area include Crockett Loam (deep, moderately well drained loamy soils) and Kaufman Clay (deep, somewhat poorly drained, clayey soils) [5].

Residents living near the Old ESCO site obtain their drinking water from the Greenville Municipal Water Supply system. The source of this water is two surface water reservoirs that are located north and upgradient of the site. Although no drinking water wells have been identified in the area, it is possible that groundwater may be used for watering livestock and residential gardens [5].

Community Health Concerns

As part of the public health assessment process, DSHS and ATSDR try to learn what health-related concerns people in the area might have about the site. Consequently, we actively gathered information and comments from people who live or work near the site during site visits and community meetings. We also received phone calls from several citizens after the meeting. The community health concerns that we have received and our response to those concerns are discussed in the public health implications section of this document.

Health Outcome Data

Health outcome data record certain health conditions that occur in populations. These data can provide information on the general health of communities living near a hazardous waste site. They also can provide information on patterns of specified health conditions. Some examples of health outcome databases are cancer registries, birth defects registries, and vital statistics. Information from local hospitals and other health care providers also can be used to investigate patterns of disease in a specific population. DSHS and ATSDR look at appropriate and available health outcome data when a completed exposure pathway or community concern exists. DSHS looked at cancer registries to address the community's concern of an excess of cancer. Results of this investigation are included in this PHA.

Children's Health Considerations

In communities faced with air, water, or soil contamination, children could be at greater risk than are adults from certain kinds of exposure to hazardous substances. A child's lower body weight and higher intake rate result in a greater dose of hazardous substance per unit of body weight. Sufficient exposure levels during critical growth stages can result in permanent damage to the developing body systems of children. Children are dependent on adults for access to housing, for access to medical care, and for risk identification. Consequently, adults need as much information as possible to make informed decisions regarding their children's health. ATSDR and DSHS evaluated the likelihood for children to be exposed to the site contaminants at levels of health concern. Exposure of children to the PCB contaminants will most likely be from the consumption of contaminated soil (via incidental ingestion, hand-to-mouth behavior, or pica behavior). DSHS tries to protect children from the possible negative effects of toxicants in soil by using exposure scenarios specific to children.

Environmental Contamination

The following sections discuss the data collected by EPA, START-2, and START-3 during their field activities in 2005 and 2007 [5] and during the Remedial Investigation in 2009 [10]. No other data was used in this evaluation. All results for PCBs are reported as "total PCBs" (the sum of all PCBs detected in a sample). To assess the "worst-case scenario", the "total PCBs" result was compared to screening values for Aroclor 1254. See Table 1 for a summary of the 2005 and 2007 soil data and Table 2 for a summary of the 2009 soil data.

In preparing this report, DSHS and ATSDR relied on the data provided to us by the EPA as having been collected according to approved Quality Assurance Project Plans. Thus, we have assumed adequate quality assurance/quality control (QA/QC) procedures were followed with regard to data collection, chain of custody, laboratory procedures, and data reporting.

Soil

Based upon previous investigations by the TCEQ [4], PCBs and lead are the only contaminants of concern in soil.

During the 2005 and 2007 EPA field activities, 2,254 surface and subsurface soil samples were collected on site and off site and analyzed for PCBs. Of these samples, 112 samples also were analyzed for lead.

PCBs were detected in 1,481 soil samples collected in 2005 and 2007, and PCB concentrations ranged from non-detect to 3,390 mg/kg (average concentration of 10 mg/kg). Lead was detected in 101 samples with concentrations ranging from non-detect to 793 mg/kg (average concentration of 31 mg/kg).

During the 2009 EPA field activities, 1,153 surface soil samples were collected from residential properties and adjacent drainage ditches and Texas Department of Transportation rights-of-way. The surface soil samples were analyzed for PCBs.

PCBs were detected in 571 soil samples collected in 2009. PCB concentrations ranged from non-detect to 32.3 mg/kg, with an average concentration of 0.33 mg/kg.

Drainage Ditch Sediment

Sediment samples from the various drainage ditches on and around Old ESCO property were collected in February, March, April, and August 2005 and analyzed for PCBs. These samples were collected to determine if contamination was being transported off site via water run-off from the site.

Concentrations of PCBs in sediment samples ranged from non-detect to 921 mg/kg, with an average concentration of 19.5 mg/kg.

Creek Sediment and Surface Water

Sediment and surface water samples were collected from Horse Creek and Cowleech Fork of the Sabine River during EPA's remedial investigation in April 2009. These samples were collected to determine if water run-off from the site was impacting nearby creeks.

PCBs were not detected in the surface water samples collected from these two creeks. Concentrations of PCBs in sediment samples collected from the creeks ranged from non-detect to 0.07 mg/kg, with an average concentration of 0.02 mg/kg.

Groundwater Monitoring Wells

During previous investigations of Old ESCO Manufacturing, five groundwater monitoring wells were installed on site. These monitoring wells were purged and sampled in February 2005 during EPA's removal assessment and in April 2009 during EPA's remedial investigation. Although

PCBs were detected in the groundwater samples, the groundwater is not used for drinking water, and no private wells were identified in the area.

Paint Chips

The on-site building may be demolished during future removal activities. In order to determine the lead content of paint used in this building, interior and exterior painted surfaces were sampled in February 2005 and analyzed for metals. Lead and other metals were detected in the paint chip samples.

Biota (Pecans)

Two pecan trees are located on a residential property adjacent to the Old ESCO site. The resident collects and sells the pecans and was concerned about the pecans containing PCBs. EPA collected and analyzed pecans from these trees in February 2005. Pecans were cracked, and the edible portion of the pecan was analyzed for PCBs. PCBs were not detected above the reporting limit in any of the pecans analyzed.

Transformer Oil

The three transformers remaining on site were sampled in February 2005 to evaluate the transformer oil. No PCBs were detected above the reporting limit in the oil sampled from the transformers.

On-Site Containers

During EPA's initial site activities, several drums and containers containing unknown materials were identified within the main building and storage shed. EPA's contractors sampled these containers and conducted a survey (Hazard Categorization Field Screening or HAZCAT®) to determine the type of waste and to properly dispose of the contents.

Asbestos

An asbestos survey conducted on February 15, 2005, by ECS-Texas, LLP identified ACM within the on-site building [3]. EPA and its contractors completed asbestos abatement of the building and removal of debris on August 27, 2008 [3].

Chemicals of Concern for the Site

The primary contaminants of concern associated with the Old ESCO site are the class of compounds known as PCBs and lead. Thus, PCBs and lead were considered in the pathways analysis for the site.

Pathways Analysis

Exposure to PCBs and lead in soil and exposure to PCBs in drainage ditch and creek sediment are currently the only exposure pathways of concern for this site. Exposure to PCBs in creek water was eliminated as an exposure pathway because PCBs were not detected in the surface water. The groundwater exposure pathway was eliminated because groundwater is not a source of drinking water for the community. Exposure to lead and other metals in paint chips was eliminated as an exposure pathway because access to the site is restricted. PCBs were not detected in the pecans; therefore, this exposure pathway was eliminated. Exposure to contaminants in transformer oil, on-site containers, and asbestos was eliminated as an exposure pathway because these items are no longer located in the facility. Air samples were not collected; however, because of the nature of the contaminants of concern, their low volatility and their high affinity for soil particles, this pathway also was eliminated as a plausible pathway of concern.

Contaminants of concern (PCBs and lead) were found in the soil and sediment samples collected on and off the site. All known residential properties and adjoining ditches in the area with PCBs exceeding 1 mg/kg have been remediated. However, on-site soil remains contaminated with PCBs and lead, and off-site highway rights-of-way, non-residential properties, and creeks remain contaminated with PCBs. Thus, we consider exposure to soil and sediment to be completed exposure pathways. These pathways are the basis for the public health conclusions and recommendations reached in this PHA.

Public Health Implications

Polychlorinated Biphenyls

Background

Polychlorinated biphenyls (PCBs) are man-made chemicals that can be liquid or solid [12]. Most are oily liquids that are clear to light yellow with no smell or taste. They were mainly used as coolants and lubricants in electrical equipment. Their physical properties as good insulators, which enabled them to withstand high heat without breaking down or burning easily, made them ideal for use in transformers and capacitors [12]. PCBs also were used in fluorescent lighting fixtures, hydraulic fluids, flame retardants, inks, adhesives, paints, and as pesticides extenders. PCB manufacturing in the U.S. began in 1929 and ceased in 1977 [12]. The peak annual production was 85 million pounds in 1970. In 1976, the regulation of PCBs was placed under the authority of the U.S. EPA. In 1978, regulation of the storage and disposal of PCBs began, and all U.S. manufacture and importation of PCBs was prohibited [12].

Usually PCBs are not found as a pure chemical but as mixtures of different PCBs. There are 209 different types of PCB compounds which are called “congeners” [12]. Congeners which have the same number of chlorine atoms are called homologs. Homologs having the same number of chlorine atoms but in different positions are called isomers [12].

Approximately 99% of PCBs used by U.S. industry were produced by the Monsanto Chemical Company [12]. Aroclor was the commercial trade name of PCBs produced by Monsanto. Different types of Aroclors were produced which contained the trade name followed by numbers (1016, 1221, 1254, and 1260). The first two digits indicated the number of carbon atoms contained in the particular PCB molecule. The second two digits indicated the percentage of chlorine contained in the molecule. For example, Aroclor 1254 is approximately 54% chlorine [12]. In general, the higher the degree of chlorination, the more toxic the Aroclor. PCBs also were produced by other countries with trade names such as; Clophen (Germany), Fenclor (Italy), Kanechlor (Japan), and Phenclor (France) [12].

PCBs are persistent and can exist in the environment for long periods of time [12]. If released into the environment as a gas, PCBs can accumulate in the leaves and the aboveground parts of plants. PCBs bind strongly to organic matter and do not partition very easily to water; thus, they are not usually transported from the release site by water (i.e. runoff) to other areas. In a water body, PCBs will attach themselves to the bottom sediment or to particles floating in the water, commonly referred to as suspended sediments [12].

Generally, background levels of PCBs are higher in aquatic environments (lakes, rivers) than in terrestrial environments (soil). Because of their lipophilic tendency (having an affinity for fat tissue), they tend to readily accumulate in fatty fish tissue [12]. After ingesting contaminated fish, the human body absorbs the PCBs into the bloodstream and quickly removes them from the blood stream to be stored in body fat. The biological half-life (the time it takes for ½ of a substance that enters a body to be eliminated) of PCBs is approximately one year [13].

Exposure to PCBs generally occurs by inhalation or ingestion [12]. PCBs in air can enter the lungs and pass into the bloodstream, but it is not known how fast or how much will enter into the blood. Contact with contaminated soil or sediments from where PCBs have been released into the environment can lead to exposure. The most common way for PCBs to enter the body is through ingestion of fish or meat containing PCBs [12].

Adverse Health Effects

High exposures of humans to PCBs can result in acne and rashes [12]. Such occurrences are usually in an industrial workplace. Rats exposed to large amounts of PCBs for a short period of time had liver damage. Rats exposed to smaller amounts for several months had stomach and thyroid injuries, changes to their immune systems, and behavioral changes [12].

PCBs are not known to cause human birth defects [12]. Pregnant women exposed to high amounts of PCBs, from the workplace or from eating fish with high PCBs, had children with lower birth weight. The children had lessened motor skills and decreased immune systems. The most likely PCB exposure of infants is from breast milk which contains PCBs. However, the benefits of breast feeding outweigh the PCB risk from breast milk [12].

Most people already have PCBs in their body because PCBs are in the environment [12]. Tests are available to determine if PCBs are in the blood, body fat, or breast milk. However, these tests are not routinely performed. The tests can show if PCB levels are elevated, which would indicate past exposure, but cannot identify where the PCBs came from or how long the exposure has been occurring. Once in the body the PCBs can change into other related chemicals called metabolites. Some of the metabolites can leave the body within a few days, but others can remain in the body fat [12].

Substances that are capable of causing cancer are known as carcinogens. There is limited, and therefore inadequate, evidence that PCBs are human carcinogens [12]. However, there are sufficient studies and evidence that PCBs are carcinogenic to animals. The U.S. Department of Health and Human Services (DHHS), National Toxicology Program (NTP) view PCBs as being reasonably anticipated to be a human carcinogen [12]. The U.S. EPA and the International Agency for Research on Cancer (IARC) believe PCBs are probably carcinogenic to humans [12].

PCBs associated with the Old ESCO site

PCB concentrations in soil samples collected in 2005 and 2007 exceeded the following health-based screening standards:

- intermediate EMEG for children exhibiting pica behavior (0.06 mg/kg) – 1,166 samples
- CREG (0.4 mg/kg) – 546 samples
- chronic EMEG for children (1 mg/kg) – 351 samples
- chronic EMEG for adults (10 mg/kg) – 111 samples

Using standard exposure assumptions (body weights of 16 kg for children and 70 kg for adults and ingestion rates of 5,000 mg soil /day for children exhibiting pica behavior, 200 mg soil/day for children, and 100 mg soil/day of adults) and the average concentrations of PCBs detected in on-site and off-site soil in 2005 and 2007 (10 mg/kg), we calculated the following estimated exposure doses associated with exposure to PCBs in soil:

- 0.0031 mg/kg/day for children exhibiting pica behavior
- 0.0001 mg/kg/day for children
- 0.00001 mg/kg/day for adults

The estimated exposure doses for children exceed ATSDR's chronic MRL of 0.00002 mg/kg/day. This MRL was based upon a study in which reduced IgM (Immunoglobulin M) and IgG (Immunoglobulin G) antibody responses to sheep red blood cells was noted in monkeys. The lowest observable adverse effect level (LOAEL) for this study was 0.005 mg/kg/day. The no observable adverse effect level (NOAEL) for this study was not reported [12].

Although the estimated exposure doses are at or above the MRL for PCBs, they are well below the levels at which health effects have been observed. Studies in animals and humans indicated LOAELs associated with chronic exposures to PCBs to be 0.005 mg/kg/day for less serious effects (elevated and separated toenails, reduced antibody responses, and inflammation of tarsal glands and nails). LOAELs for other effects are higher. Therefore, DSHS and ATSDR conclude that touching or accidentally eating on-site and off-site soil is not expected to harm people's health because PCB levels are below levels of health concern and because people do not have access to the contaminated soil on site.

Using the same exposure assumptions as above and the EPA's CSF we calculated the theoretical excess cancer risk associated with exposure to PCBs in soil to be 1.2×10^{-5}. We would interpret this risk as posing no apparent increased risk for cancer.

PCB concentrations in soil samples collected in 2009 exceeded the following health-based screening standards:

- intermediate EMEG for children exhibiting pica behavior (0.06 mg/kg) – 359 samples
- CREG (0.4 mg/kg) – 132 samples
- chronic EMEG for children (1 mg/kg) – 69 samples
- chronic EMEG for adults (10 mg/kg) – 6 samples

Using standard exposure assumptions (body weights of 16 kg for children and 70 kg for adults and ingestion rates of 5,000 mg soil /day for children exhibiting pica behavior, 200 mg soil/day for children, and 100 mg soil/day for adults) and the average concentrations of PCBs detected in off-site soil in 2009 (0.33 mg/kg), we calculated the following estimated exposure doses associated with exposure to PCBs in soil:

- 0.0001 mg/kg/day for children exhibiting pica behavior
- 0.000004 mg/kg/day for children
- 0.0000005 mg/kg/day for adults

The estimated exposure dose for children exhibiting pica behavior exceeds ATSDR's intermediate-duration MRL of 0.00003 mg/kg/day. This MRL was based upon a study in which neurobehavioral effects were noted in infant monkeys. The LOAEL for this study was 0.0075 mg/kg/day. There was no NOAEL available for this study [12].

Although the estimated exposure dose for children exhibiting pica behavior exceeds the MRL for PCBs, it is well below the levels at which health effects have been observed. Additionally, pica behavior is typically a short-term behavior. Therefore, DSHS and ATSDR conclude that touching or accidentally eating off-site soil is not expected to harm people's health because PCB levels are below levels of health concern.

Using the same exposure assumptions as above and the EPA's CSF we calculated the theoretical excess cancer risk associated with exposure to PCBs in soil to be 4×10^{-7}. We would interpret this risk as posing no increased risk for cancer.

PCB concentrations in drainage ditch sediment samples collected in 2005 exceeded the following health-based screening standards:

- CREG (0.4 mg/kg) – 60 samples
- chronic EMEG for children (1 mg/kg) – 52 samples
- chronic EMEG for adults (10 mg/kg) – 22 samples

Using standard exposure assumptions and the average concentrations of PCBs detected in the drainage ditch sediment (19.5 mg/kg), we calculated the following estimated exposure doses associated with exposure to PCBs in sediment:

- 0.0002 mg/kg/day for children
- 0.00003 mg/kg/day for adults

Although the estimated exposure exceed the MRL for PCBs (0.00001 mg/kg/day), exposure to sediments is likely to be short and infrequent and the estimated exposure doses are conservative with respect to protecting human health. Therefore, DSHS and ATSDR conclude that touching or accidentally eating on-site and off-site sediments is not expected to harm people's health because PCB levels are below levels of health concern.

PCB concentrations in sediment samples collected from Horse Creek and Cowleech Fork of the Sabine River in 2009 did not exceed health-based screening standards. Therefore, DSHS and ATSDR conclude that touching or accidentally eating creek sediment is not expected to harm people's health because PCB levels are below levels of health concern.

Lead

Background

Lead is a naturally occurring heavy metal [14]. It usually exists in the environment with two or more other elements to form a lead compound. Lead compounds are used as a pigment in paint, dyes, and ceramic glazes and in caulk. However, the amount of lead used in these products has been reduced over the years [14]. Lead can be combined with other metals to form lead alloys, which are commonly found in pipes, storage batteries, weights, ammunition, cable covers, and sheets used for blocking radiation. The use of lead in ammunition and fishing sinkers also is being reduced. Lead was previously used in gasoline as an additive to increase octane ratings. However, this use was phased out in the United States in the 1980s, and beginning January 1, 1996, lead was banned for use in gasoline for motor vehicles [14].

Most lead used today is obtained from recycled lead-acid batteries. Other lead used in industry comes from mined ores (Alaska and Missouri in the United States) and recycled scrap metal [14].

Although lead occurs naturally in the environment, most of the high levels found throughout the environment are the result of human activities [14]. Over the last 300 years, environmental lead levels have increased over 1,000-fold due to human activities. Prior to banning the use of leaded gasoline, most environmental lead came from vehicle exhaust and the greatest increase in environmental lead over the last three centuries (which occurred between 1950 and 2000) was attributed to the increased use (worldwide) of leaded gasoline [14]. Other environmental sources of lead include releases from mining lead and other metals and from factories that make or use lead, lead compounds, or lead alloys. Weathering and chipping of lead-based paint from buildings and other structures also contributes to lead contamination in soil [14].

Very small lead particles in the atmosphere can travel long distances. Lead is removed from the atmosphere by rain and by particles falling to the earth. Lead in soil sticks strongly to soil particles and remains in the upper layer of soil. Lead may enter rivers, lakes, and streams when soil particles are moved by rainwater. Lead stuck to soil and sediment remains for many years, and typically does not move into groundwater [14].

Lead is commonly found in soil near busy highways, railways, older houses, mining areas, industrial sites, landfills, and hazardous waste sites [14]. People may be exposed to lead by breathing air, drinking water, eating foods, or swallowing dust or soil that contain lead. Skin contact with lead occurs daily, and inexpensive costume jewelry can contain high levels of lead. However, not much lead enters the body through the skin [14]. Other potential exposures to lead include some hobbies (stained glass), home remedies, hair and cosmetic products, occupational exposures, and home renovation that removed lead-based paint [14].

Lead that gets into the body via inhalation enters the lungs and moves quickly to other parts of the body. Most of the lead that gets into the body comes through swallowing, either by the ingestion of food or water that contain lead or by inhaling particles that are too large to get into the lungs. The amount of lead that is absorbed by the body through ingestion depends on the age of the person and when they ate their last meal [14]. Very little lead that is ingested gets into the blood in adults that had just eaten, but most lead ingested gets into the blood in adults that had not eaten for a day. Children absorb about half of the ingested lead. Although lead does not pass through the skin easily, lead on the surface of the skin can be accidentally ingested when people eat, drink, smoke, or apply cosmetics [14].

Lead that gets into the body travels in the blood to soft tissues and organs [14]. After several weeks, most lead moves into bones and teeth. Lead can stay in the bones for decades, but may be released back into the bloodstream during pregnancy and periods of breastfeeding, after a bone is broken, and during advancing age [14].

Adverse Health Effects

Health effects related to exposure to lead are the same, regardless of the exposure route [14]. For both adults and children, the main target for lead toxicity is the nervous system. Long-term, occupational exposure to lead has been linked to decreased performance in tests that measure nervous system function. Weakness in fingers, wrists, or ankles also is associated with lead exposure. Exposure to high levels of lead can cause brain and kidney damage in adults and children, and may lead to death. It can also cause miscarriages in pregnant women and damage to organs responsible for sperm production in men [14].

There is no conclusive proof that lead is a human carcinogen [14]. Kidney tumors have developed in mice and rats exposed to high levels of lead compounds. The DHHS NTP view lead and lead compounds as reasonably anticipated to be human carcinogens, the EPA has determined that lead is a probable human carcinogen, and the IARC has determined that inorganic lead is probably carcinogenic to humans [14]. IARC also has determined that organic lead compounds are not classifiable as to their carcinogenicity in humans based on inadequate evidence from studies in humans and animals [14].

Lead associated with the Old ESCO site

The ATSDR has not established a screening value for lead; rather, they use EPA's screening level for lead in residential soil (400 mg/kg). Three on-site soil samples exceeded this screening value for lead. However, DSHS and ATSDR conclude that touching or accidentally eating on-site soil is not likely to harm people's health because people do not have access to the contaminated soil.

Community Health Concerns Associated with the Old ESCO site

Community health concerns were collected by DSHS, ATSDR, and EPA through site visits, public meetings, and phone calls. Our responses to those concerns are included in this section.

Potential health effects related to past exposures

In the past, access to the site was not restricted and soil in residential areas was contaminated with PCBs. It is possible that people came into contact with PCB-contaminated soil both on site and off site. Trespassers that entered the on-site facility may have come into contact with debris and other potential hazardous substances that were stored in the building. Assessing the potential health affects related to these exposures is difficult because we do not know the conditions under which people may have been exposed to PCBs or other contaminants. Based upon the 2005 and 2007 soil sampling data and the average concentration of PCBs detected in on-site and off-site soil, we calculated the theoretical excess cancer risk associated with exposure to PCBs in soil to be 1.2×10^{-5}. We would interpret this risk as posing no apparent increased risk for cancer. DSHS and ATSDR conclude that touching or accidentally eating on-site and off-site soil in the past is not expected to harm people's health because PCB levels are below levels of health concern.

Although we do not expect past exposures to harm people's health, EPA is being protective of human health in their efforts to remove soil contaminated with PCBs above 1 mg/kg in residential areas. This will prevent current and future exposure to PCBs in the residential areas.

Potential health effects related to clean-up activities

The EPA and its contractors ensure the safety of its employees and the general public during clean-up activities. Proper engineering controls are used to prevent further spread of contaminated soil and to monitor conditions during remediation. More information about the clean-up process is available from the EPA.

Potential excess of cancer in the area

Due to a number of concerns regarding an excess of cancer in this area, the Texas Cancer Registry, located within DSHS, evaluated cancer rates for the area around the former Old ESCO facility. The Texas Cancer Registry evaluated 1997 through 2006 incidence data for cancers of the liver and intrahepatic bile duct and gallbladder and other biliary for zip codes 75401 and 75402. These cancers were evaluated since they are the types of cancer most likely to be related to the chemicals of concern. Based upon the state rates of these cancers, they were found to be within expected ranges for both males and females [15].

Safety of consuming garden vegetables and pecans grown in contaminated soil

PCBs stick to organic matter and clay in soils and are not readily taken up into plants through the roots. Although some root crops such as carrots can accumulate PCBs, bioaccumulation factors (the concentration of PCBs in plant tissue divided by the concentration in the soil) for most terrestrial plants is estimated to be less than 0.02. The primary mode of uptake of PCBs in terrestrial vegetation is from PCBs in the air.

Pecan samples collected from pecan trees grown in contaminated soil did not contain detectable levels of PCBs. Because PCBs are not readily taken up into plants from the roots, garden vegetables and pecans grown in this area should be safe to eat.

Fishing in Lee Street flood waters after flood events

Local citizens reported to the EPA that they catch and consume fish from the off-site drainage area after significant rainfall events [5]. As PCBs readily accumulate in fish species, the consumption of fish from a potentially contaminated area is an important exposure pathway to consider. Five sediment samples were collected from the flood area and analyzed for PCBs. One sample exceeded the chronic EMEG for children (0.1 mg/kg). All other samples were below the detection limit or, if detected, below health-based screening values. There are no fish sampling data available to assess the uptake of PCBs from this flood area into fish species, and the species of fish caught in this area is unknown. However, because the concentration of PCBs in sediment in this area is low, and because it is not likely that people will consume fish from the flood area on a regular basis, it is assumed that the consumption of fish from flood areas does not represent a significant exposure to PCBs.

Whether their drinking water source (Lake Tawakoni) is safe

Residents living near the Old ESCO site obtain their drinking water from the Greenville Municipal Water Supply system. The source of this water is two surface water reservoirs that are located north and upgradient of the site. These reservoirs have not been impacted by the Old ESCO facility and the public water supply system does not contain PCBs. On-site monitoring wells have indicated groundwater in the area is contaminated with PCBs; however, no private wells have been identified in the area.

Conclusions

DSHS and ATSDR reached three conclusions in this health assessment:

Based upon the soil results for lead and PCBs, DSHS and ATSDR conclude that touching or accidentally eating soil in residential areas in close proximity to the Old ESCO site will not harm people's health because people are not being exposed to levels of PCBs that exceed health-based screening values. In 2008 and 2009, EPA removed soil with PCBs above 1 mg/kg in all residential yards and adjoining ditch lines, preventing people living in these areas from coming into contact with contaminated soil.

DSHS and ATSDR conclude that exposure by touching or accidentally eating on-site soil and soil being stored in the Old ESCO building will not harm people's health because people do not have access to the contaminated soil. A perimeter fence has been installed and access to the site is restricted to EPA and TCEQ personnel.

DSHS and ATSDR conclude that touching or accidentally eating on-site and off-site soil in the past is not expected to harm people's health because either PCB levels are below levels of health concern or because contact with contaminated soil would not have been frequent enough to cause adverse health effects. Based upon the soil sampling data and the average concentration of PCBs detected in off-site soil, DSHS and ATSDR find that the levels of PCBs in soil are below levels known to result in non-cancer harmful health effects. Also, DSHS and ATSDR do not consider the PCB levels found in the soil to present an increased cancer risk. The areas with the highest levels of PCBs in soil are located on-site and employees of the facility could have come into contact with contaminated soil. If contact with the soil (touching) did occur, it would have been infrequent and is not likely to cause adverse health effects.

Recommendations

Based upon DSHS' and ATSDR's review of the Old ESCO data and the concerns expressed by community members, the following recommendations are appropriate and protective of public health:

1. Access to the site should continue to be restricted to EPA, TCEQ, and their contractors.
2. Lead and other metals were detected in paint chip samples, and on-site soil is contaminated with lead and PCBs. The EPA and their contractors should follow the site safety plan during future remedial or removal activities to avoid exposure to these contaminants.

Public Health Action Plan

The public health action plan for the site contains a description of actions that have been or will be taken by DSHS, ATSDR, and other government agencies at the site. The purpose of the public health action plan is to ensure that this public health assessment both identifies public health hazards and provides a plan of action designed to mitigate and prevent harmful human health effects resulting from breathing, drinking, or touching hazardous substances in the environment. Included is a commitment on the part of DSHS and ATSDR to follow up on this plan to ensure that it is implemented.

Actions Completed

1. The site came under initial review in July 1980 when the Texas Department of Water Resources received and investigated a complaint that transformer oil had been disposed of at the site.
2. URS Corporation conducted a Phase I Environmental Site Assessment in February 2003.
3. A Phase II Environmental Site Assessment was conducted in June 2003 by URS Corporation.
4. In November 2004, Weston Solutions, Inc. conducted a removal assessment of the Old ESCO site.
5. An asbestos survey was conducted on February 15, 2005, by ECS-Texas, LLP.
6. An additional removal assessment of the Old ESCO site was conducted by Weston Solutions, Inc. in 2007.
7. The DSHS conducted a site visit and attended an EPA availability session on March 15, 2008. The purpose of the EPA availability session was to inform the residents that the Old ESCO site was being proposed to the NPL. The Old ESCO Manufacturing site was proposed to the NPL on March 19, 2008, and was added to the final NPL on September 3, 2008.

8. EPA and its contractors completed asbestos abatement of the Old ESCO building and removal of debris on August 27, 2008. All contaminated soils were removed from residential properties adjacent to the site on the east side and property restoration was completed by December 1, 2008.
9. Additional soil sampling to ultimately delineate the extent of soil contamination began in March 2009 and continued through May 2009.
10. The Texas Cancer Registry conducted a cancer cluster investigation for this area. The results of this investigation are presented in this PHA.
11. The DSHS conducted additional site visits and attended EPA availability sessions on March 24, 2009 and September 23, 2009. The purpose of the EPA availability sessions was to update the community on the work EPA had done and to discuss future plans for the site.
12. As of December 31, 2009, all known residential properties and adjoining ditch lines with PCBs exceeding 1 mg/kg have been remediated.

Actions Planned

1. This document will be made available to the community and local government officials for public comment. Comments received during the public comment period will be addressed by DSHS and ATSDR.
2. The final version of this document will be made available to community members, city officials, the TCEQ, and the EPA as well as other interested parties.

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Certification

This public health assessment for the Old ESCO Manufacturing site located in Greenville, Hunt County, Texas was prepared by the Texas Department of State Health Services (DSHS) under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methods and procedures existing when the time the public health assessment was initiated. Editorial review was completed by the Cooperative Agreement partner.

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

Alan Yarbrough
Team Lead, CAT, CAPEB, DHAC, ATSDR

Appendix A: Acronyms and Abbreviations

ACM	asbestos-containing material
ATSDR	Agency for Toxic Substances and Disease Registry
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
CREG	Cancer Risk Evaluation Guide
CSF	Cancer Slope Factor
DHHS	United States Department of Health and Human Services
DRV	Dose-Response Value
DSHS	Texas Department of State Health Services
e.g.	[*exempli gratia*] : for example
EMEG	Environmental Media Evaluation Guide
EPA	United States Environmental Protection Agency
ESL	Effects Screening Level
GI	Gastrointestinal
HAC	Health Assessment Comparison
HEAST	Health Effects Assessment Summary Table
HSDB	Hazardous Substance Data Bank
IARC	International Agency for Research on Cancer
i.e.	[*id est*] : that is
IgG	Immunoglobulin G
IgM	Immunoglobulin M
IRIS	Integrated Risk Information System
IUR	Inhalation Unit Risk
LOAEL	Lowest Observable Adverse Effect Level
µg/L	microgram per liter
$\mu g/m^3$	microgram per cubic meter
mg/kg	milligram per kilogram
mg/kg/day	milligram per kilogram per day
MRL	Minimal Risk Level
ND	Not Detected
NLM	National Library of Medicine
NOAEL	No Observable Adverse Effect Level
NPL	National Priorities List
NTP	National Toxicology Program
Old ESCO	Old Electrical Service Company
ORNL	Oak Ridge National Laboratories
OSF	Oral Slope Factor
PCB	Polychlorinated Biphenyl
PHA	Public Health Assessment
ppb	parts per billion
ppbv	parts per billion by volume
ppm	parts per million
PRP	Potentially Responsible Party
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act of 1976
REL	Reference Exposure Level
RfC	Reference Concentration
RfD	Reference Dose
RMEG	Reference Dose Media Evaluation Guide
RSL	Regional Screening Level
SARA	Superfund Amendments and Reauthorization Act of 1986
START	EPA Superfund Technical Assessment and Response Team
TCEQ	Texas Commission on Environmental Quality

Appendix B: The Public Health Assessment Process

The public health assessment process for NPL and other hazardous waste sites frequently involves the evaluation of multiple data sets. These data include available environmental data, exposure data, health effects data (including toxicologic, epidemiologic, medical, and health outcome data), and community health concerns.

Environmental Data

As the first step in the evaluation, ATSDR scientists review available environmental data to determine what contaminants are present in the various media to which people may be exposed (e.g., air, soil, sediment, dust, surface water, groundwater, vegetation, etc.) and at what concentrations. ATSDR generally does not collect its own environmental sampling data, but instead, reviews information provided by other federal or state agencies and/or their contractors, by individuals, or by potentially responsible parties (PRPs) [i.e., companies that may have generated the hazardous waste found at an NPL site, shippers that may have delivered hazardous waste to the site, and individuals or corporations that own (or owned) the property on which the site is located]. When the available environmental data is insufficient to make an informed decision about the public health hazard category of the site, the report will indicate what further sampling data is needed to fill the "data gaps."

Exposure Data

Pathway Analysis

The presence of hazardous chemical contaminants in the environment does not always mean that people who spend time in the area are likely to experience adverse health effects. Such effects are possible only when people in the area engage in activities that make it possible for a sufficient quantity of the hazardous chemicals to be transported into the body and absorbed into the bloodstream. This transport process is required in order for there to be a true exposure; thus, the assessment of real and potential exposures defines the real and potential health hazards of the site and drives the public health assessment process.

As the second step in the health assessment process, ATSDR scientists conduct an evaluation of the various site-specific pathways through which individuals may become truly exposed to site contaminants and be at risk for adverse health effects. Chemical toxicants can be transported into the body through the lungs, through the gastrointestinal (GI) tract, or directly through the skin by dermal absorption. People can be exposed to site contaminants by breathing air containing volatile or dust-borne contaminants, by eating or drinking food or water that contain contaminants from the site (or through hand-to-mouth activities with contaminated soil, dust, sediment, water, or sludge present on the hands), or by coming into direct skin-contact with contaminated soil, dust, sediment, water, or sludge resulting in dermal absorption of toxicants.

To conduct a pathways analysis ATSDR scientists review available information to determine whether people visiting the site or living nearby have been, currently are, or could be exposed (at some time in the future) to contaminants associated with this site. To determine whether people are exposed to site-related contaminants, investigators evaluate the environmental and human behavioral components leading to human exposure. The five elements of each exposure pathway that agency scientists evaluate are:

1) The contaminant source (i.e., the reservoir from which contaminants are being released to various media),
2) The environmental fate and transport of contaminants (i.e., how contaminants may dissipate, decay, or move from one medium to another,
3) The exposure point or area (i.e., the location(s) where people may come in physical contact with site contaminants),
4) The exposure route (i.e., the means by which contaminant gets into the body at the exposure point or area), and
5) The potentially exposed population (i.e., a group of people who may come in physical contact with site contaminants).

Exposure pathways can be **complete**, **potential**, or **eliminated**. For a person to be exposed to site contaminants, at least one exposure pathway for those contaminants must be complete. A pathway is **complete** when all five elements in the pathway are present and exposure has occurred, is occurring, or will occur in the future. If one or more of the five elements of a pathway is missing, but could become completed at some point in the future, the pathway is said to be a **potential** pathway. A pathway is eliminated if one or more of the elements are missing and there is no plausible way of it ever being completed, then the pathway has been **eliminated**.

Exposure Assessment Scenarios

After pathways have been evaluated, ATSDR scientists construct a number of plausible exposure scenarios, depicting a range of exposure possibilities, in order to determine whether people in the community have been (or might be) exposed to hazardous materials from the site at levels that are of potential public health concern. To do this, they must take into consideration the various contaminants, the media that have been contaminated, the site-specific and media-specific pathways through which people may be exposed, and the general accessibility to the site. In some cases, it is possible to determine that exposures have occurred or are likely to have occurred in the past. However, a lack of appropriate historical data often makes it difficult to quantify past exposures. If scientists determine that combined exposures from multiple pathways (or individual exposures from a single pathway) are posing a public health hazard, ATSDR makes recommendations for actions that will eliminate or significantly reduce the exposure(s) causing the threat to public health.

Health Effects Data

Even when chemical contaminants come into contact with the lungs, the GI tract, or the skin, adverse health effects may not occur if the contaminant is present in a form that is not readily absorbed into the bloodstream or it does not pass readily through the skin into the bloodstream. Since exposure does not always result in adverse health effects it is important evaluate whether the exposure could pose a hazard to people in the community or to people who visit the site. The factors that influence whether exposure to a contaminant or contaminants could potentially result in adverse health effects include:

- The toxicological properties of the contaminant (i.e., the toxicity or carcinogenicity),
- The manner in which the contaminant enters the body (i.e., the route of exposure),
- How often and how long the exposure occurs (i.e., frequency and duration of exposure),
- How much of the contaminant actually gets into the body (i.e., the delivered dose),
- Once in (or on) the body, how much gets into the bloodstream (i.e., the absorbed dose),
- The number of contaminants involved in the exposure (i.e., the synergistic or combined effects of multiple contaminants), and
- Individual host factors predisposing to susceptibility (i.e., characteristics such as age, sex, body weight, genetic background, health status, nutritional status, and lifestyle factors that may influence how an individual absorbs, distributes, metabolizes, and/or excretes the contaminants).

Thus, as the third step in the health assessment process (often done in conjunction with the pathway analysis and exposure assessment scenarios described above); ATSDR scientists review existing scientific information to evaluate the possible health effects that may result from exposures to site contaminants. This information frequently includes published studies from the medical, toxicologic, and/or epidemiologic literature, ATSDR's Toxicologic Profiles for the contaminants, EPA's online Integrated Risk Information System (IRIS) database, the National Library of Medicine's (NLM's) Hazardous Substance Data Bank (HSDB), published toxicology textbooks, or other reliable toxicology data sources.

Health Assessment Comparison (HAC) Values

To simplify the health assessment process, ATSDR, EPA, Oak Ridge National Laboratories (ORNL), and some of the individual states have compiled lists of chemical substances that have been evaluated in a consistent, scientific manner in order to derive toxicant doses (health guidelines) and/or toxicant concentrations (environmental guidelines), exposures to which, are confidently felt to be without significant risk of adverse health effects, even in sensitive sub-populations.

Health Guidelines

Health guidelines are derived from the toxicologic or epidemiologic literature with many uncertainty or safety factors applied to insure that they are amply protective of human health. They are generally derived for specific routes of exposure (e.g., inhalation, oral ingestion, or dermal absorption) and are expressed in terms of dose, with units of milligrams per kilogram per day (mg/kg/day).

Media-specific HAC values for non-cancer health effects under oral exposure routes are generally based on ATSDR's chronic oral minimal risk levels (MRLs) or EPA's oral reference doses (RfDs). Chronic oral MRLs and RfDs are based on the assumption that there is an identifiable exposure dose (with units of mg/kg/day) for individuals, including sensitive subpopulations (such as pregnant women, infants, children, the elderly, or individuals who are immunosuppressed), that is likely to be without appreciable risk for non-cancer health effects over a specified duration of exposure.

Environmental Guidelines

Environmental guidelines for specific media (e.g., air, soil/sediment, food, drinking water, etc.) are often derived from health guidelines after making certain assumptions about 1) the average quantities of the specific media that a person may assimilate into the body per day (i.e., inhale, eat, absorb through the skin, or drink) and 2) the person's average body weight during the exposure period. Environmental guidelines are expressed as chemical concentrations in a specific medium with units such as micrograms per cubic meter ($\mu g/m^3$), milligrams per kilogram (mg/kg), micrograms per liter (µg/L), parts per million (ppm), or parts per billion (ppb). If these values are based on ATSDR's oral MRLs, they are known as environmental media evaluation guides (EMEGs); if they are based on EPA's RfDs, they are called reference dose media evaluation guides (RMEGs).

For airborne contaminants, ATSDR health assessors frequently use ATSDR's inhalation minimal risk levels (inhalation MRLs) or EPA's inhalation reference concentrations (RfCs). Inhalation MRLs and RfCs are all based on the assumption that there is an identifiable exposure concentration in air [with units of $\mu g/m^3$ or parts per billion by volume (ppbv)] for individuals, including sensitive subpopulations (such as pregnant women, infants, children, the elderly, or individuals who are immunosuppressed), that is likely to be without appreciable risk for non-cancer health effects over a specified duration of exposure. Since it is already in the form of a concentration in a particular medium, the inhalation MRL is also called the EMEG for air exposures.

These environmental guidelines are frequently referred to as "screening values" or "comparison values" since the contaminant concentrations measured at a Superfund or other hazardous waste site are frequently "compared" to their respective environmental guidelines in order to screen for those substances that require a more in-depth evaluation. Since comparison values are health-based (i.e., derived so as to be protective of public health) and they are frequently employed in conducting public health assessments, they are frequently referred to as health assessment comparison values or HAC values.

Other HAC value names have been coined by the various EPA Regions or other state or federal agencies including EPA Regional Screening Levels (RSLs), EPA's health effects assessment summary tables (HEAST) "dose-response values" (DRVs), California's "reference exposure levels" (RELs), and Texas Commission on Environmental Quality's "effects screening levels" (ESLs). These values are occasionally used when there are no published MRLs, RfDs, or RfCs for a given contaminant.

HAC values for non-cancer effects (specifically ATSDR's oral and/or inhalation MRLs) may be available for up to three different exposure durations: acute (14 days or less), intermediate (15 to 365 days), or chronic (366 days or more). As yet, EPA calculates RfD or RfC HAC values only for chronic exposure durations.

HACs for Cancer Effects

When a substance has been identified as a carcinogen, the lowest available HAC value usually proves to be the cancer risk evaluation guide (CREG). For oral exposures, the CREG (with units of mg/kg or ppm) is based on EPA's chemical-specific cancer slope factor (CSF) (also referred to as oral slope factor or OSF) and represents the concentration that would result in a daily exposure dose (in mg/kg/day) that would produce a theoretical lifetime cancer risk of 1×10^{-6} (one additional cancer case in one million people exposed over a 70 year lifetime).

For inhalation exposures, the CREG (in $\mu g/m^3$) is based on the EPA's inhalation unit risk (IUR) value and is calculated as CREG = $10^{-6} \div$ IUR. The inhalation CREG represents the ambient air concentration that, if inhaled continuously over a lifetime, would produce a theoretical excess lifetime cancer risk of 1×10^{-6} (one additional cancer case in one million people exposed over a 70 year lifetime).

Imputed or Derived HAC Values

The science of environmental health and toxicology is still developing, and sometimes, scientific information on the health effects of a particular substance of concern is not available. In these cases, ATSDR scientists will occasionally look to a structurally similar compound, for which health effects data are available, and assume that similar health effects can reasonably be anticipated on the basis of their similar structures and properties. Occasionally, some of the contaminants of concern may have been evaluated for one exposure route (e.g., the oral route) but not for another route of concern (e.g., the inhalation route) at a particular NPL site or other location with potential air emissions. In these cases ATSDR scientists may do what is called a route-to-route extrapolation and calculate the inhalation RfD, which represents the air concentration (in $\mu g/m^3$) that would deliver the same dose (in mg/kg/day) to an individual as the published oral RfD for the substance. This calculation involves making certain assumptions about the individual's inhalation daily volume (in m^3/day), which represents the total volume of air inhaled in an average day, the individual's body weight (in kg), a similarity in the oral and inhalation absorption fraction, and – once the contaminant has been absorbed into the bloodstream – that it behaves similarly whether it came through the GI tract or the lungs. Because of all the

assumptions, route-to-route extrapolations are employed only when there are no available HAC values for one of the likely routes of exposure at the site.

Use of HAC Values

When assessing the potential public health significance of the environmental sampling data collected at a contaminated site, the first step is to identify the various plausible site-specific pathways and routes of exposure based on the media that is contaminated (e.g., dust, soil, sediment, sludge, ambient air, groundwater, drinking water, food product, etc.). Once this is done, maximum values for measured contaminant concentrations are generally compared to the most conservative (i.e., lowest) published HAC value for each contaminant. If the maximum contaminant concentration is below the screening HAC value, then the contaminant is eliminated from further consideration, but if the maximum concentration exceeds the screening HAC, the contaminant is identified as requiring additional evaluation. However, since the screening HAC value is almost always based on a chronic exposure duration (or even a lifetime exposure duration, in the case of comparisons with CREG values) and the maximum contaminant concentration represents a single point in time (which would translate to an acute duration exposure), one cannot conclude that a single exceedance (or even several exceedances) of a HAC value constitutes evidence of a public health hazard. That conclusion can be reached only after it has been determined that peak concentrations are exceeding acute-exposure-duration HAC values, intermediate-term average concentrations are exceeding intermediate-exposure-duration HAC values, or long-term average concentrations are exceeding chronic-exposure-duration HAC values.

Community Health Concerns

If nearby residents are concerned about specific diseases in the community, or if ATSDR determines that harmful exposures are likely to have occurred in the past, health outcome data may be evaluated to see if illnesses are occurring at rates higher than expected and whether they plausibly could be associated with the hazardous chemicals released from the site. Health outcome data may include cancer incidence rates, cancer mortality rates, birth defect prevalence rates, or other information from state and local databases or health care providers. The results of health outcome data evaluations may be used to address community health concerns. However, since various disease incidence, mortality, and/or prevalence rates can (and do) fluctuate randomly over space and time, care must be taken not to attribute causality to a real or theoretical exposure possibility when rates are slightly higher than expected (any more than one would attribute a protective effect to an environmental exposure if disease rates were lower than expected).

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 public comments that related to the public health assessment document are addressed in the final version of the report.

Conclusions

The public health assessment document presents conclusions about the nature and severity of the public health threat posed by the site. Conclusions take into consideration the environmental sampling data that have been collected, the available toxicologic data regarding the contaminants identified, the environmental media that are affected, and the potential pathways of exposure for the public. If health outcome data have been evaluated, conclusions are also presented regarding these data evaluations.

Recommendations

If the conclusions indicate that the site represents a public health hazard, the ATSDR will make recommendations to the state or federal environmental agencies regarding steps that can be taken to stop or reduce the exposures to the public. These steps are presented in the public health action plan for the site. However, if the public health threat is urgent, the ATSDR can issue a public health advisory, warning people of the danger. ATSDR can also recommend health education activities or initiate studies of health effects, full-scale epidemiology studies, exposure investigations, disease registries, disease surveillance studies, or research studies on specific hazardous substances.

Appendix C: Figures

Figure 1. Site Location and Facility Layout [2].

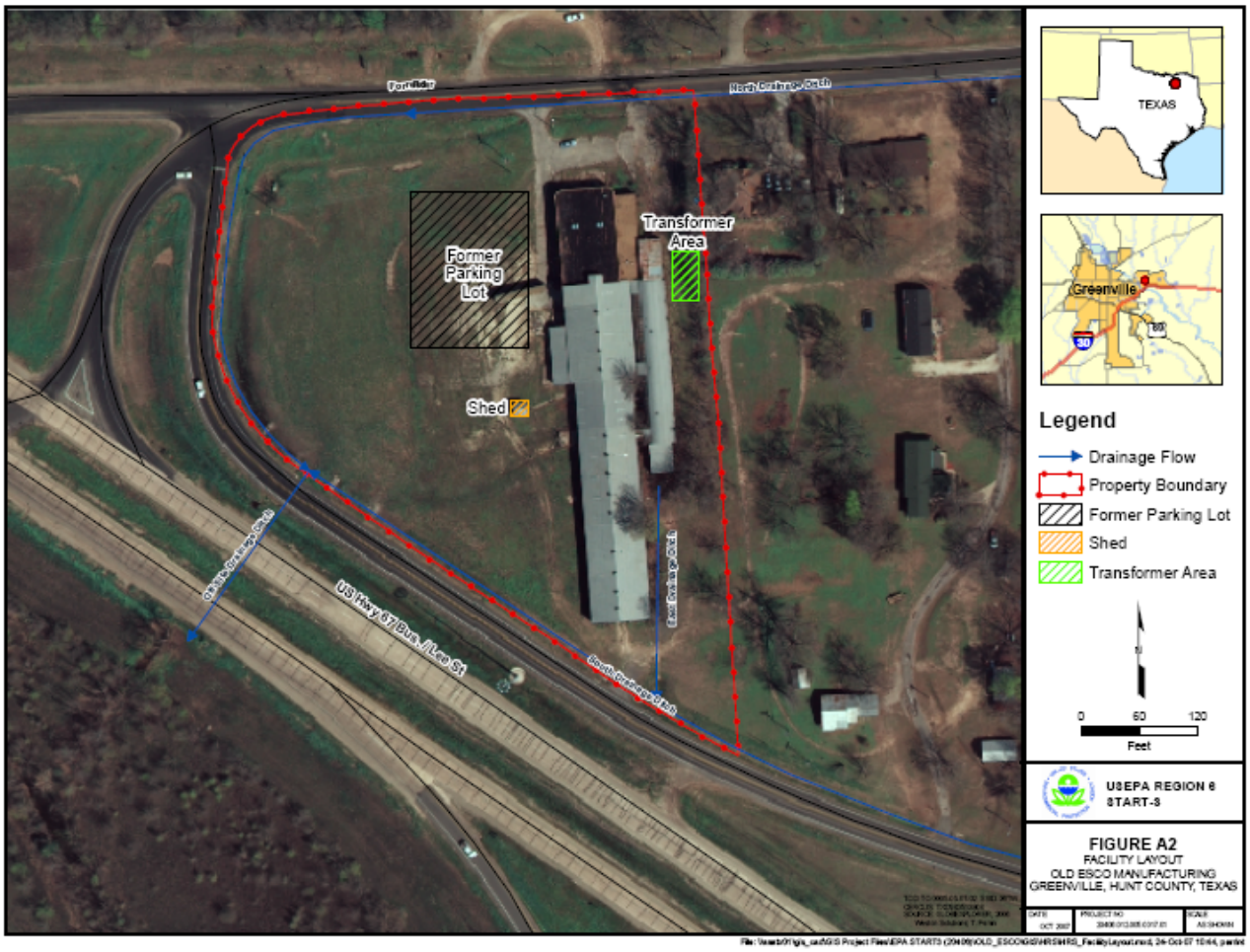
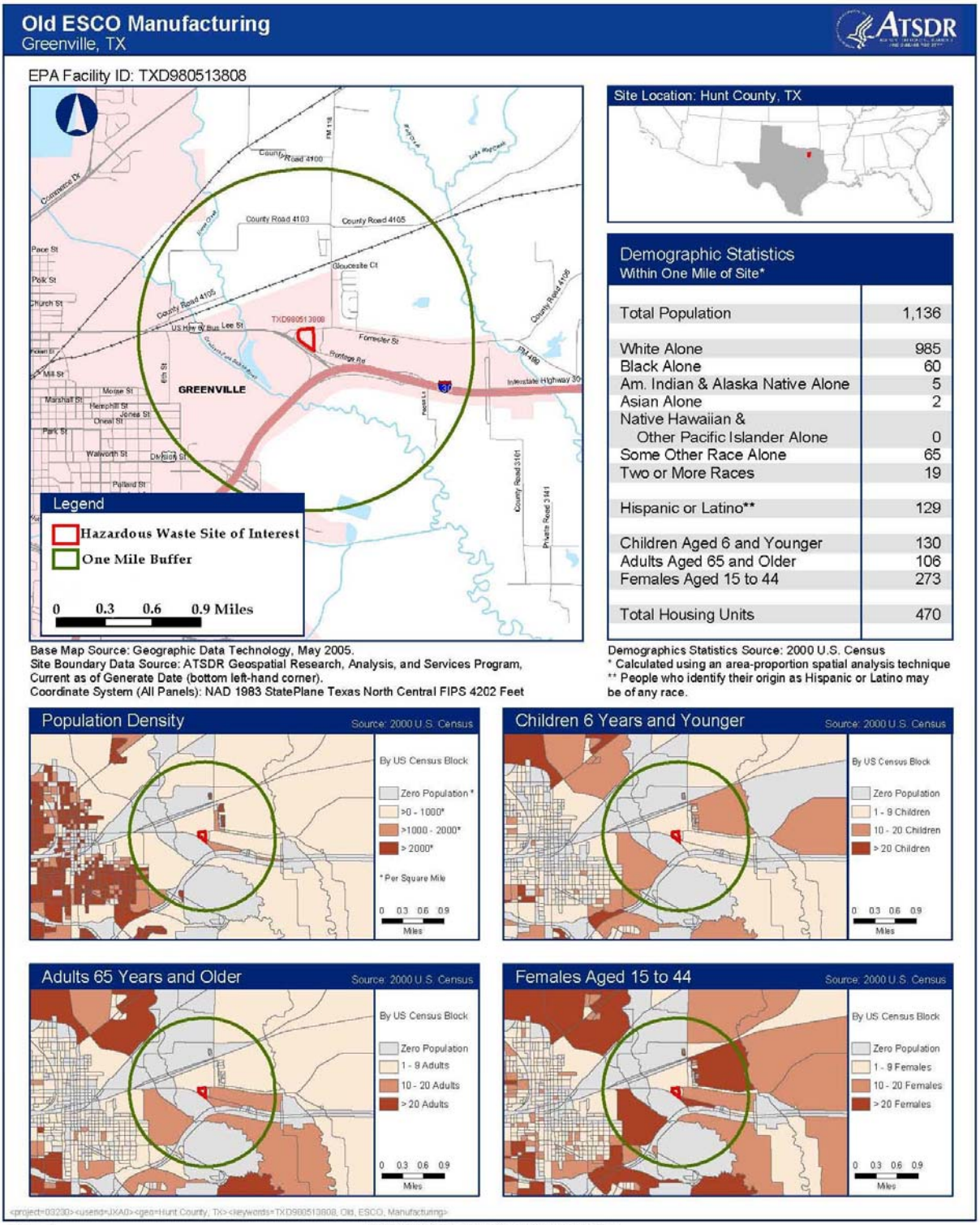


Figure 2. Site Location and Demographic Statistics.



Appendix D: Table

Table 1. Soil sampling data collected in 2005 and 2007 that exceed health-protective comparison values. All other sampling results were below comparison values.

Contaminant	Number of Samples	Concentration Range (mg/kg)	Average Concentration (mg/kg)	Number of Samples Detected	Number of Samples that Exceed Comparison Value	Comparison Value (mg/kg)	Comparison Value Source	Theoretical Excess Lifetime Cancer Risk[a]
Total PCBs	2,254	ND-3,390	10	1,481	1,166 546 351 111	0.06 0.4 1 10	EMEG pica CREG child EMEG adult EMEG	1.2×10^{-5}
Lead	417	ND-793	31	416	3	400	EPA	NA

[a] The theoretical excess cancer risk is based upon the average concentration of PCBs and the assumption that the exposure lasts for 30 years. Theoretical excess cancer risks calculated as being greater than 1×10^{-4} indicate a low increased risk for cancer. The theoretical excess lifetime cancer risk calculated for PCBs at this site (1.2×10^{-5}) is an even lower risk.

Table 2. Soil sampling data collected in 2009 that exceed health-protective comparison values. All other sampling results were below comparison values.

Contaminant	Number of Samples	Concentration Range (mg/kg)	Average Concentration (mg/kg)	Number of Samples Detected	Number of Samples that Exceed Comparison Value	Comparison Value (mg/kg)	Comparison Value Source	Theoretical Excess Lifetime Cancer Risk[a]
Total PCBs	1,153	ND-32.3	0.33	571	359	0.06	EMEG pica	4×10^{-7}
					132	0.4	CREG	
					69	1	child EMEG	
					6	10	adult EMEG	

[a] The theoretical excess cancer risk is based upon the average concentration of PCBs and the assumption that the exposure lasts for 30 years. Theoretical excess cancer risks calculated as being greater than 1×10^{-4} indicate a low increased risk for cancer. The theoretical excess lifetime cancer risk calculated for PCBs at this site (4×10^{-7}) is an even lower risk.