

PUBLIC HEALTH ASSESSMENT

ROUTE 561 DUMP
(a/k/a ROUTE 561 DUMP SITE)

CERCLIS NO. NJ0000453514

AND

UNITED STATES AVENUE BURN
(a/k/a US AVENUE BURN SITE)

CERCLIS NO. NJ0001120799

GIBBSBORO, CAMDEN COUNTY, NEW JERSEY

Prepared by:

New Jersey Department of Health and Senior Services
Hazardous Site Health Evaluation Program
Consumer and Environmental Health Services
Division of Epidemiology, Environmental and Occupational Health
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, full-scale 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 (E-56), Atlanta, GA 30333.

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Summary

This Public Health Assessment serves to evaluate the public health issues associated with the Route 561 Dump site and the United States Avenue Burn site. The two sites were proposed for listing to the National Priorities List on September 29, 1998 and July 28, 1998, respectively.

The Route 561 Dump site and the United States Avenue Burn site are two related sites in Gibbsboro, Camden County, New Jersey. The Route 561 Dump site is situated on approximately 2.9 acres located in an area of mixed commercial and residential uses. The closest residence is less than 200 feet northeast. The site is reported to have been used, in the past, as an area to dump paint wastes and paint sludges. A portion of the United States Avenue Burn site was previously used for disposal and burning of paint wastes, while another portion was used for the storage of sludge from a former paint manufacturing facility's wastewater system. The burn and landfill portions of the United States Avenue Burn site occupy approximately 8 acres. The Railroad Track Area of the United States Avenue Burn site encompasses approximately 7,200 square feet centered around an abandoned railroad track. The Railroad Track Area of the United States Avenue Burn site, which is currently an abandoned railroad line, was previously used to transport materials to and from the former paint manufacturing facility. The total quantity of paint waste dumped or burned on the site is unknown. In May 1994, the New Jersey Department of Environmental Protection (NJDEP) analyzed samples of soil from the area with visible burned waste, and found the area to be heavily contaminated by lead. In addition, it has been reported that municipal trash may have been brought to the site and used as fill.

In September of 1995 the USEPA entered into an Administrative Order of Consent with Sherwin-Williams to conduct a removal action investigation at the burn area of the United States Avenue Burn site. On May 1, 1997, a Unilateral Administrative Order was issued to the Sherwin-Williams Company by USEPA to conduct a removal action at the Railroad Track Area of the United States Avenue Burn site. On November 12, 1997, USEPA issued an Administrative Order on Consent for Removal Action at the Rt. 561 Dump site to the Sherwin-Williams Company. Sampling conducted at these sites confirmed the presence of paint wastes and heavy metal contamination, and helped delineate the extent of the sites' contamination.

Environmental media contamination, resulting from the dumping, storage and/or burning, has been present at these sites for at least 40 years. Site sampling has been performed to characterize the extent of the contamination, in particular of surface soil, at both sites.

On the basis of the information reviewed, the ATSDR and NJDHSS have concluded that surface soil contamination at the Route 561 Dump site and the United States Avenue Burn site exists at levels of public health concern if young children were to gain access to contaminated areas. However, the sites currently represent no apparent public health hazard for exposures to on-site surface soil due to a lack of completed human exposure pathways. It is important to note, however, that there were completed exposure pathways at the United States Avenue Burn site in the past. The United States Avenue Burn site represented a public health hazard in the past, based on available information and an analysis of exposure dose and duration. Adults utilizing the site were not likely

to have been exposed to lead contamination at concentrations sufficient to constitute a public health hazard. Children, however, may have been exposed to levels of lead that may pose a public health hazard.

Surface water, sediments and groundwater at the two sites have been shown to be adversely affected by the dumping, storage and/or the burning of paint and paint sludges. It is possible that, associated with these two sites, and the newly discovered Hilliard's Creek site, there is a widespread problem of heavy metals transport off-site via surface water, sediments and/or groundwater. Therefore, these environmental media must be considered to be potential human exposure pathways. The potential for off-site migration of site-related contaminants through these environmental media has not been thoroughly examined.

There is at least one home near each of the sites that uses a private well for potable water. These wells were last checked in 1994 and both were found to be free of site-related contamination; however, the current quality of the water is unknown. The depth of the groundwater from which these residences draw water is also unknown. The direction of groundwater flow in the area needs to be discerned.

The NJDHSS and the ATSDR have recommended the following: 1) periodically monitor the fences surrounding the two sites to keep them secure against trespassers; 2) identify and sample all private well water potentially impacted by the site; and, 3) monitor nearby surface water features (creeks and lakes) periodically to determine if off-site migration of contamination has or is occurring. In addition, a hydrogeologic investigation of area groundwater is needed to characterize the direction and extent of contaminant migration from the site.

Purpose and Health Issues

This Public Health Assessment serves to evaluate the public health issues associated with the Route 561 Dump site and the United States Avenue Burn site. The two sites were proposed for listing to the National Priorities List (NPL) on September 29, 1998 and July 28, 1998, respectively. NPL or "Superfund" sites represent those sites which are associated with significant public health concern in terms of the nature and magnitude of contamination present and the potential to adversely impact the health of populations in their vicinity.

This document will comprehensively evaluate human exposure pathways associated with known contaminated environmental media within or associated with the Route 561 Dump Site and the United States Avenue Burn site and recommend actions consistent with protection of the public health. At the Route 561 Dump site and the United States Avenue Burn site, the known contaminated media include soils, sediments, groundwater, and surface water.

The New Jersey Department of Health and Senior Services (NJDHSS) will collaborate with environmental agencies such as the U.S. Environmental Protection Agency (USEPA) and the New Jersey Department of Environmental Protection (NJDEP) to develop and implement a health component to proposed and ongoing remedial activities.

Background

A. Site Description and History

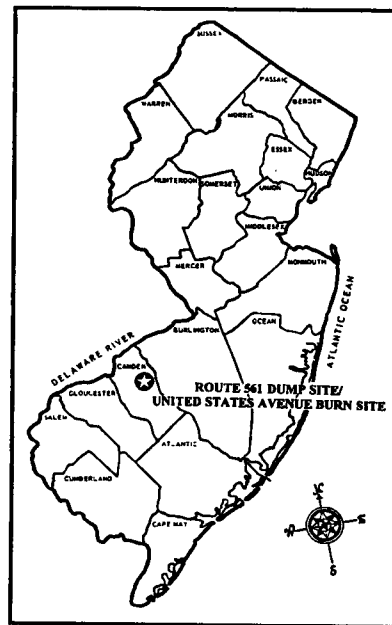
The Route 561 Dump site and the United States Avenue Burn site are two related sites in Gibbsboro, Camden County, New Jersey (inset).

Route 561 Dump Site ⁽¹⁾

The Route 561 Dump site is situated on approximately 2.9 acres located in an area of mixed commercial and residential uses. (Figure 1). The closest residence is less than 200 feet northeast. There is a commercial establishment on the northern border of the site, and a lake is located approximately 200 feet northeast of the site. The site is reported to have been used, in the past, as an area to dump paint wastes and paint sludges.

United States Avenue Burn Site ^(2,3,4,14)

The United States Avenue Burn site was owned and operated by the Sherwin-Williams Company, Inc. The burn and landfill portions of the site occupy approximately 8 acres and were previously used to dispose of and burn



paint wastes, as well as storage of sludge from a former paint manufacturing facility's wastewater system. The Railroad Track Area of the United States Avenue Burn site encompasses approximately 7,200 square feet centered around an abandoned railroad track (Figure 2). The Railroad Track Area of the United States Avenue Burn site, which is currently an abandoned railroad line, was previously used to transport materials to and from the former paint manufacturing facility. There are historical reports that note the use of paint thinners for the burning of these paint wastes and materials at the site. The total quantity of paint waste dumped, stored or burned on the site is unknown. In May 1994, the New Jersey Department of Environmental Protection (NJDEP) analyzed samples of soil from the area with visible burned waste, and found the area to be heavily contaminated with heavy metals. In response to NJDEP's findings, the Sherwin-Williams Company installed a chain-link fence around this area. The resulting enclosure, installed in July 1995, was approximately 60' by 60'.

In an area just south of the burn area the Sherwin-Williams Company constructed a bermed storage area. It is thought that the company stored sludge from their wastewater system. This activity took place between approximately 1950 and 1977. In addition, it has also been reported that municipal trash may have been brought to the site, and used as fill prior to the construction of the sludge pits.

Remedial History

In September of 1995, the USEPA entered into an Administrative Order of Consent with Sherwin-Williams to conduct a removal action investigation at the burn area of the United States Avenue Burn site. On November 12, 1997 USEPA issued an Administrative Order on Consent for Removal Action at the Rt. 561 Dump site to the Sherwin-Williams Company. On May 1, 1997, a Unilateral Administrative Order was issued to the Sherwin-Williams Company by USEPA to conduct a removal action at the Railroad Track Area of the United States Avenue Burn site. Sampling conducted at these sites confirmed the presence of paint wastes and heavy metal contamination and helped delineate the extent of the sites' contamination.

Soil contamination, resulting from the dumping, storage and burning, has been there for at least 40 years. Site sampling has been performed to characterize the extent of the contamination at both sites. The full extent of the contamination, however, is not known.

Additional chain-link fencing was installed in 1997, which encompasses the fencing installed in July 1995, to surround the contaminants in the burn and landfill areas of the United States Avenue Burn site. According to the USEPA, the fence currently encloses all known soil lead contamination above 400 mg/kg.

There is a section of the site located on the other side of United States Avenue from the burn site known as the "Railroad Track Area." In the final conclusion of a recent data review (December 18, 1996), ATSDR found the surface soil in the Railroad Track Area to have levels of lead contamination that presented a public health threat. According to the USEPA, this area has undergone a removal action for contaminated soil. Contaminated "hot spots" have been excavated and these areas were covered with clean soil.

B. Demography and Land Use

Route 561 Dump Site

The Route 561 Dump site is a vacant property in a mixed residential/commercial area. A small shopping plaza borders the property's northern side. The shopping plaza includes a convenience store and a pizzeria.

An estimated total population of 5,280 people live within one mile of the site (Figure 1). Approximately 200 of these people are within one-quarter mile. There are two homes near the site, one of which is within 200 feet. At least one of these homes draws potable water from a residential well.

There is a wetlands area located to the east and southeast. Adjacent to the wetland is a small lake, Clement Lake. Clement Lake is used for boating and swimming.

The aquifers below the site provide potable water to an estimated 28 public water supply wells within four miles of the site.

United States Avenue Burn Site

The United States Avenue Burn site is in a mixed commercial and residential area. The site is not currently in use; however, it has been used in the past for the disposal and burning of paint wastes, and, for a period of time, a municipal landfill.

The site is bordered on three sides by woodlands and wetlands. The north side is bordered by a single residence, which is less than 200 feet from the burn site. The USEPA has indicated that the residents of this home obtain their potable water from a private well. There are no school or day care facilities on or within 200 feet of the property.

Population demographics based upon the 1990 census have been prepared by the ATSDR using area-proportion spatial analysis, and are presented in Figure 2. Within a one mile radius there are approximately 1,406 homes with as many as 4,465 people.

C. Past ATSDR/NJDHSS Involvement

The ATSDR/NJDHSS have completed two (2) previous Public Health Consultations at the United States Avenue Burn and/or the Route 561 Dump sites, dated July 25, 1995 and December 4, 1997. ATSDR also completed two (2) data reviews, dated September 20, 1996 and December 18, 1996. The following is a review of these documents:

1995 Health Consultation ⁽⁵⁾

In the 1995 Health Consultation of the United States Avenue Burn site, the ATSDR evaluated USEPA sampling data for sediments (June 30, 1993) and for surface soils and sediments (May 20,

1994). In the first round of sampling, sediments from Haney Run were evaluated for metals. Arsenic levels ranged from 261 to 1,560 parts per million (ppm). Barium levels ranged from 534 to 17,600 ppm. Cadmium levels ranged from 8 to 15.6 ppm. Lead levels ranged from 1,270 to 2,330 ppm.

In subsequent testing (5/20/94) for heavy metal contamination, four surface samples (0-6 inches) and six sediment samples (from Haney Run and White Sand Branch) were taken at the site. Antimony levels ranged from non- detected (ND) to 41.9 ppm. Arsenic levels ranged from 5.0 to 43.7 ppm. Cadmium levels ranged from 79.1 to 607 (ppm). Barium levels ranged from 1,470 to 4,800 ppm. Total chromium ranged from 599 to 3,000 (ppm) and lead levels ranged from 8,140 to 134,000 ppm. The sediment samples were also shown to be contaminated. Arsenic levels ranged from non-detected (ND) to 235 ppm. Barium levels ranged from ND to 397 ppm. Cadmium levels ranged from ND to 3 ppm and lead levels ranged from 3.4 to 2,510 ppm.

ATSDR concluded the following:

1. Sediments and surface soils at the site were contaminated with metals (e.g., lead, arsenic and cadmium) at concentrations that pose a public health hazard;
2. Humans, in particular children, might be exposed to contaminants, while visiting or playing on the site, through the ingestion or inhalation of surface soils.

The Health Consultation recommended the following:

1. Determine the extent of contamination in surface soil and sediment at the site;
2. Restrict access to contaminated areas until contamination is remediated;
3. Test water from nearby private wells, to determine if they have been impacted by the site.

Data Review (September 20, 1996) ⁽⁶⁾

The above referenced data review was performed by ATSDR following a request by USEPA to evaluate the public health significance of one specific area of the site. The specific area evaluated was the Railroad Track Area, which is located on the opposite side of United States Avenue from the burn and landfill areas of the site currently surrounded by a chain link fence.

In this ATSDR data review, three surface soil (0-6 inches) samples from the Railroad Track Area were evaluated. Levels of lead detected were 1,020 ppm, 5,470 ppm and 251,000 ppm. ATSDR concluded that these levels of lead contamination presented a public health threat. It was also recommended that access to the area be restricted and that the soil should be further characterized.

Data Review (December 18, 1996) ⁽⁷⁾

The above referenced data review was performed by ATSDR following a request by USEPA to further evaluate the public health significance of the Railroad Track Area following the collection

of 8 additional surface soil samples. This request was a response to the ATSDR recommendation in the September 20, 1996, Data Review that the soils in this section be further characterized. The additional sampling confirmed lead contamination in surface soil (0-6 inches). Lead levels were detected in surface soil at concentrations ranging from 443 ppm to 56,100 ppm (average concentration = 23,800 ppm).

ATSDR concluded that with this additional sampling, the Railroad Track Area of the site has been adequately characterized. In addition, lead contamination was noted to present a continuing public health threat.

1997 Public Health Consultation ⁽¹³⁾

The above referenced Public Health Consultation was performed by the ATSDR and NJDHSS following a request by USEPA to evaluate the public health significance of exposure pathways at the United States Avenue Burn and the Route 561 Dump sites. The pathway specifically examined in this Public Health Consultation concerned the ingestion or inhalation of lead contaminated soil by trespassers.

At the Route 561 Dump site, ATSDR/NJDHSS concluded that there were no documented ongoing human exposures to site-related contaminants. Past exposures to contaminated soil could not be ruled out, but because it would be difficult to define a contaminant dose or identify an exposed population, no toxicological evaluation of this pathway was performed.

Regarding the United States Avenue Burn site, the ATSDR/NJDHSS concluded that the site represented a public health hazard in the past and present, based on available information and an analysis of exposure dose and duration. Adults utilizing the site were not likely to have been exposed to lead contamination at concentrations sufficient to constitute a public health hazard. Children, however, may have been exposed to lead at levels of public health concern.

ATSDR/NJDHSS further concluded that both sites had not been adequately characterized to completely determine public health implications. The ATSDR/NJDHSS requested additional sampling of surface soil and area groundwater, including potable wells, for contamination.

ATSDR/NJDHSS recommended that public access to contaminated areas of the United States Avenue Burn site be restricted and the perimeter of the site should be posted to warn potential site trespassers of the hazards of entering the site. The ATSDR/NJDHSS further recommended delineation of the extent of contamination in groundwater, surface soil and sediment at the Route 561 Dump and the United States Avenue Burn sites and the testing of potable water from private wells adjacent to the sites to determine if they have been impacted.

As a follow-up to the 1997 Public Health Consultation, the ATSDR/NJDHSS prepared a fact sheet concerning the two sites (January, 1998).⁽¹⁷⁾ A draft of this document was distributed to the Camden County Health Department (CCHD).

D. Site Visit

On July 2, 1999, S. Kubiak and J. Winegar of the New Jersey Department of Health and Senior Services (NJDHSS) visited the Route 561 Dump and the United States Avenue Burn sites. The NJDHSS was accompanied by representatives of the USEPA. The following observations were made during the site visit:

Route 561 Dump Site

- The Route 561 Dump site is an area of about 2.9 acres. The site was largely wooded and sloped toward a small stream. The lower portion, about one-third of the site, was swampy wetlands with very dense understory growth. The entire area was surrounded by a new chain link fence installed by the Sherwin-Williams Company under a USEPA 1997 Administrative Order on Consent for Removal Action. The fence appeared to be in excellent condition and would make trespassing in this section difficult. In fact, there was no evidence of trespassing at the site.
- A security system was also installed, in addition to the new fence, at the site under the USEPA 1997 Consent Order. The security system included three cameras on the northern perimeter, and a sensor on the front gate.
- The site is in a mixed commercial/residential area with the closest residence less than 200 feet northeast. There is a group of commercial establishments (a strip mall) bordering the site on the north.
- Staining was observed along a cut made by drainage water from the commercial parking lot. Pigments of several colors were also noticed at various locations in the swampy area near the center of the site.
- Several of the most contaminated surface soil "hot spots" within the Route 561 site have been stabilized as an interim measure. Some of the contaminated surface soil areas were covered with membrane, clean soil and then seeded in 1997.

United States Avenue Burn Site

Landfill/burn sub-site

- The site is located in a mixed residential / commercial area and is approximately 8 acres in size. It is bordered on three sides by woodlands and wetlands. The closest residence is less than 200 feet from the site.
- A very large area of the site is now surrounded by a new chain link fence installed by the Sherwin-Williams Company under a USEPA 1997 Administrative Order on Consent for Removal Action. The fence appeared to be in excellent condition and would make

trespassing in this area difficult. A small portion of the original burn site is still surrounded by a chain link fence which is entirely within the new fence. The rusted remnants of paint cans were observed. Many of the cans appeared to have solidified paint attached.

- The open central area of the site is no longer readily accessible to trespassers.
- There are two small creeks, White Sand Branch and Haney Run, which converge at the site and flow through a culvert beneath United States Avenue. The creek then empties into a small lake (Bridgewood Lake).
- According to the USEPA, most of the site's contaminated surface soil lies inside the fenced area. However, some areas of contaminated soil may still be outside the fenced area.
- There are no known or suspected radiological or biological hazards associated with the site.
- Several private residences in the vicinity of the site use private wells as their source of potable water.

Railroad Track Area sub-site

- According to the USEPA, a removal action was conducted to limit the existing public health hazard and environmental impacts from the Railroad Track Area sub-site.

Discussion

A. Pathways Analysis and Public Health Implications

This section contains discussion of the exposure pathways at the sites and their public health implications, if applicable. An exposure pathway is the process by which an individual is exposed to contaminants that originate from some source of contamination.

ATSDR/NJDHSS classifies exposure pathways into three groups: (1) **completed pathways**, that is, those in which exposure has occurred, is occurring, or will occur; (2) **potential pathways**, that is, those in which exposure might have occurred, may be occurring, or may yet occur; and (3) **eliminated pathways**, that is, those that can be eliminated from further analysis because one of the five elements is missing and will never be present, or in which no contaminants of concern can be identified.

A completed exposure pathway must include each of five elements that link a contaminant source to a receptor population. The five elements of a completed exposure pathway are the following:

- (1) source of contamination;

- (2) environmental media and transport mechanisms;
- (3) point of exposure;
- (4) route of exposure; and
- (5) receptor population.

Health effects evaluations are accomplished by estimating the amount (or dose) of those contaminants that a person might come in contact with. This estimated exposure dose is then compared to established health guidelines. People who are exposed for some crucial length of time to contaminants of concern at levels above established guidelines are potentially more likely to have associated illnesses or disease.

Health guidelines are developed for contaminants commonly found at hazardous waste sites. Examples of health guidelines are the ATSDR's Minimal Risk Level (MRL) and the USEPA's Reference Dose (RfD). When exposure (or dose) is below the MRL or RfD, then non-cancer adverse health effects are unlikely to occur.

MRLs are developed for each type of exposure, such as acute (less than 14 days), intermediate (15 to 364 days), and chronic (365 days and greater). ATSDR presents these MRLs in Toxicological Profiles. These chemical-specific profiles provide information on health effects, environmental transport, human exposure, and regulatory status.

The toxicological effects of the contaminants detected in the environmental media have been considered singly. The cumulative or synergistic effects of mixtures of contaminants may serve to enhance their public health significance. Additionally, individual or mixtures of contaminants may have the ability to produce greater adverse health effects in children as compared to adults. This situation depends upon the specific chemical being ingested or inhaled, its pharmacokinetics in children and adults, and its toxicity in children and adults.

B. Route 561 Dump Site

On-Site Surface Soil

Under current site conditions, there are no documented ongoing human exposures to site-related soil contaminants. Past exposures to contaminated soil cannot be ruled out, but because it would be difficult to define a contaminant dose or identify an exposed population, no toxicological evaluation of this pathway will be performed. Surface soil contamination at the Route 561 Dump site exists at levels of public health concern if young children were to gain access to contaminated areas.

As noted above, during the site visit, the entire Route 561 Dump area was surrounded by a recently installed chain link fence, which appeared to be in good condition, making trespassing in this section difficult. In addition, a monitored security system has been installed at the site. Several of the most contaminated surface soil "hot spots" within the Route 561 site have been stabilized as an interim measure. Some of the contaminated surface soil areas were covered with membrane and clean soil, and then seeded. The potential for any human exposure to contaminated soils at the site

has been greatly reduced, if not totally eliminated, by the installation of the new perimeter fence, interim partial capping, and the active security system.

Sediments

The NJDEP collected sediment samples at the Route 561 Dump site on June 15, 1994. Three sediment samples were collected from the White Sand Branch. Analysis of the samples showed a progressive increase of lead concentrations from 16.6 mg/kg (upstream) to 364 mg/kg (downstream) and arsenic concentrations from 2.4 mg/kg (upstream) to 17 mg/kg (downstream). It is likely that sediment contamination at this site is related to or causing a more widespread problem with the streams and lakes in the vicinity; therefore, this must be considered a potential human exposure pathway. The Route 561 Dump site is upstream and connected by a series of streams and lakes to the United States Avenue Burn site and the newly discovered Hilliard's Creek site.

Surface Water

The NJDEP collected surface water samples at the Route 561 Dump site on June 15, 1994. Three surface water samples were collected from the White Sand Branch. Analysis of the samples showed a progressive increase of lead concentrations from 3.1 micrograms per liter ($\mu\text{g/l}$) (upstream), to 43.6 $\mu\text{g/l}$ (downstream). As with the sediments, it is likely that surface water contamination at this site is related to the more widespread problem with contamination in some streams and lakes in the vicinity. Therefore, this must be considered a potential human exposure pathway.

Groundwater/Private Wells

The NJDEP collected shallow groundwater samples at the Route 561 Dump site in June 15, 1994 using a subsurface probe. Analysis of the samples showed the following concentrations; arsenic 3,790 $\mu\text{g/l}$, barium 6,970 $\mu\text{g/l}$, cadmium 14 $\mu\text{g/l}$, chromium 2,520 $\mu\text{g/l}$, copper 2,960 $\mu\text{g/l}$, cyanide 2,140 $\mu\text{g/l}$, lead 37,200 $\mu\text{g/l}$, nickel 1,440 $\mu\text{g/l}$, vanadium 814 $\mu\text{g/l}$, and zinc 2,730 $\mu\text{g/l}$. These groundwater samples were collected for screening purposes only and not for health and/or risk assessment purposes.

Currently, no data on potential contamination levels in deeper ground water are available.^(8,9) Groundwater contamination also needs to be examined in terms of area wide environmental contamination at the United States Avenue Burn site and the Hilliard's Creek site.

There is a residential well within 200 feet of the Route 561 Dump site. Because this well is so close to the site there exists a potential for the well to become contaminated at levels of potential public health significance. The well was last checked in 1994 and was found to be free of site related contamination. However, the current quality of the water is unknown. The depth of the groundwater from which this residence draws water is also unknown. The direction of groundwater flow in the area needs to be discerned.

C. United States Avenue Burn Site

This section contains a discussion of contaminant levels found at the United States Avenue Burn site, and the possible health effects in adults and children exposed to those contaminants. The contaminant levels used in this public health assessment are from a field sampling event at the site conducted by Roy F. Weston, Inc.⁽¹⁴⁾ Samples were collected in 1995 and 1996.

On-Site Soil

The Sherwin-Williams Company's environmental consultant, Roy F. Weston, Inc., has done extensive soil sampling to identify contamination at the site.⁽¹⁴⁾ Analysis of on-site surface and sub-surface soil samples showed the presence of numerous heavy metals contaminants, including high levels of lead. Lead was detected in 223 of the 532 soil samples collected. Lead concentrations ranged from undetected to a maximum level of 244,000 mg/kg at 4 to 4.5 feet below the surface. In surface soil samples (0 to 6") lead concentrations ranged from undetected to 51,700 mg/kg.⁽¹⁴⁾

Other contaminants found in soil samples at levels above ATSDR soil comparison levels included: arsenic (maximum level 264 mg/kg); hexavalent chromium (maximum level 311 mg/kg); barium (maximum level 9,230 mg/kg); and zinc (maximum level 98,500 mg/kg).

The results of the sampling are summarized below in Table 1.

Table 1. On-Site Surface and Sub-surface Soil Contamination, United States Avenue Burn, (November 1995 to December 1996).

Contaminant	Maximum Concentration (mg/kg)	Comparison Value	
		ppm	Source
Arsenic	264	20	Child EMEG**
Chromium (hexavalent)	311	300	Child RMEG***
Barium	9,230	4,000	Child RMEG
Lead	244,000	NE****	
Zinc	98,500	20,000	Child RMEG

* Source: Roy F. Weston, (November, 1995 to December, 1996)⁽¹⁴⁾.

** EMEG: Environmental Media Evaluation Guide (ATSDR)

***RMEG: Reference Dose Media Evaluation Guide

****NE - Not Established. The NJDEP has established a Soil Cleanup Criteria level at 400 mg/kg for residential properties, and 600 mg/kg for non-residential properties.

Past Completed Exposure Pathways ⁽⁷⁾

Although there are currently no known completed human exposure pathways at the United States Avenue Burn site, trespassing in the past constitutes a completed exposure pathway. The NJDHSS/ATSDR has conducted two Public Health Consultations at the United States Avenue Burn site and two data reviews between 1995 and 1997. These documents were written prior to the recent installation of the security and fencing systems at the site. Analysis of site data and direct site observation have indicated that a completed human exposure pathway existed in the past among trespassers exposed to lead in soil. Trespassers using all-terrain vehicles and dirt bikes were known to have used the United States Avenue Burn site prior to the installation of the chain-link fence in 1997. The surface soil and waste material in this area are friable and easily dispersed.

Although the maximum concentration of lead detected in soil was 244,000 mg/kg, this concentration was only found in sub-surface soil at a depth of 4 - 4.5 feet. The highest level of lead found in surface soil was 51,700 mg/kg; however, this was in an area not easily accessible. The maximum lead contamination value (42,200 mg/kg) collected from surface soil in an area known to be used by trespassers was used as the basis for the toxicological evaluation for the December 4, 1997 consultation.⁽¹³⁾ In that document, the ATSDR and the NJDHSS concluded that the site represented a public health hazard in the past, based on available information and an analysis of exposure dose and duration. Adults utilizing the site were not likely to have been exposed to lead contamination at concentrations sufficient to constitute a public health hazard. Children, however, may have been exposed to levels of lead that may pose a public health hazard. Children are at higher risk from lead than adults because their developing systems are more susceptible to its effects. These effects can include decreased intelligence, learning disabilities, hearing loss, and behavioral problems in exposed children.

Current Potential Exposure Pathways

The NJDHSS has determined that trespassers on the site, in particular older children, could potentially be exposed to several contaminants in on-site surface soil. Under current site conditions, it is very unlikely that young children would enter the site, mostly due to the remoteness of the site and the inaccessibility of the area due to the 6' high chain-link fence. It is likely that trespassers would be either adults or older children capable of scaling the fence. This is unlikely to be a common occurrence. Most of the known contaminated areas of the United States Avenue Burn site are surrounded by a chain-link fence. As noted previously, the USEPA believes the fence currently encloses all known soil lead contamination above 400 mg/kg. It is possible, however, that the full extent of the site contamination was not delineated prior to the erection of the fence and some contaminated areas outside the fence may be accessible.

Under current site conditions, trespassers riding all-terrain vehicles and dirt bikes on the site no longer have open access to the heavily contaminated portions. The surface soil and waste material in this area remains friable and easily dispersed. The maximum concentration of lead (51,700 mg/kg) is still present in surface soil. This contaminated soil would be accessible to determined site

trespassers, who would climb over or cut through the 6' chain-link fence. It is, however, unlikely that much, if any, trespassing has occurred on this site since it was enclosed.

Sediments

Sediment samples were collected from water bodies (White Sands Branch, Haney Run Brook, and Bridgewood Lake) located upstream, downstream, and adjacent, respectively, to the United States Avenue Burn site. During its investigation, Weston collected a total of 38 sediment samples. Analysis of these sediment samples indicated the presence of lead (maximum level 14,700 mg/kg), arsenic (maximum level 162 mg/kg), cadmium (maximum level 3.5 mg/kg), mercury (maximum level 0.71 mg/kg), and zinc (maximum level 212 mg/kg).

In its report, Weston noted that in some cases the concentrations measured in upstream locations were higher than concentrations measured on-site. This indicates that contaminants may have migrated from another site (e.g. Route 561 Dump site). It also illustrates the need to investigate the sediment contamination at the United States Avenue Burn site as part of an area-wide investigation of this site, the Route 561 site, the Hilliard's Creek site, and possibly other undiscovered sites. Sediments, therefore, must be considered a potential human exposure pathway. Two sediment samples for lead were taken from Bridgewood Lake, which is downstream of the site. The lead levels in these samples were 1,420 and 1,360 mg/kg.

Surface Water

During its investigation, Weston collected 5 surface water samples at the site. Analysis of these surface water samples indicated the presence of lead in all five samples (maximum level 9.7 µg/l). As with the sediments at this site and other related sites, it is likely that surface water contamination at this site is related to the more widespread problem with contamination in some streams and lakes in the vicinity. Therefore, this must be considered a potential human exposure pathway.

Groundwater/Private Wells

Groundwater monitoring at the United States Avenue Burn site has not been thorough enough to fully characterize the depth and spread of the contamination. Sampling that has been performed confirms that the shallow groundwater has been contaminated by the site. Between August 1981 and December 1988 fourteen groundwater samples were taken from each of four monitoring wells located in the vicinity of the former landfill area. Lead was detected as high as 69,000 µg/l (Well #7, 4/17/85). Benzene has also been detected in groundwater. Well #9 showed benzene at 75.9 µg/l during sampling on 9/14/83.

During its investigation, Weston collected 5 groundwater samples at the site. Analysis of these groundwater samples indicated the presence of lead in two well locations (maximum level 112 µg/l). Also detected were; arsenic (maximum level 826 µg/l), cadmium (maximum level 4.1 µg/l), and manganese (maximum level 174 µg/l). Benzene has also been detected at 9 µg/l.

There is a residential well within 200 feet of this site. As with the Route 561 site, this well is so close to the site there exists a potential for it to become contaminated at levels of potential public health significance. At this time, no data on potential contamination levels in deeper ground water were available. The well was last checked in 1994 and was found to be free of site related contamination, however, the current quality of the water is unknown. The depth of the groundwater from which this residence draws water is also unknown. The direction of groundwater flow in the area needs to be discerned.

Health Outcome Data

There are multiple sources of health outcome data in New Jersey. State and local data for health outcome information include the New Jersey State Cancer Registry, Birth Defects Registry, Vital Statistics Records, Renal Dialysis Network, and Hospital Discharge Reports. However, because no exposed populations have been defined and the low number of possible individuals exposed, review of health outcome data in this case would not be appropriate. Therefore, no health outcome data were evaluated.

ATSDR Child Health Initiative

ATSDR's Child Health Initiative recognizes that the unique vulnerabilities of infants and children demand special emphasis in communities faced with contamination in their environment. Children are at greater risk than adults from certain kinds of exposures to hazardous substances emitted from a waste site. They are more likely to be exposed because they play outdoors and they often bring food into contaminated areas. They are shorter than adults, which means they breathe dust, soil, and heavy vapors closer 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. Children depend completely on adults for risk identification and management decisions, housing decisions, and access to medical care.

Children who may have frequented the United States Avenue Burn site in the past may have been exposed to lead at levels of public health concern. The surface soil at the sites has been contaminated with high levels of lead. Lead is harmful to children, especially children less than six years old. The areas of contaminated soil, however, are currently inaccessible to young children, making contact with contaminated surface soil very unlikely. The areas of contaminated soil would only be accessible to the most determined older children who may trespass on the sites.

Community Health Concerns

In order to gather information on community health concerns at the Route 561 Dump site and the United States Avenue Burn site, NJDHSS spoke with the Camden County Health Department (CCHD) and its Environmental Health Division on 7/15/99. According to these local officials, community concerns have been minimal, possibly due to the sites' remoteness and the limited number of residents living near the sites. The CCHD was unaware of any childhood lead issues

associated with the sites. The ATSDR/NJDHSS prepared a fact sheet concerning the two sites (January, 1998). A draft of this document was distributed to the CCHD.

A Public Comment period occurred from June 19 through July 19, 2000. No comments were received during that time.

Conclusions

Evaluation of Nature and Magnitude of Health Risks

A. Route 561 Dump Site

On the basis of the information reviewed, the ATSDR and NJDHSS have concluded that surface soil contamination at the Route 561 Dump site exists at levels of public health concern if young children were to gain access to contaminated areas. However, the site currently constitutes no apparent public health hazard for exposures to on-site surface soil due to a lack of completed human exposure pathways. Past exposures to contaminated soil could not be ruled out, but because it would be difficult to define a contaminant dose or identify an exposed population, no toxicological evaluation of this pathway was performed.

Under current conditions, areas of surface soils at the Route 561 Dump site are largely inaccessible to all but the most determined trespassers. This surface soil has been characterized and there are areas of heavy on-site contamination with metals, including lead, arsenic, chromium and cyanide. Some "hot spots" at the Route 561 site have been remediated.

Surface water, sediments and groundwater at the Route 561 Dump site have been shown to be adversely affected by the dumping of paint and paint sludges. It is possible that there is a widespread problem of heavy metals transport off-site via surface water, sediments and/or groundwater, therefore, these must be considered potential human exposure pathways. The potential for off-site migration of site-related contaminants through these environmental media has not been thoroughly examined.

There is at least one home near the site that uses a private well for its potable water. The well was last checked in 1994 and was found to be free of site related contamination, however, the current quality of the water is unknown. The depth of the groundwater from which this residence draws water is also unknown. The direction of groundwater flow in the area needs to be discerned.

B. United States Avenue Burn Site

On the basis of the information reviewed, the ATSDR and NJDHSS have concluded that surface soil contamination at the United States Avenue Burn site exists at levels of public health concern if young children were to trespass at the site. However, the site currently constitutes no apparent public health hazard for exposures to on-site surface soil due to a lack of a completed human

exposure pathway. It is important to note, however, that it was concluded that there were completed exposure pathways at the United States Avenue Burn site in the past. The United States Avenue Burn site represented a public health hazard in the past, based on available information and an analysis of exposure dose and duration. Adults utilizing the site were not likely to have been exposed to lead contamination at concentrations sufficient to constitute a public health hazard. Children, however, may have been exposed to levels of lead that may pose a public health hazard.

Under current conditions, areas of surface soils at the United States Avenue Burn site are largely inaccessible to all but the most determined trespassers. Surface soil has been extensively characterized and there are areas of heavy contamination with metals, including lead, arsenic, and chromium.

Some “hot spots” at the Railroad Track Area sub-site of the United States Avenue Burn site have undergone a removal action. Contaminated “hot spots” have been excavated and these areas were capped and covered with clean soil. The contaminated surface soil at the United States Avenue Burn site (landfill and burn areas) have not been remediated to date.

Surface water, sediments and groundwater at the United States Avenue Burn site have been shown to be adversely affected by the dumping of paint and paint sludges, which has lead to contamination of media with heavy metals and possibly benzene. In addition, some of the contamination at the United States Avenue Burn site may be related to former landfilling activities. It is possible that there is a widespread problem of heavy metals transport off-site via surface water, sediments and/or groundwater. Therefore, these must be considered potential human exposure pathways. The potential for off-site migration of site related contaminants through these environmental media has not been thoroughly examined.

As with the Route 561 Dump site, there is at least one home near the site that uses a private well for its potable water. The well was last checked in 1994 and was found to be free of site related contamination, however, the current quality of the water is unknown. The depth of the groundwater from which this residence draws water is also unknown. The direction of groundwater flow in the area needs to be discerned.

Recommendations

A. Cease/Reduce Exposure

1. Inform the public about the Route 561 Dump site and United States Avenue Burn site and the potential hazards of each because it would be prudent to keep trespassers off the sites. The fences surrounding the two sites need to be periodically checked to keep them secure against trespassers.
2. Identify and sample all private well water potentially impacted by the sites.

3. Monitor nearby surface water features (creeks and lakes) periodically to determine if off-site migration of contamination has or is occurring.
4. Utilize optimal dust control measures during site remediation due to the nature and extent of soil contamination.

B. Site Characterization

The following information is needed to fully and adequately evaluate the public health impact of the Route 561 Dump site and the United States Avenue Burn site:

1. Conduct hydrogeologic investigations of area groundwater to characterize the direction and extent of contaminant migration from the site.

Public Health Actions

The Public Health Action Plan (PHAP) for the Route 561 Dump site and United States Avenue Burn site contains a description of the actions to be taken by ATSDR and/or NJDHSS at or in the vicinity of the sites subsequent to the completion of this Public Health Assessment. The purpose of the PHAP is to ensure that this health assessment not only identifies public health hazards, but provides a plan of action designed to mitigate and prevent adverse human health effects resulting from exposure to hazardous substances in the environment. Included is a commitment on the part of ATSDR/NJDHSS to follow up on this plan to ensure that it is implemented. The public health actions undertaken or planned by ATSDR/NJDHSS are as follows:

A. Public Health Actions Taken

1. Environmental data have been evaluated within the context of human exposure pathways and relevant public health issues.
2. The ATSDR/NJDHSS prepared a fact sheet concerning the two sites (January 1998). A draft of this document was distributed to the Camden County Health Department (CCHD). The CCHD was also contacted by letter (January 1998 and April 1998) to determine if they required any assistance. The CCHD did not indicate a need for our direct assistance.

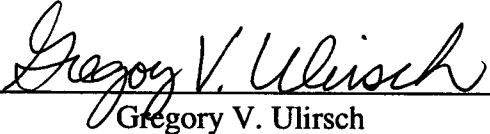
B. Public Health Actions Planned

1. ATSDR and the NJDHSS will coordinate with the appropriate environmental agencies to develop plans to implement the cease/reduce exposure and site characterization recommendations contained in this health assessment.

2. The ATSDR/NJDHSS will review data generated during the remedial investigations or other environmental investigations at these sites and, if necessary, evaluate these data for public health significance.
3. The ATSDR/NJDHSS will contact the CCHD and again offer our assistance in addressing community needs. The NJDHSS/ATSDR will also provide a Citizen's Guide to this document to the CCHD, local libraries, and interested parties.
4. This report will be placed in repositories that contain copies of this health assessment, and will be provided to persons who request it.
5. The ATSDR and the NJDHSS will reevaluate and expand the Public Health Action Plan (PHAP) as warranted. New environmental, toxicological, or health outcome data, or the results of implementing the above proposed actions, may determine the need for additional actions at these sites.


Certification

This Public Health Assessment was prepared by the New Jersey Department of Health and Senior Services (NJDHSS) 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 Public Health Assessment was begun.



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



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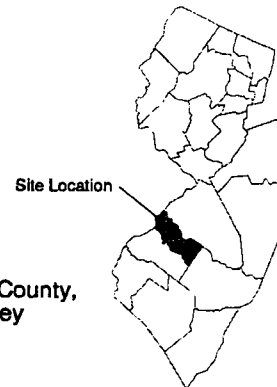
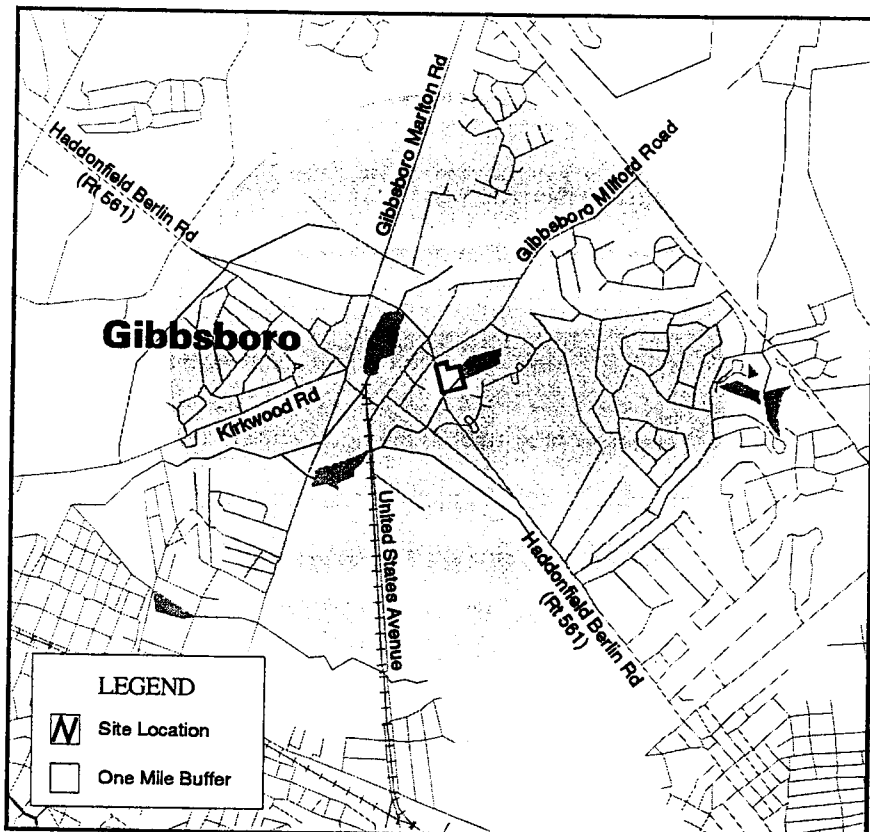
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Figures

Route 561 Site Gibbsboro, New Jersey



Camden County,
New Jersey

Demographic Statistics Within One Mile of Site*	
Total Population	5280
White	4432
Black	349
American Indian, Eskimo, Aleut	4
Asian or Pacific Islander	454
Other race	41
Hispanic origin	95
Children Aged 6 and Younger	565
Adults Aged 65 and Older	387
Females Aged 15 - 44	1250
Total Housing Units	1592

*Calculated using an area-proportion spatial analysis technique

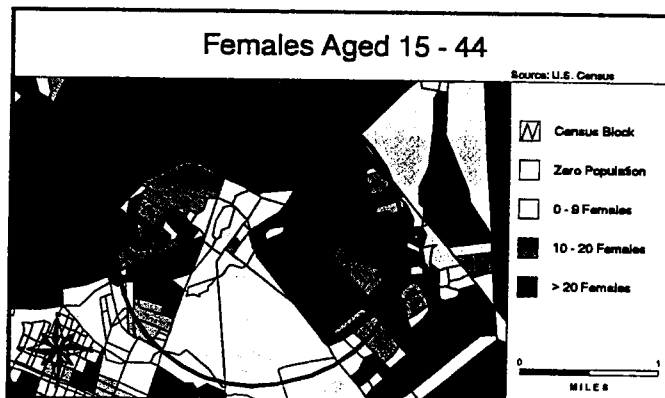
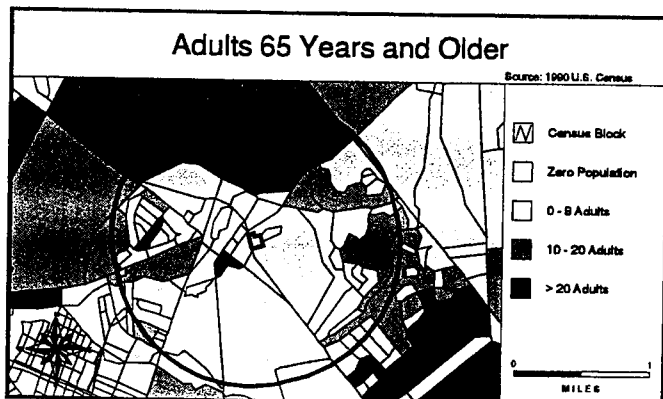
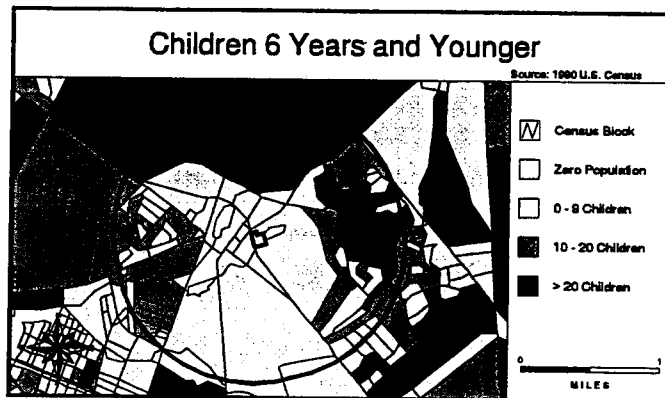
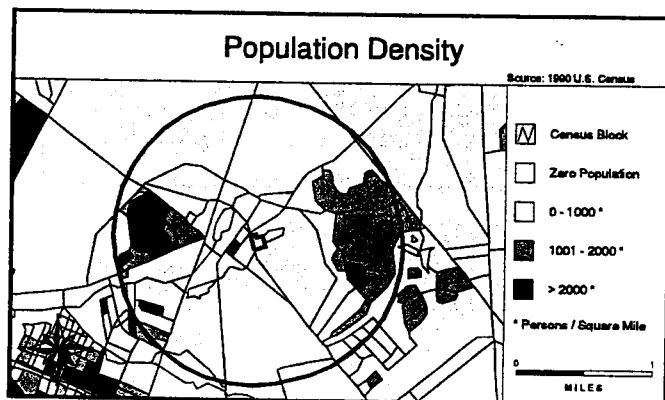
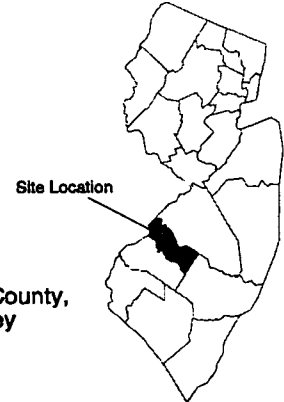
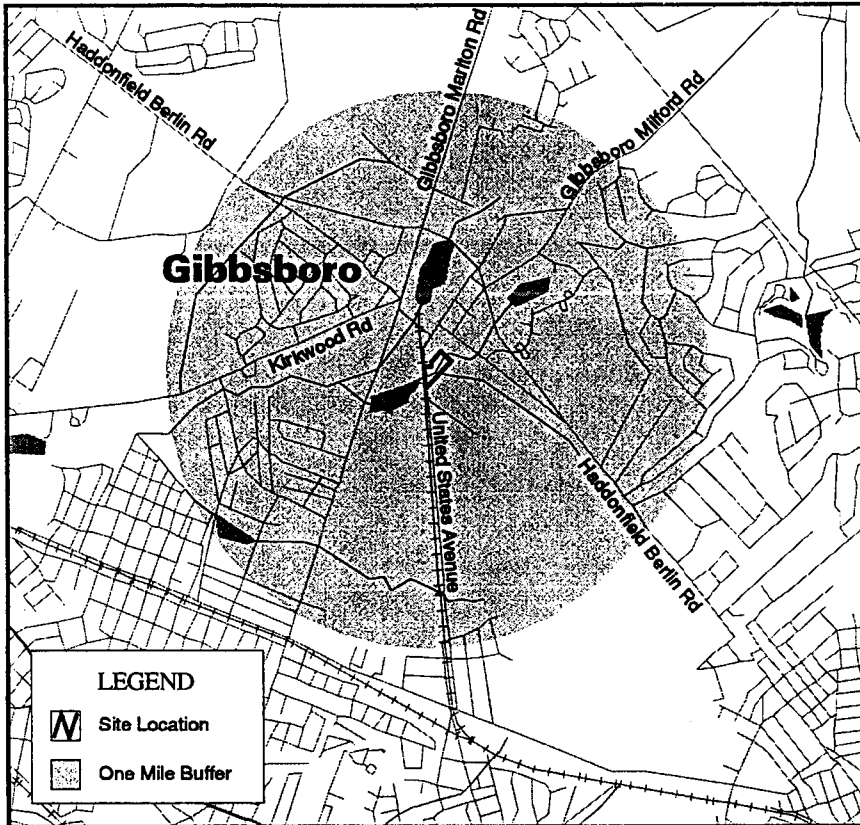


Figure 2

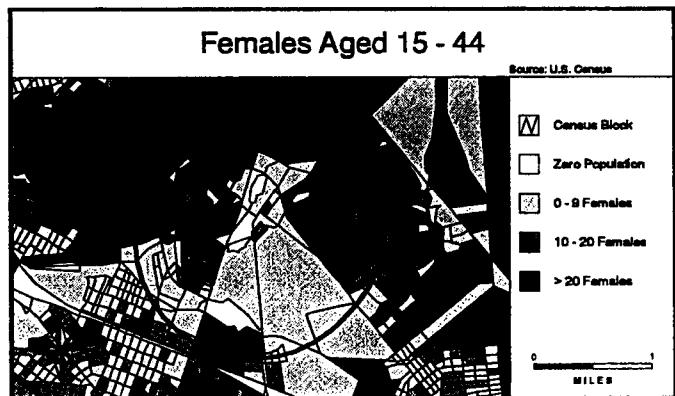
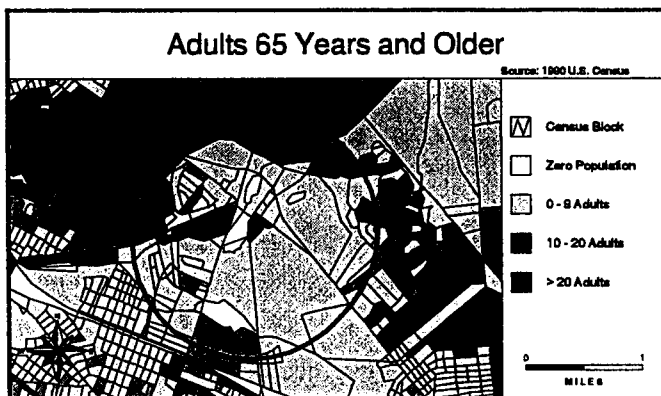
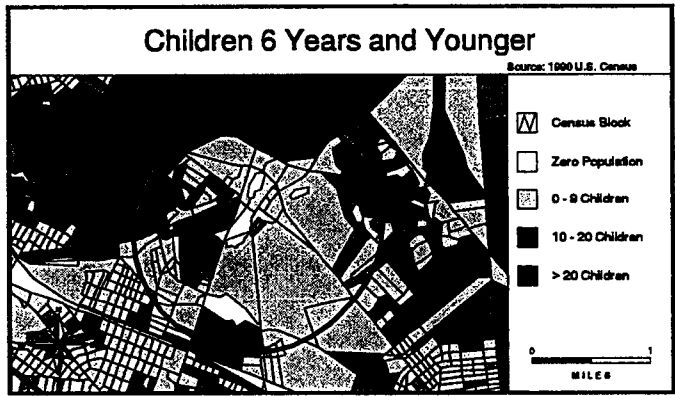
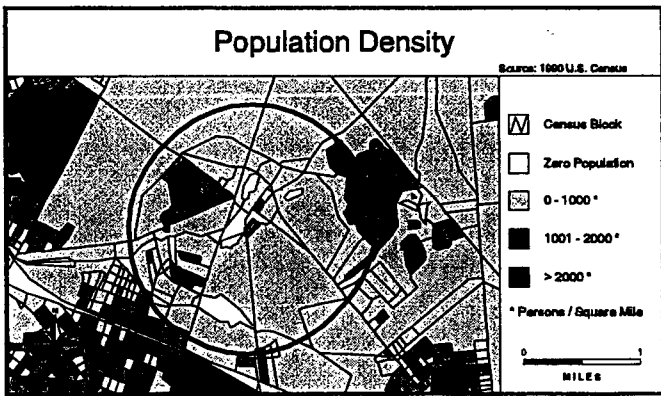
United States Avenue Burn Site

Gibbsboro, New Jersey



Total Population	4465
White	3856
Black	354
American Indian, Eskimo, Aleut	5
Asian or Pacific Islander	219
Other race	31
Hispanic origin	66
Children Aged 6 and Younger	472
Adults Aged 65 and Older	379
Females Aged 15 - 44	1064
Total Housing Units	1406

*Calculated using an area-proportion spatial analysis technique



ATSDR Glossary

ATSDR Plain Language Glossary of Environmental Health Terms

- 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 Agency for Toxic Substances and Disease Registry. 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 Community Assistance Panel.
- 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 Comprehensive Environmental Response, Compensation, and Liability Act.

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**.
- U.S. 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: **Lowest Observed Adverse Effect Level.** 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: **Minimal Risk Level.** 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 National Priorities List.** (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: **No Observed Adverse Effect Level.** 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: **Public Health Assessment.** 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: **Potentially Responsible Party.** 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 Superfund Amendments and Reauthorization Act 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.