Health Consultation

EXPOSURE INVESTIGATION

MATERIALS EXCHANGE CORPORATION (MEC) LANDFILL
(a/k/a WEST COAST MATERIALS)

HOMOSASSA SPRINGS, CITRUS COUNTY, FLORIDA

NOVEMBER 7, 2001

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

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

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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HOMOSASSA SPRINGS, CITRUS COUNTY, FLORIDA

Prepared by:

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

Summary and Statement of Issues

This health consultation evaluates air concentrations of hydrogen sulfide (H_2S) and other sulfur compounds in a neighborhood close to the Materials Exchange Corporation (MEC) Landfill in Homosassa Springs, Florida. Since 1996, the Florida Department of Environmental Protection (DEP) has documented complaint calls from citizens near the landfill. Since 1999, the Florida Department of Health (DOH) has received odor and health complaints.

From July 2000 to March 2001, the Florida DOH, in cooperation with the Agency for Toxic Substances and Disease Registry (ATSDR), coordinated continuous air monitoring for hydrogen sulfide near the MEC landfill. Lockheed Martin (under contract to EPA) assisted the Florida DOH with this investigation. The Florida DOH chose three locations for the continuous hydrogen sulfide air monitoring based on resident complaints and wind direction. All of the 24-hour average hydrogen sulfide concentrations were less than ATSDR's health-based guidance concentration of 30 parts per billion (ppb).

In September 2000, Florida DOH also coordinated grab air sampling at one location. Hydrogen sulfide and other sulfur compounds were not detected in the grab sample.

Based on evaluation of results of the air monitoring program, Florida DOH concludes there is no apparent public health hazard from hydrogen sulfide near this landfill. The conclusions and recommendations of this consultation are only applicable to people living near the MEC landfill. The Florida DOH developed this consultation under a cooperative agreement with the ATSDR. ATSDR provided the financial support for this consultation.

Site Description and Background

***Demographics*:**

The MEC landfill is a privately owned operating construction and demolition (C&D) landfill. It is on the north side of Grover Cleveland Boulevard, about 3.5 miles east of US 19 (Figures 1 & 2). Six single-family homes and five mobile homes are within 500 feet of the landfill. Located more than 500 feet to the west and northwest are both undeveloped and residential areas. The areas north and east of the landfill may be used for forestry and mining; there are very few houses in this area. Residential areas extend southeast, south, and southwest of the landfill for several miles.

According to 1990 census data, approximately 979 people live within 1 mile of the landfill (Figure 3). Of this population, 98% is Caucasian and 2% a combination of African Americans, Asians, Hispanics, and others; 15% is 65 years and older; 20% percent are females between the ages of 15 and 44; and 10% of the population is 6 years old or younger. As of 1990, there were 428 housing units within 1 mile of the landfill.

***Site History*:**

The site was a sand mine in the 1970s. Beginning in 1980, the mined areas were filled. Currently, two closed (filled) cells and one active cell exist on the 131-acre property (Figure 4). From 1980 to 1990, the previous landfill-owner, Monex (also known as Monier Resources), disposed of 1.25 million tons of flyash from a coal-fired power plant in the first cell. One cell closed in 1990, the second closed in 1998. Currently, the third cell receives construction and demolition waste.

In 1993, MEC began to fill the second cell with construction and demolition waste (as permitted by the Florida DEP). The landfill received about 1 million cubic yards of wastes every 2 years from Citrus County and several other counties to the south.

In November 1995, the Citrus County Health Department (CHD) began receiving complaints of odors from nearby residents. The Florida DEP began receiving odor complaints from residents in January 1996.

From November 1995 to October 1996, the Citrus County Department of Public Safety inspected the MEC landfill for odors. They documented 6 days of odors on-site.

In October 1996, the Citrus County Department of Public Safety and Florida DEP measured 18,000 parts per billion (ppb) hydrogen sulfide at the bottom of the cell at MEC. They did not detect hydrogen sulfide levels above 1,000 ppb at the landfill boundary.

In 1998, Dr. Wayne Westhoff, College of Public Health, University of South Florida, compiled the health complaints of 76 people living in 41 homes within 2 miles of the landfill. He found that 95% of the participants complained of an increase in frequency of at least one adverse health symptom since the landfill opened or since they moved near the landfill. These symptoms included respiratory distress, skin disorders, eye irritation, and neurological problems. Dr. Westhoff categorized the mood or affective state of the participants as either tension-anxiety, fatigue-inertia, depression-dejection, anger-hostility, vigor-activity, or confusion-bewilderment. He measured respiratory (lung) capacity of the children (4-18 years old) using a spirometer. Dr. Westhoff separated chronic diseases people had before living near the landfill from symptoms experienced after living near the landfill (Westhoff 1998). Limitations of this study were small sample size, lack of hydrogen sulfide measurement, and no comparison or control group.

From August 1998 to April 2000, Florida DEP received 144 phone calls complaining of odors. Seventy-seven of these calls were anonymous. The other 67 phone calls that Florida DEP received were from 20 different households. Residents complained of unbearable stench, nausea, burning eyes, sore throats, rotten egg odors, lack of sleep, difficulty breathing, chest pains, and headaches. Residents reported odors were worse after rainfall. They reported they could not leave their windows open.

In March 1999, a nearby resident and member of the Citrus County Civic Association petitioned ATSDR for a public health assessment. The resident reported community concerns about hydrogen sulfide and symptoms community members were experiencing.

In 1999, the Florida DEP and the Citrus CHD sought but were unable to obtain funding from the Environmental Protection Agency (EPA) for hydrogen sulfide air monitoring. Florida DOH then asked ATSDR for hydrogen sulfide air monitoring equipment. In June 1999, the Florida DOH and ATSDR drove through the neighborhoods surrounding the landfill and met with several concerned residents.

In a 1999 health consultation, Florida DOH determined the landfill posed an indeterminate public health hazard because critical air and water quality data were lacking. In that report, Florida DOH concluded:

- Air quality information is not currently available to address the community's health concerns.
- Information on possible releases of metals from the flyash cell to groundwater is limited to on-site monitoring wells.
- Area physicians (and residents) may not have adequate information on the effects of hydrogen sulfide exposure.

A second Florida DOH health consultation in April 2000 again was unable to determine the public health threat from groundwater near MEC. Although the Florida DEP tests of private drinking water wells found no public health threat, these wells were more than1/2 mile from the landfill. Florida DOH recommended testing of private wells closer to the landfill.

In July 2000, ATSDR provided three Zellweger tapemeters (air monitors) to measure hydrogen sulfide levels in the air. Since ATSDR only has a few Zellweger tapemeters for the entire country, ATSDR agreed to provide the tapemeters at this landfill until they were needed elsewhere. Lockheed Martin installed and maintained the air monitors at three residences, collected the data, and provided technical assistance.

On July 17 and September 20, 2000, the Florida DOH and the Citrus CHD met with several nearby residents in a home to hear their health concerns. Florida DOH addressed these concerns in a March 20, 2001, e-mail to these residents. In August 2000, one nearby resident reported seeing dead animals in the last few months near the landfill. She also reported seeing blind birds in her yard. She reported five dogs in her neighborhood died in the last 2 years; three of the dogs were old and two were young. She believes at least one dog died of hydrogen sulfide poisoning.

On February 5, 2001, staff from the Florida DOH, ATSDR, Citrus CHD, and Florida DEP participated in a teleconference with several nearby residents. Florida DOH discussed the ongoing air monitoring and addressed residents' health concerns. Nearby residents report that the more rainfall the area experienced, the stronger the odors became. Since January 2001, nearby residents have reported that the intensity of odors appear to have decreased. This may coincide with below normal rainfall that has been recorded in the area.

Throughout the hydrogen sulfide air monitoring, Florida DOH staff spoke frequently with the three residents with air monitors at their homes. Florida DOH responded to residents' concerns as quickly as possible. The Citrus CHD also assisted, as needed. Florida DOH informed Citrus CHD

of the air monitoring activities and meetings with nearby residents. The Citrus CHD attended three of these meetings.

In August 2001, one nearby resident complained of strong odors. Florida DOH provided a Silicon-lined cannister for this resident to collect a grab air sample.

Discussion

General Characteristics of Landfill Gases:

Landfill gas is composed of a mixture of hundreds of different gases. Typically, landfill gas contains about 50% methane and 50% carbon dioxide. Landfill gas also typically contain less than 1% sulfides (hydrogen sulfide, dimethyl sulfide, mercaptans) and non-methane organic compounds (NMOCs) such as trichloroethylene, benzene, and vinyl chloride. The amount of sulfides and NMOCs varies from landfill to landfill and depends on whether the landfill receives wastes containing these chemicals and whether chemical reactions are occurring which create or remove them (ATSDR 2001).

Various conditions can affect landfill gas production including waste composition, age, presence of oxygen, moisture content, and temperature. For example, the presence of moisture in a landfill increases gas production because it encourages bacterial decomposition and chemical reactions that produce gases. Saturation of landfill soils due to rain increases the tendency of landfill gases to migrate offsite (especially in unlined landfills). This phenomenon may explain why residents living near the MEC landfill complained of stronger odors after rainfall.

Temperature also affects landfill gas production. As the landfill's temperature rises, bacterial activity increases which results in increased gas production. Increased temperature may also increase rates of volatilization and chemical reactions.

Other characteristics of landfill gas production include diffusion, permeability (flow-through), and pressure. Gases in a landfill move from areas of high gas concentrations to areas with lower concentrations. Gas concentrations are generally higher in the landfill than in the surrounding areas, so landfill gases diffuse out of the landfill to the surrounding areas with lower gas concentrations.

Gases move through areas of high permeability (e.g., sand or gravel) rather than through areas of low permeability (e.g., clay or silt). Since landfill covers are often made of low permeability soils such as clay, covered landfill gases move more horizontally than vertically. As more gases are generated, pressure in landfills increases. When pressure in the landfill is higher, gases move into the atmosphere or indoor air.

Once in ambient air, landfill gases can be carried with the wind. Odors from day-to day landfill activities suggest gases moving above ground. If a landfill gas collection or control system is in place and operating properly, migration and exposures should be minimal (ATSDR 2001).

***Exposure to Landfill Gases*:**

Many exposures to landfill gas involve chemicals at low or trace levels, and mixtures of chemicals. Most studies that look at health effects from chemical exposures consider much higher chemical exposure levels than those associated with landfills. Only a few studies have looked at low-level, multi-chemical exposures.

The handful of studies looking at possible long-term adverse health effects (e.g., cancer) associated with low-level and multi-chemical exposures associated with living near landfills have been inconclusive. Although each study found some increase in reproductive effects or cancer incidence, overall, they were inconclusive.

In each study, the researchers noted the lack of data both about specific landfill gas emissions and about the effects of confounding factors such as lifestyle choices that may affect the health of individuals exposed to landfill gases. Investigators noted that a study of a single landfill and the surrounding community is unlikely to answer the question of whether landfill gases are adversely affecting the health of community members. In all cases, the investigators cited the need for additional studies (ATSDR 2001).

***Landfill Odors*:**

People in communities near landfills are often concerned about landfill odors. The residents near the MEC landfill allege odors from the landfill create health problems and symptoms such as headaches and nausea.

Landfill odors are produced by bacterial or chemical processes and can originate from both active or closed landfills. These odors can migrate to surrounding communities. Potential sources of landfill odors include sulfides, ammonia, and certain non-methane organic compounds (NMOC) such as trichloroethylene, benzene, and vinyl chloride. Landfill odors may also be produced by the disposal of certain types of wastes such as manures and fermented grains. Odors from the disposal of these wastes, however, tend not to last long and are usually noticeable only a few hundred feet from the landfill (ATSDR 2001).

The sense of smell varies from person to person. One person can smell an odor like hydrogen sulfide at extremely low concentrations, while another person cannot. Because of this variation, there is no absolute odor threshold value above which odors are unpleasant and below which odors are not noticeable.

Amoore (1985) estimates that 30 ppb of hydrogen sulfide can be detectable by 83% of the population and would be discomforting to 40% of the population. These estimates have been substantiated by odor complaints and reports of nausea and headache at 30 ppb hydrogen sulfide near a geyser (Reynolds and Kauper 1985, Collins and Lewis 2000).

General Characteristics of Hydrogen Sulfide:

Hydrogen sulfide is a colorless, flammable gas that smells like rotten eggs. People can smell hydrogen sulfide at concentrations as low as 0.5 parts of hydrogen sulfide per billion parts of air (ppb). At concentrations more than 100,000 ppb, most people can no longer smell hydrogen sulfide (ATSDR 1999).

Hydrogen sulfide is found both naturally (i.e., bacterial breakdown of organic matter) and as the result of human activities (i.e., sewage treatment facilities). Hydrogen sulfide is found naturally in crude petroleum, natural gas, volcanic gases, hot springs, and as the result of bacterial breakdown of organic matter.

Hydrogen sulfide concentrations substantially exceeding the odor threshold cause headache or nausea (Amoore 1985 and Reynolds and Kauper 1985). The perceived intensity of the odor of hydrogen sulfide depends on the longevity of the concentration. The perceived intensity increases about 20% for each doubling of the hydrogen sulfide concentration (Amoore, 1985).

Hydrogen Sulfide Monitoring:

The Florida DOH chose to conduct air monitoring specifically for hydrogen sulfide at the MEC landfill. Gypsum drywall is a major component of construction and demolition (C&D) debris in landfills. Hydrogen sulfide gas is emitted from decaying gypsum drywall. People living near landfills, sewage treatment plants, or farms with manure storage or livestock confinement facilities may be exposed to higher-than-average levels of hydrogen sulfide in the air.

Background Hydrogen Sulfide Air Concentrations:

The amount of naturally occurring hydrogen sulfide in the air in the United States is between 0.11 to 0.33 ppb. Hydrogen sulfide concentrations in an unpolluted area of Colorado were between 0.02 and 0.07 ppb (ATSDR 1999).

The World Health Organization (WHO) reports that to avoid odor complaints, hydrogen sulfide concentrations should not be allowed to exceed a 30-minute average of 5 ppb (WHO 1981, National Research Council 1979, Lindvall 1970).

The Occupational Safety and Health Administration's (OSHA) acceptable ceiling concentration is 20,000 ppb in the workplace, with a maximum level of 50,000 ppb allowed for 10 minutes maximum duration if no other measurable exposure occurs.

Hydrogen sulfide has been identified at 29 of the 1,467 current or former EPA National Priorities List (NPL) hazardous wastes sites (Figure 5, HazDat 1998). Hydrogen sulfide levels at NPL sites ranged from 900 to 808,000 ppb (ATSDR 1999).

Health Effects of Hydrogen Sulfide:

Researchers have studied both animals and people (including asthma sufferers) to learn about possible health effects resulting from exposure to hydrogen sulfide. Studies of asthma sufferers found no significant health effects at concentrations as high as 2,000 ppb. Epidemiologic studies of asthma sufferers and workers in pulp mills (another common source of hydrogen sulfide) did not identify any significant health effects from exposure to hydrogen sulfide in the air (ATSDR 2001).

ATSDR's acute (14 days or less) inhalation minimal risk level (MRL) for hydrogen sulfide is 70 ppb. ATSDR uses an MRL of 30 ppb for intermediate (15-364 days) inhalation. Due to lack of studies, ATSDR does not have an MRL for chronic (365 days or more) exposure (ATSDR 1999). An MRL is an estimate of daily human exposure that is likely to be without a measurable risk of adverse, noncancerous effects.

Hydrogen sulfide does not accumulate in the body. Acute health effects do not occur until exposure is greater than the body's ability to excrete the excess sulfur. Fortunately, our bodies rapidly excrete hydrogen sulfide at concentrations that most people are exposed to. Most of the injuries related to hydrogen sulfide occur in occupational workplace settings where the potential to be exposed to sudden bursts of hydrogen sulfide are much greater (NIEHS 2001).

Exposure to lower concentrations of hydrogen sulfide can cause symptoms such as eye irritation, sore throat and cough, shortness of breath, and fluid in the lungs. These symptoms usually subside within a few weeks, but other changes such as memory problems may occur. Breathing hydrogen sulfide over a long time may result in fatigue, loss of appetite, headaches, irritability, poor memory and dizziness. The levels of hydrogen sulfide measured near the MEC landfill in 2000 and 2001 are, however, unlikely to cause illness.

It is difficult to assess the health effects of repeated exposures to hydrogen sulfide. There is a lack of data on the toxicological effects of hydrogen sulfide exposure through the air. Anecdotal reports suggest a wider variety of outcomes, including chronic neurotoxicity associated with long-term and low-level exposure, respiratory disorders, cardiac toxicity, and other effects. Current literature, however, does not provide support for an association for any one of these. Chronic central neurotoxicity in response to long-term, low-level exposures has been theorized based on neurobehavioral testing of populations exposed to varying levels. These reports, however, have methodological problems and to date lack essential criteria for concluding causation. There are many gaps in our understanding of hydrogen sulfide exposure (Guidotti 2000).

While there is some concern that odors might precipitate an asthmatic attack in highly sensitive people, a controlled study of asthmatics found that exposure to a high level of hydrogen sulfide (2000 ppb) did not trigger an asthmatic attack or alter respiratory function (ATSDR 2001).

Hydrogen sulfide has not been shown to cause cancer in humans, and its possible ability to cause cancer in animals has not been studied thoroughly. Hydrogen sulfide has not been classified for its ability to cause or not cause cancer (ATSDR 1999).

Animals and Hydrogen Sulfide:

Hydrogen sulfide is released from manure during anaerobic decomposition. Exposure to 400,000 ppb or higher in the air leads to sudden death in pigs and cattle (White, 2001). One resident near the MEC landfill reported five dogs died in a two-year period. The levels of hydrogen sulfide measured in 2000 and 2001 near the MEC landfill, however, were much lower and unlikely to cause illness in dogs.

***Hydrogen Sulfide Biomarkers*:**

The major metabolic pathway for hydrogen sulfide in the body is oxidation of sulfide to sulfate. The sulfate is excreted in the urine. Urinary thiosulfate levels can be used as biomarkers for hydrogen sulfide exposure. This biological monitoring, however, is usually only conducted in the workplace.

In one study volunteers inhaled 8,000, 18,000 or 30,000 ppb of hydrogen sulfide for 30-45 minutes. Excretion of urinary thiosulfate peaked at 15 hours but remained low. Most of the absorbed hydrogen sulfide was metabolized or excreted within 15 hours (ATSDR 1999). The concentrations of hydrogen sulfide in the air near the MEC landfill were much lower than the concentrations found in this study.

***Air Monitoring of Gases at Landfills*:**

Due to its variability, air is a unique medium. Even samples collected directly downwind of an emission source at different times within a day can vary by an order of magnitude or more due to changes in meteorological parameters and site emissions (Keith and Walker 1995).

Atmospheric pressure affects the migration of gases through and out of landfills. Volatile contaminants from landfills may be released at higher rates during periods of low atmospheric pressure. The reverse may also occur: high atmospheric pressure may decrease the rate of landfill gas release. However, because of significant lag times, changes in gas migration may not be very noticeable. Each landfill must be considered individually (Keith and Walker 1995).

Hydrogen Sulfide and Weather Data Collection

***Hydrogen Sulfide Data Collection*:**

The Florida DOH selected three hydrogen sulfide air monitoring locations based in part on wind direction, proximity to the landfill, and electrical power availability.

On July 17, 2000, EPA's consultant, Lockheed Martin (under an interagency agreement with ATSDR), installed Zellweger air monitors at three homes near the landfill. Location #1 was west of the MEC landfill, location #2 was further west of #1, and #3 was northeast of the landfill. The air monitors at location #1 and #2 were set-up in screened porches. At location #3, the monitor

was located indoors with tubing extending out the window. All three air monitors measured hydrogen sulfide from ambient (outside) air only. For each of the three residents, Florida DOH explained the air monitoring process, confidentiality, and the consent form (Appendix A).

The Zellweger air monitors are single point monitors (SPM) with chemcasettes. Each monitor is automated and operates continuously (24 hours per day, 7 days per week). Each monitor is designed with an indicator light that flashes if the monitor is not operating correctly. The monitors pump ambient air through a chemically treated tape that undergoes a color-producing chemical reaction when exposed to certain chemicals. For this investigation, the tapes were specific for hydrogen sulfide. The tape within the monitor darkens in proportion to the hydrogen sulfide concentration. The more hydrogen sulfide detected, the darker the tape. Each monitor measures hydrogen sulfide concentrations from 2 to 90 parts per billion (ppb). Lockheed Martin maintained the monitors, collected the hydrogen sulfide data, stored it on disks, and sent the data to the Florida DOH.

On August 24, 2000, Florida DOH, ATSDR, and Lockheed Martin visited the three sampling locations to change the tapemeters cassettes (tapes), to ensure the monitors were operating correctly, and to download recorded hydrogen sulfide measurements onto a disk. The Florida DOH spoke directly with residents at location #2 and #3 and with the resident at location #1 by telephone.

The three air monitors operated continuously for 8 months from July 17, 2000, through March 14, 2001. Because of the high humidity and temperature experienced at the sampling locations during the sampling period, Lockheed Martin changed the hydrogen sulfide tapes more frequently than the recommended rate of every 60 days. Lockheed Martin changed the tapemeters cassettes on August 24, September 20, and November 2, 2000, and again on January 13, 2001. Complete 24-hour air monitoring data are unavailable on the dates the tapemeters were changed. The monitor at location #1 malfunctioned from July 21 to August 23, 2000; therefore, hydrogen sulfide measurements were not recorded at this location on these dates.

Grab Air Sample Collection (Silicon-Lined Canisters):

On August 24, 2000, Florida DOH delivered two silicon-lined canisters with sampling instructions to residents at each of the three locations. Silicon-lined canisters are glass-lined stainless steel containers used to collect one-time (grab) air samples. In September 2000, the residents at location #3 collected two ambient air grab samples in their backyard. Residents at location #1 and #2 did not collect grab air samples since odors were not noted during these times. Copies of the Access to Property consent forms, instructions, and the analytical request forms are in Appendices B, C, and D.

Weather Data Collection:

Florida DOH obtained wind speed, dominant wind direction, temperature, and rainfall data at the Brooksville Airport from July 1999 through March 2001 (Table I). The airport is approximately 20 miles southeast of the MEC landfill. Beginning in September 2000, the resident at Location #2

collected weather data from a meteorological tower installed on his roof. The tower recorded weather data every 30 minutes (Table II). In April 2001, the Florida DOH obtained and reviewed the weather data from this meteorological tower.

Hydrogen Sulfide and Weather Data Results

Continuous Hydrogen Sulfide Monitoring Results:

The three air monitors measured ambient hydrogen sulfide concentrations every 5 minutes over an 8-month period from July 17, 2000 to March 14, 2001. The monitors recorded 288 hydrogen sulfide readings every 24 hours. This resulted in more than 200,000 hydrogen sulfide measurements. An example of the raw data are included in Appendix E.

Figures 6 through 22 summarize hydrogen sulfide concentrations measured every 5 minutes at the three locations near the landfill. The absence of a mark on the graphs indicates that hydrogen sulfide was not detected on that day. The hydrogen sulfide detection limit for this type of monitor is 2 parts per billion (ppb).

Tables III through VIII show maximum monthly hydrogen sulfide concentrations (recorded every 5 minutes) and maximum monthly 24-hour averages. We included the times and dates these maximum hydrogen sulfide concentrations were detected. Most of the hydrogen sulfide measurements were below the instrument detection limit of 2 parts per billion (ppb).

Florida DOH used a conservative approach in calculating 24-hour average hydrogen sulfide concentrations. Florida DOH assumed that measurements below the detection limit of 2 ppb to be 1 ppb instead of 0 or 2 ppb. This is a widely accepted assumption in this type of sampling program. Therefore, the calculated 24-hour average hydrogen sulfide concentrations may marginally overestimate (or underestimate) average hydrogen sulfide concentrations.

Location #1:

Of the three locations, location #1 had the highest hydrogen sulfide concentrations. The maximum hydrogen sulfide concentration at location #1 was 33 ppb (November 5, 2000: 4:40-5:05 a.m.). Most maximum concentrations at this location occurred in the mornings between 12:00 a.m. and 10:40 a.m. Hydrogen sulfide was detected at location #1 on 4 days during the week of November 1, 2000:

11/01/00 - 2:32 a.m. to 4:42 a.m. - 8-15 ppb.

11/03/00 - 10:10 a.m. to 10:50 a.m. - 4-16 ppb.

11/04/00 - 12:10 a.m. to 7:10 a.m. - 8-20 ppb.

11/05/00 - 1:10 a.m. to 5:25 a.m. - 9-33 ppb.

The maximum 24-hour average concentration at location #1 was on November 5, 2000 (3.9 ppb). Most (89 %) of the maximum 24-hour hydrogen sulfide concentration averages, however, were less than 2 ppb.

Location #2:

Of the three locations, location #2 had the lowest hydrogen sulfide concentrations. The maximum hydrogen sulfide concentration at this location was 4 ppb. Most of the maximum hydrogen sulfide concentrations were recorded in the mornings.

During the 8-month air monitoring period, all (100%) of the 24-hour averages were less than 2 ppb. During September, October, and December 2000, no hydrogen sulfide was detected by the air monitors.

Location #3:

The maximum hydrogen sulfide concentration at location #3 (22 ppb) was on July 20, 2000, from 6:08 - 6:18 a.m. The maximum 24-hour average (2.3 ppb) was also on July 20, 2000.

During the 8-month air monitoring period, most (89%) of these 24- hour averages were less than 2 ppb. During November/December 2000 and January/March 2001, hydrogen sulfide was not detected by the monitors.

Grab Air Sample Results (Silicon-Lined Canister):

In addition to continuous hydrogen sulfide air monitoring, the Florida DOH arranged for grab sampling to be collected. Two grab air samples (silicon-lined canisters) were collected and analyzed. The samples were collected on September 2000 from location #3. Concentrations of hydrogen sulfide, n-butyl mercaptan, t-butyl mercaptan, carbon disulfide, carbonyl sulfide, diethyl sulfide, dimethyl disulfide, ethyl mercaptan, isopropyl mercaptan, n-propyl mercaptan, tetrahydrothiophene, and thiophene were below detection limits in both air samples.

***Weather Results*:**

During the 8-month air monitoring period, much of Florida suffered a severe drought. Residents at the three sampling locations near this landfill reported that the intensity of odors appeared to have decreased from the landfill during this period. Monthly rainfall totals, average wind speeds, wind directions, and temperatures at location #2 and at the Brooksville Airport are shown in Tables I and II. Wind direction at location #2 is available from September 22, 2000, through March 14, 2001.

Weather Conditions:

During the 8-month monitoring period, there was no obvious correlation between rainfall and hydrogen sulfide concentration. There was little or no rain on days with maximum hydrogen sulfide

concentrations. Also, the months with the most rainfall did not have the higher hydrogen sulfide concentrations.

Overall, the dominant wind directions were similar for the temporary meteorological tower at location #2 and the Brooksville Airport. During the 8-month air monitoring period, the wind was predominantly from the north or northeast. For two months (January and March 2001), the dominant wind direction was from the west-southwest. Average wind speeds at the Brooksville Airport were two to three times higher than those at location #2.

The highest hydrogen sulfide concentrations appear to coincide with little or no wind. Maximum hydrogen sulfide concentrations were recorded in the early morning hours when there was little or no wind. In November 2000, the month with the highest hydrogen sulfide concentrations, the average wind speed was 1.3 miles per hour. This wind speed was the lowest recorded on the meteorological tower. At the time of the highest hydrogen sulfide concentration at location #1 (November 5, 2000, from 1:10 a.m. to 5:25 a.m.), there was no wind. This was also true of other dates throughout the 8-month air monitoring period. Little or no wind may allow hydrogen sulfide, which stays low to the ground, to migrate away from the landfill without being mixed and diluted in the atmosphere.

On February 9, 2001, the wind was from the east and all three air monitors near the landfill detected hydrogen sulfide concentrations. On other days, however, there was no clear relationship between wind direction and hydrogen sulfide. More hydrogen sulfide concentrations were detected during months with higher temperatures.

Child Health Initiative

This health consultation addresses nearby residents including children playing outdoors. As with many sites, children are a primary concern. Children are not small adults. A child's exposure may differ from an adult's exposure in many ways. Children drink more fluids, eat more food, and breathe more air per kilogram of body weight. They also have a larger skin surface area in proportion to their body volume. A child's diet often differs from that of adults. A child's behavior and lifestyle also influence exposure. Children crawl on the floor, put things in their mouths and may ingest inappropriate things such as dirt or paint chips. Children also spend more time outdoors. Children are closer to the ground and do not have the judgment of adults in avoiding hazards (ATSDR 1999).

Exposure to the levels of hydrogen sulfide that were measured near the MEC landfill during this sampling program are unlikely to cause illnesses in children.

Conclusions

1. After 8 months of continuous air monitoring, the Florida DOH has determined that "no apparent public health hazard" exists due to exposure to hydrogen sulfide concentrations measured in ambient air near the MEC landfill.

2. The Florida DOH bases its assessment on ATSDR's health-based minimal risk level (MRL) of 30 parts per billion (ppb) for hydrogen sulfide (24-hour average). Exposure to 24-hour average concentrations less than 30 ppb are unlikely to cause illness. The highest 24-hour average concentration near the MEC landfill was 3.9 ppb.

3. During the entire 8-month air monitoring period, the highest hydrogen sulfide concentrations was 33 ppb at location #1 lasting 25 minutes. Only 21 days had hydrogen sulfide concentrations greater or equal to 5 ppb.

4. For all three locations, the highest hydrogen sulfide concentrations were detected during the morning hours when there was little or no wind.

5. There were no detectable levels of hydrogen sulfide or other sulfur compounds in the grab (one-time) air samples (silicon-lined canisters) collected at location #3 in September 2000.

6. Florida experienced severe drought during the 8-month period of ambient air monitoring at the MEC landfill. This lack of rainfall could have decreased hydrogen sulfide production in the landfill.

7. Since 1996, the residents living near the MEC landfill have expressed concerns about odors from the landfill. Residents feel that the odors are a chronic nuisance and affect their quality of life.

8. Since exposure to hydrogen sulfide concentrations measured during this sampling program at the landfill are unlikely to cause illness, biological testing is not warranted at this time.

9. There has not been any ambient air monitoring in the neighborhoods around the MEC landfill prior to July 2000. Without historical air monitoring data, the Florida DOH, at this time, cannot estimate past exposure or the likelihood of illness due to past exposures to ambient air near MEC.

Recommendations/Public Health Action Plan

1. Florida DOH recommends that Florida DEP continue to monitor MEC's compliance with their landfill permit.

2. Florida DEP or the U. S. EPA should consider conducting additional ambient air monitoring in the future as warranted.

3. Florida DOH will make this consult available to the residents near the MEC landfill. Additionally, the Florida DOH is planning a public meeting in November of 2001 to discuss this consult and the results of the MEC air monitoring program.

4. Florida DOH is available to evaluate additional environmental data if more data becomes available.

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Special Acknowledgment:

The Florida DOH thanks Lockheed Martin Senior Environmental Scientist Ray Pierson for his exceptional professionalism, hard work, and dedication throughout this project.

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GLOSSARY

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.

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

Ambient Air: Outside air; any portion of the atmosphere not confined by walls and a roof.

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

Chronic Exposure: A contact with a substance or chemical that happens over a long period of time. ATSDR considers exposures of more than 1 year to be *chronic*

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.

Effect: A disease or injury that happens as a result of exposures that may have occurred in the not recent 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."

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.

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, disease will 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.

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.

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

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

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

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.

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

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 that tell whether people could be harmed by conditions present at the site. Each are defined in the Glossary. The categories are:

1. Urgent Public Health Hazard
2. Public Health Hazard
3. Indeterminate Public Health Hazard
4. No Apparent Public Health Hazard
5. No Public Health Hazard

Reference Dose (RfD): An estimate, with safety factors (see **safety factor**) built in, of the daily, lifetime exposure of human populations to a possible hazard that is <u>not</u> 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 do not 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.

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.

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.

Uncertainty Factor: See **Safety Factor**.

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

CERTIFICATION

The Florida Department of Health, Bureau of Environmental Epidemiology prepared the Materials Exchange Corporation (MEC) Landfill Health Consultation under a cooperative agreement with the Agency for Toxic Substances and Disease Registry. It followed approved methodology and procedures existing at the time it began.

Debra Gable
Technical Project Officer,
SPS, SSAB, DHAC

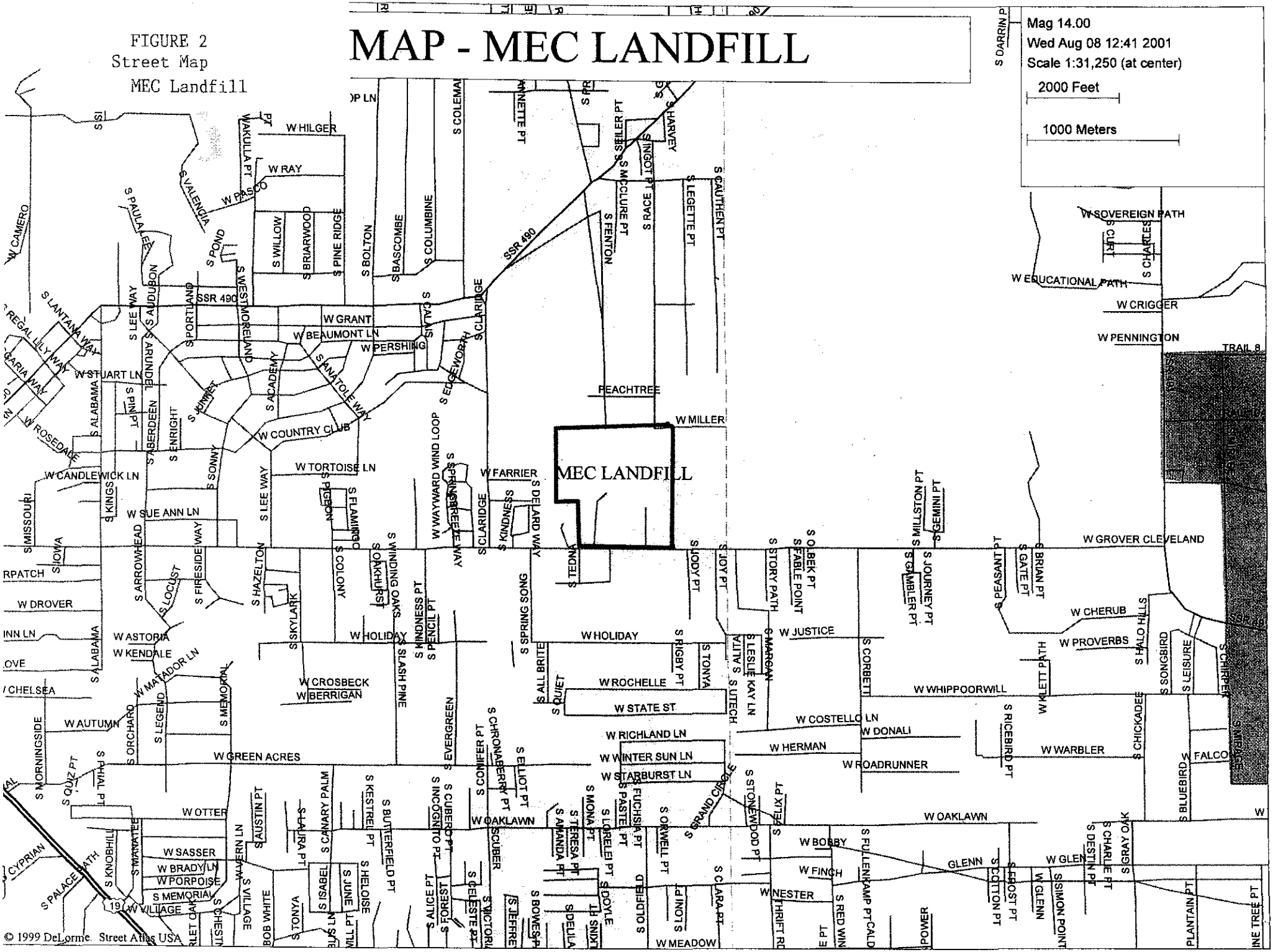
The Division of Health Assessment and Consultation, ATSDR, has reviewed this health consultation, and concurs with its findings.

Richard Gillig
Branch Chief,
SSAB, DHAC, ATSDR

FIGURES

FIGURE 2
Street Map
MEC Landfill

MAP - MEC LANDFILL



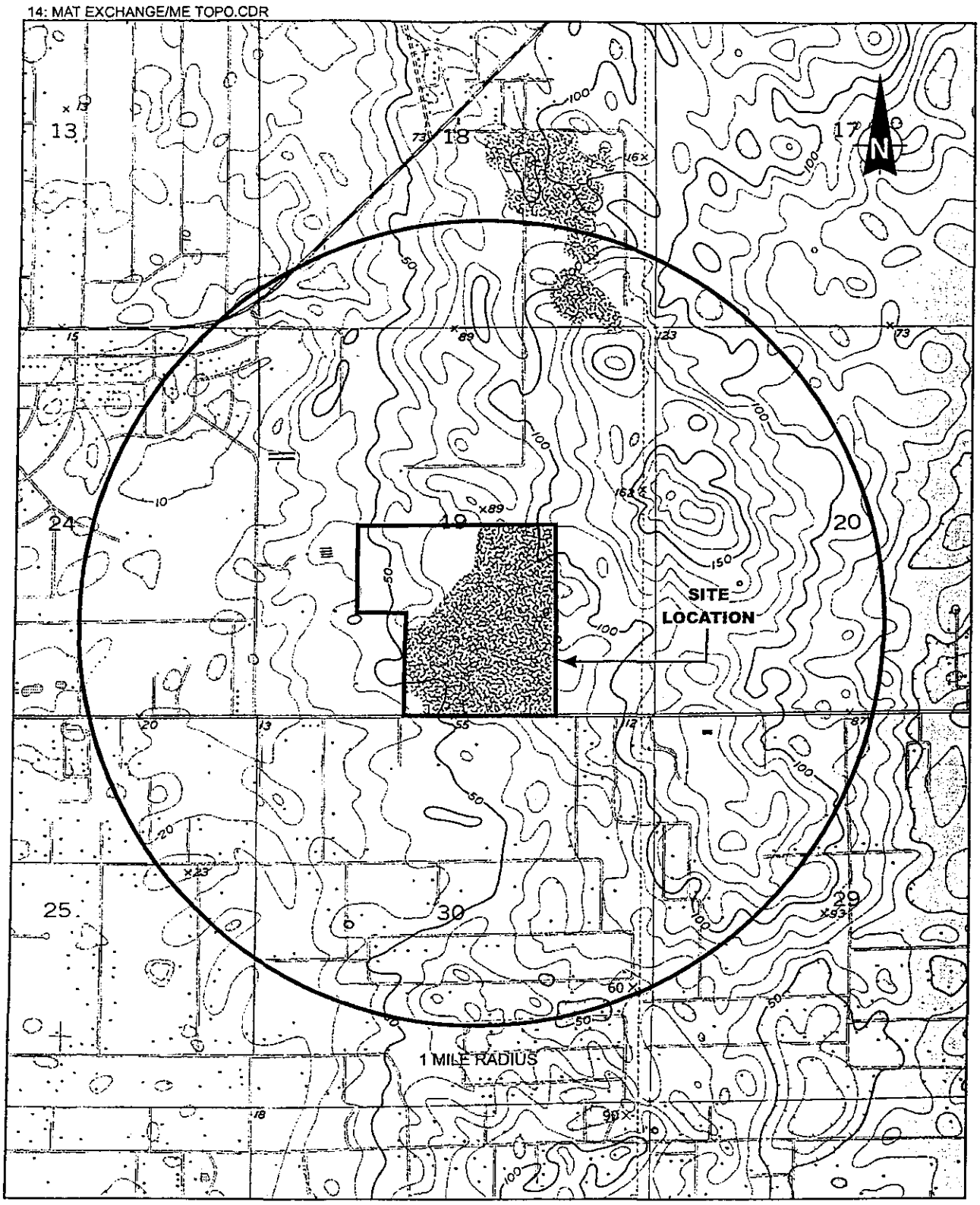


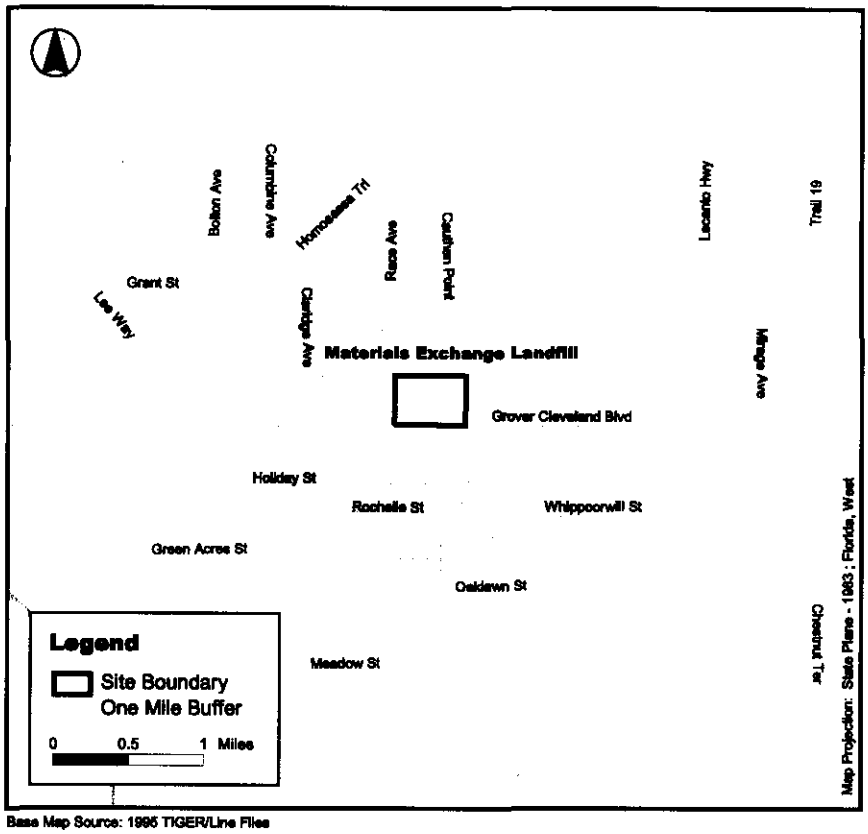
FIGURE 1
Site Location Map
MEC Landfill

Figure 1 **SITE LOCATION MAP -- MATERIAL EXCHANGE CORPORATION SITE, HOMOSASSA SPRINGS, CITRUS COUNTY, FLORIDA**

Materials Exchange Landfill

Homosassa, Florida

FIGURE 3
Demographics
MEC Landfill

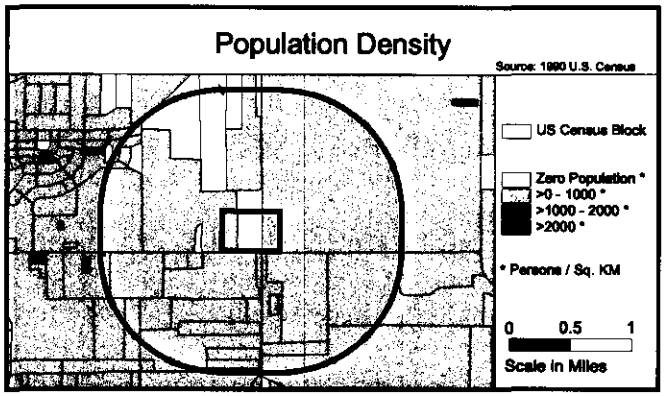


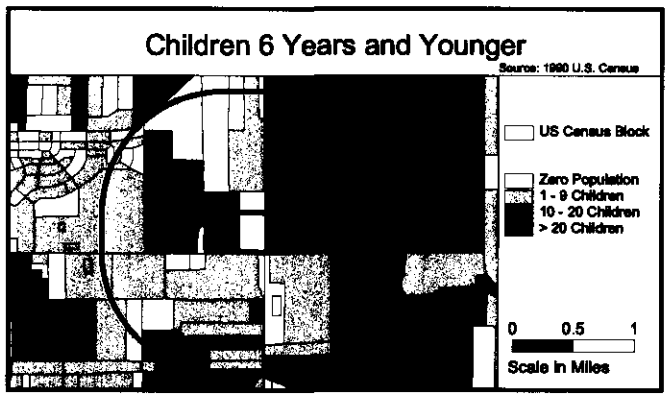
Base Map Source: 1995 TIGER/Line Files

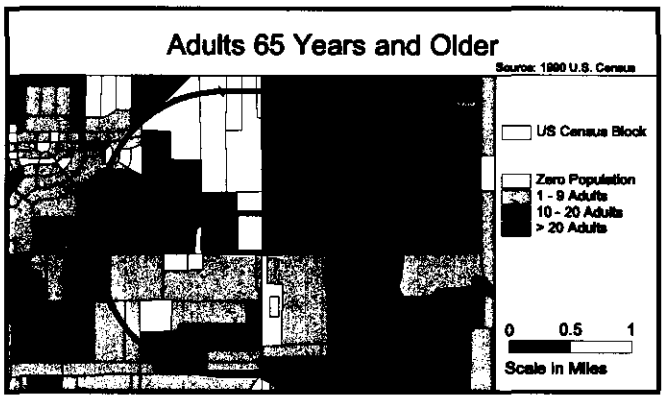
Citrius County, Florida

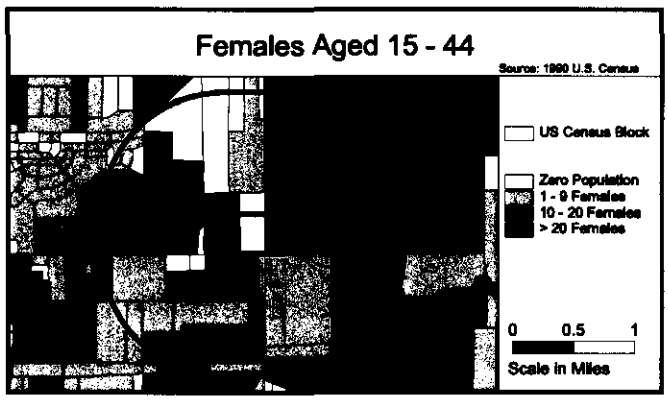
Demographic Statistics Within Specified Distance*	1mi	2mi
Total Population	979	4691
White	961	4637
Black	6	18
Am. Indian, Eskimo, Aleut	8	18
Asian or Pacific Islander	3	11
Other Race	2	5
Hispanic Origin	16	73
Children Aged 6 & Younger	96	465
Adults Aged 65 & Older	143	953
Females Aged 15 - 44	197	864
Total Housing Units	428	2198

Demographics Statistics Source: 1990 US Census
*Calculated using an area-proportion spatial analysis technique









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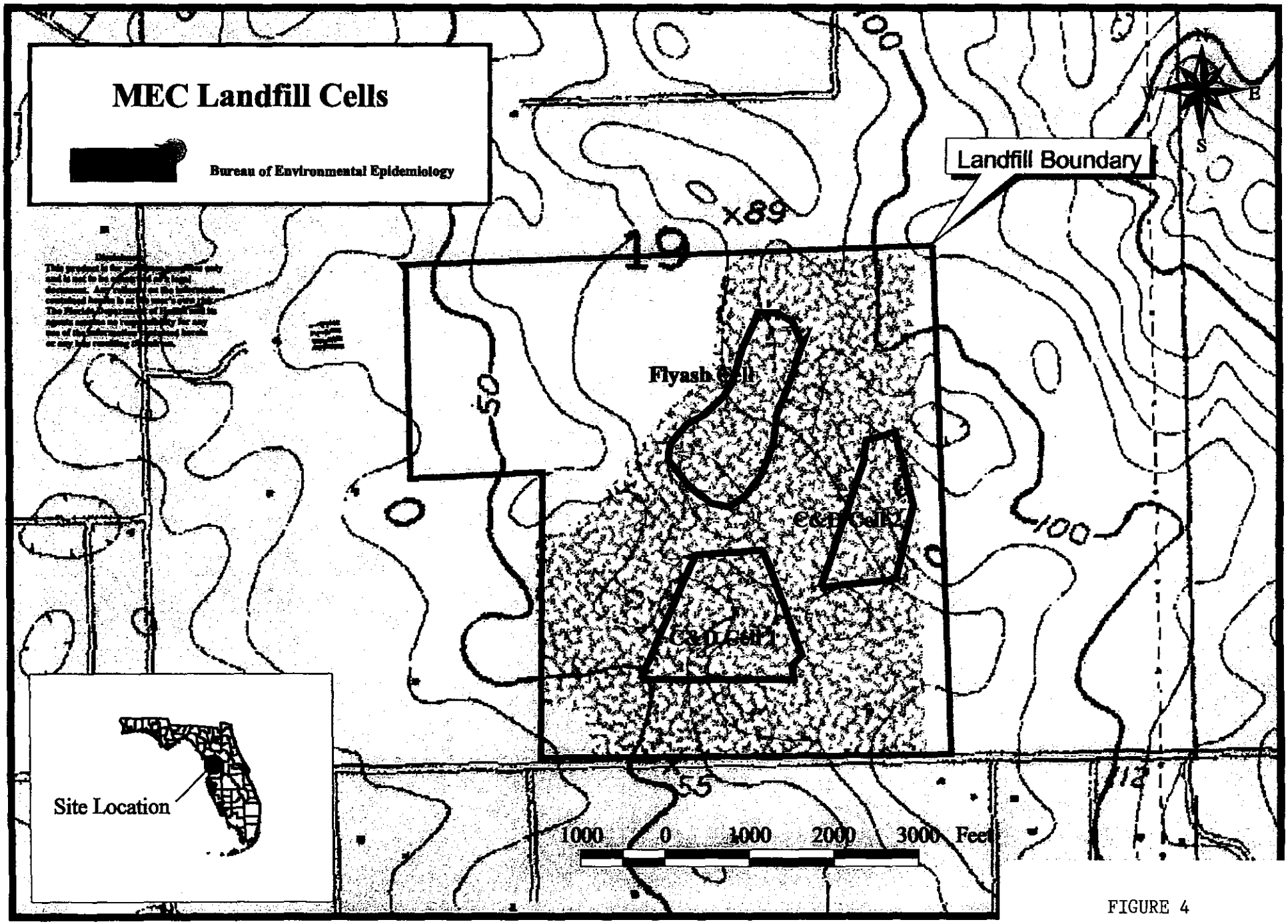
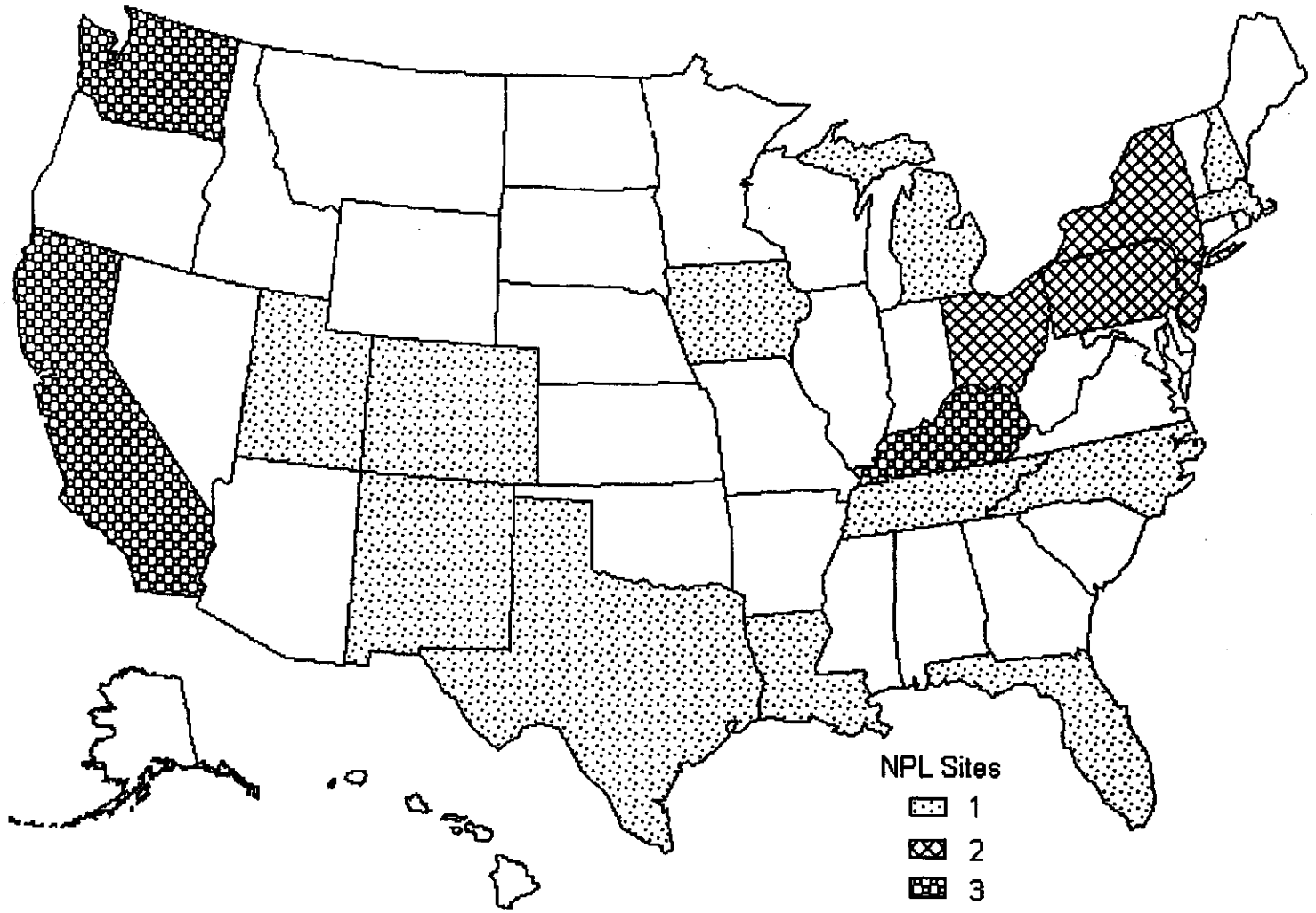


FIGURE 4
Landfill Cells & County Site Location Map

MEC Landfill

Figure 5 Frequency of NPL Sites with Hydrogen Sulfide Contamination



*Derived fromHazDat 1998

Reference: ATSDR's Toxicological Profile dated July 1999

FIGURE 5
Frequency of NPL Sites with
Hydrogen Sulfide

MEC Landfill

MEC Landfill
5 Minute Hydrogen Sulfide Air Concentrations
Location #1
07/17/00 - 07/20/00

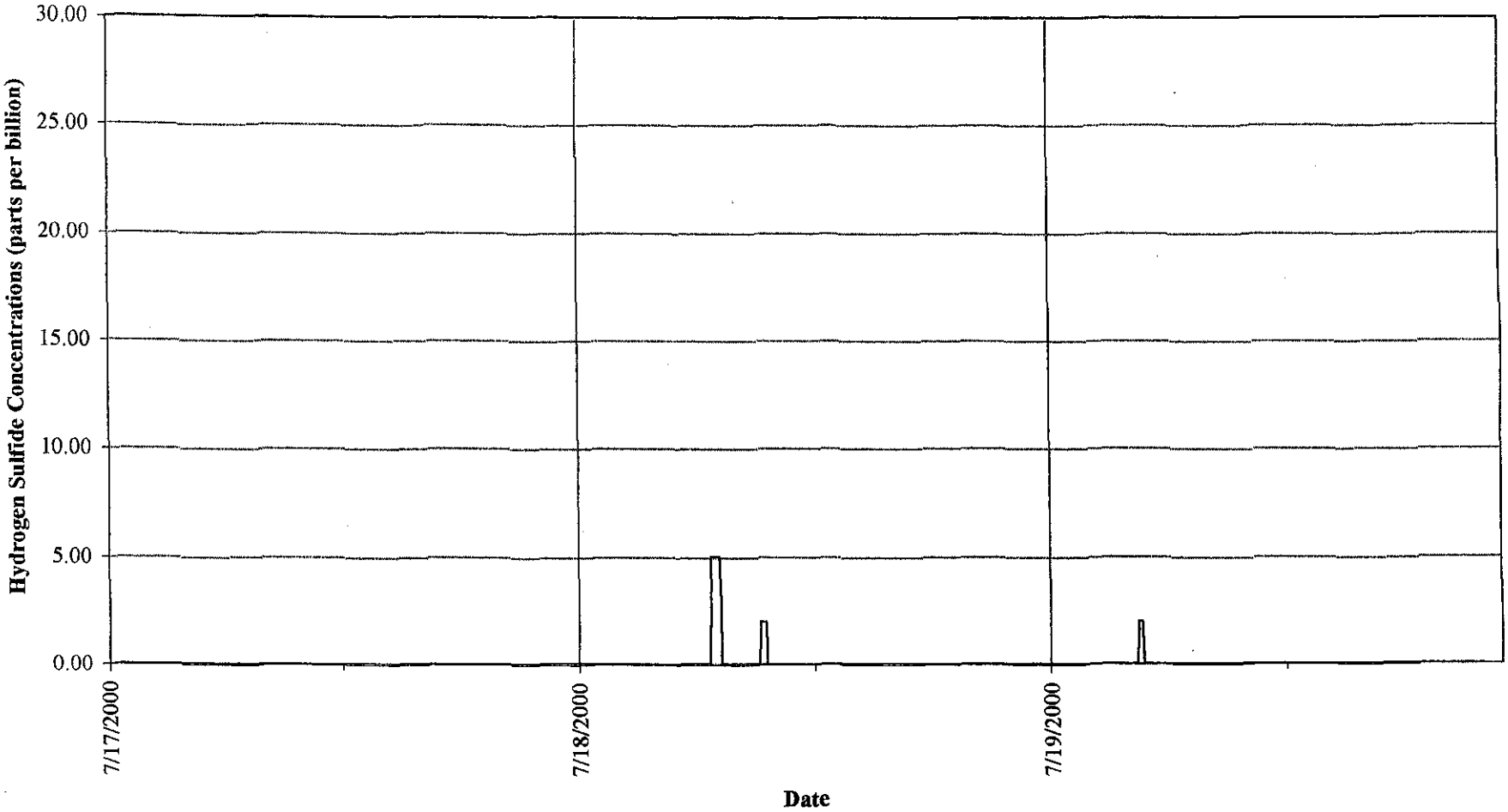
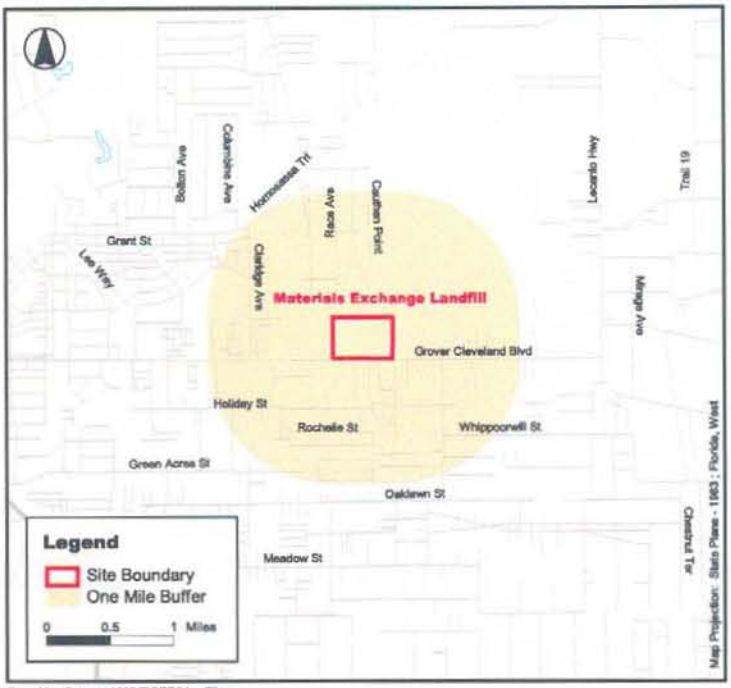


FIGURE 6

Materials Exchange Landfill

Homosassa, Florida

FIGURE 3
Demographics
MEC Landfill



Base Map Source: 1995 TIGER/Line Files

Citrius County, Florida

Demographic Statistics Within Specified Distance*	1mi	2mi
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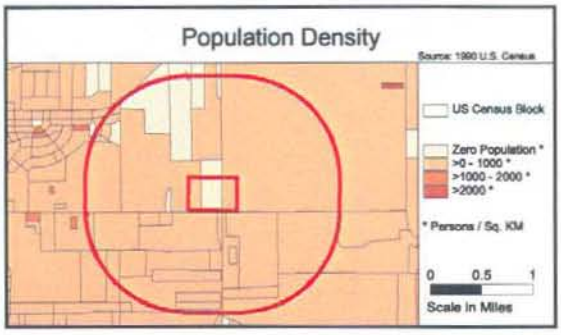
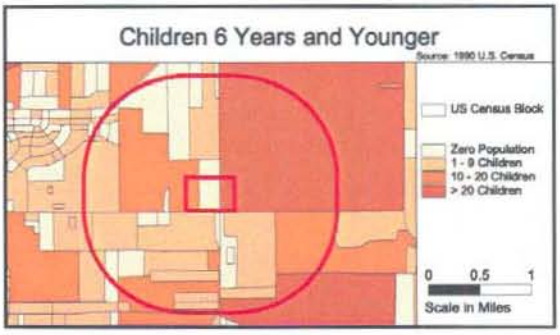
Demographics Statistics Source: 1990 US Census
*Calculated using an area-proportion spatial analysis technique





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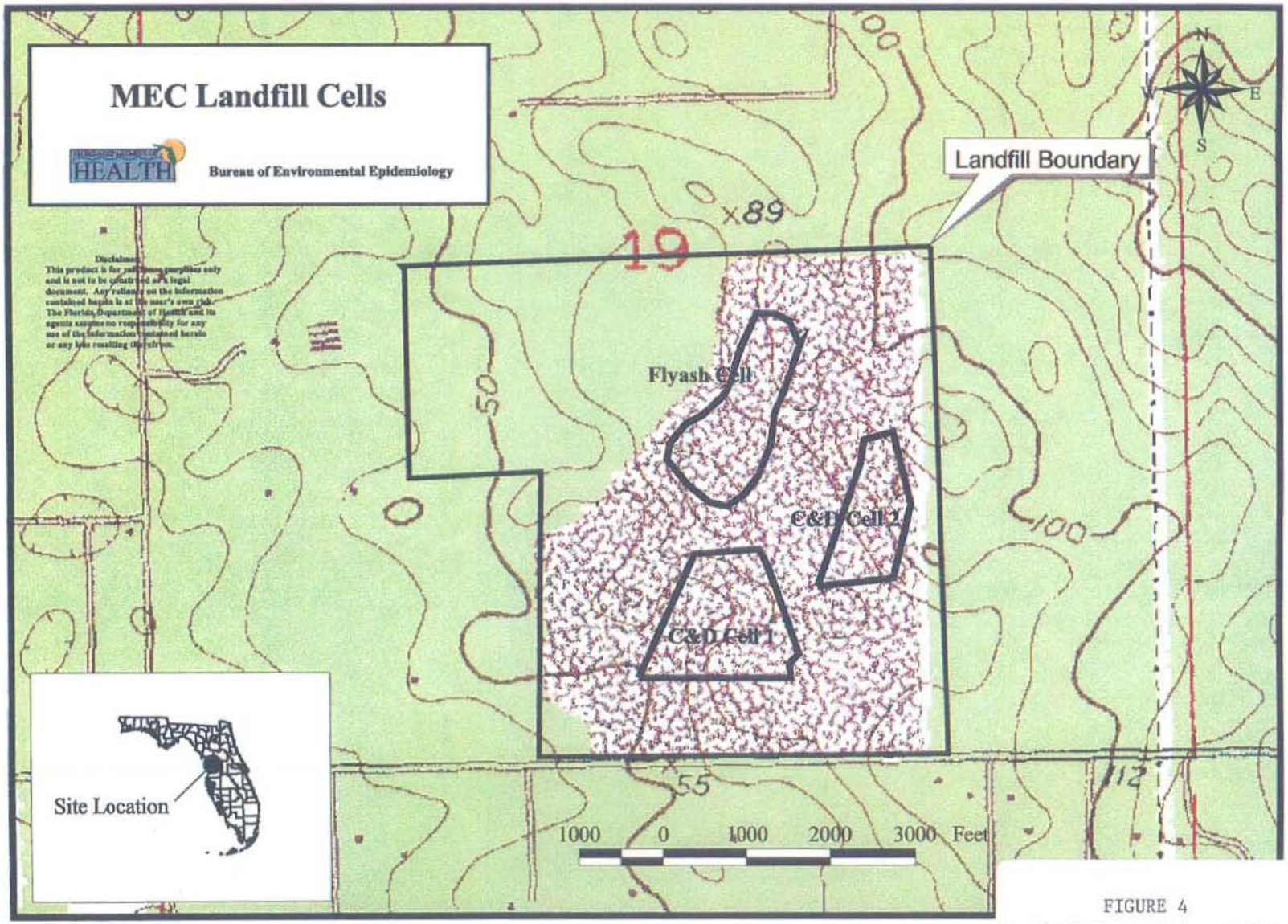


FIGURE 4
Landfill Cells & County Site Location Map
MEC Landfill

MEC Landfill
5 Minute Hydrogen Sulfide Air Concentrations
Location# 1
08/24/00 - 09/20/00

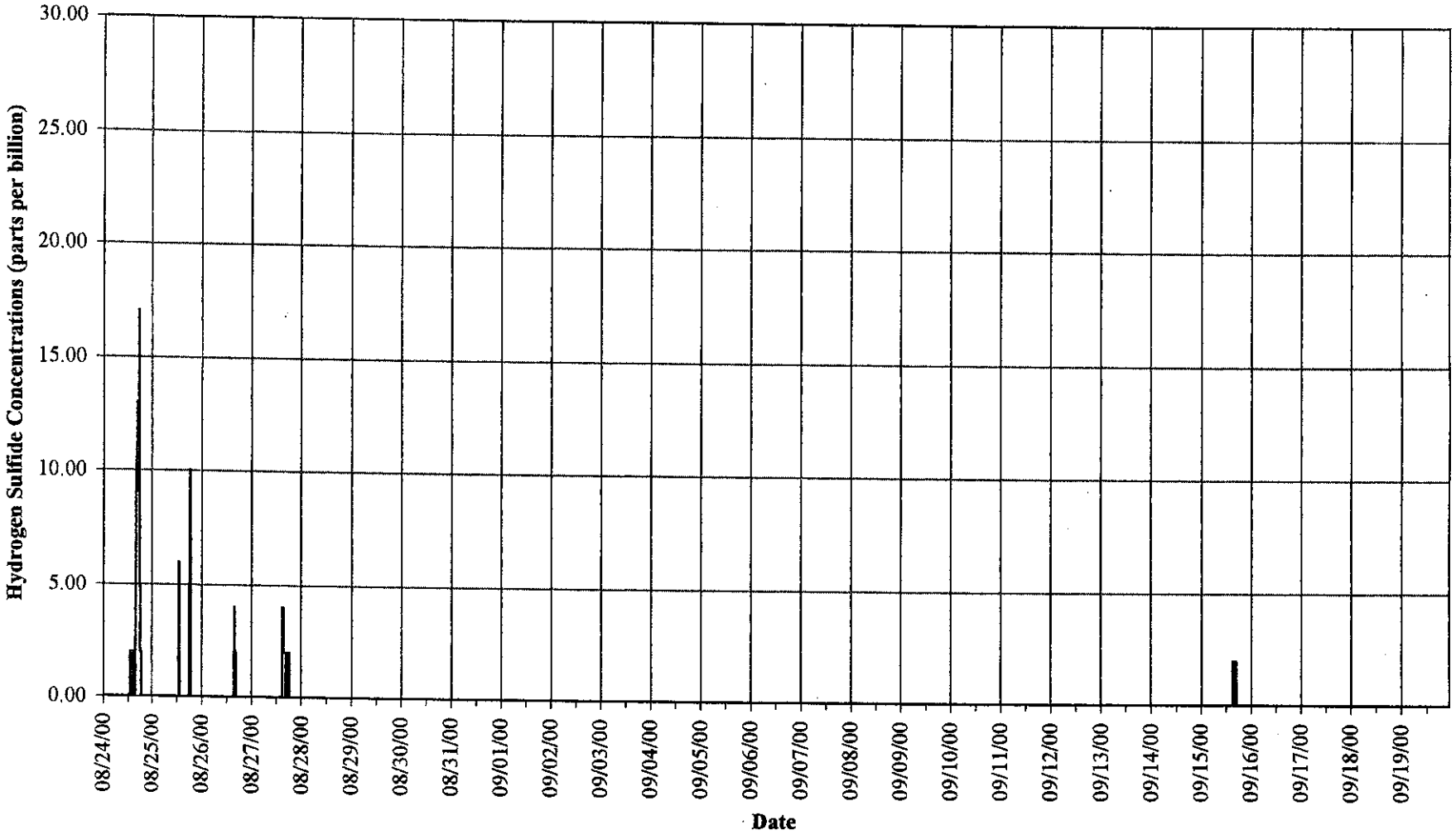
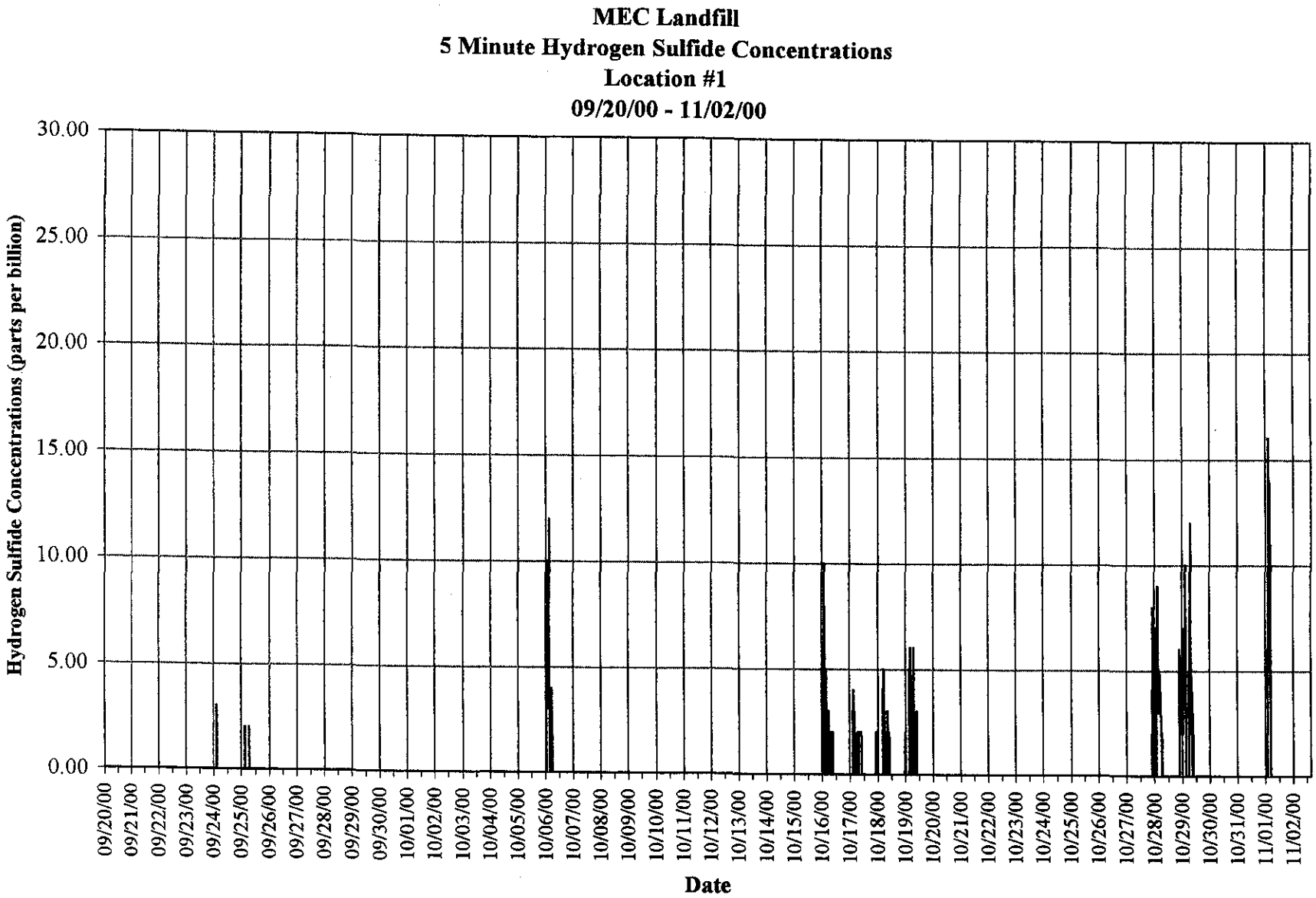


FIGURE 7


MEC Landfill
5 Minute Hydrogen Sulfide Concentrations
Location #1
09/20/00 - 11/02/00
Hydrogen Sulfide Concentrations (parts per billion)
30.00
25.00
20.00
15.00
10.00
5.00
0.00
09/20/00
09/21/00
09/22/00
09/23/00
09/24/00
09/25/00
09/26/00
09/27/00
09/28/00
09/29/00
09/30/00
10/01/00
10/02/00
10/03/00
10/04/00
10/05/00
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10/23/00
10/24/00
10/25/00
10/26/00
10/27/00
10/28/00
10/29/00
10/30/00
10/31/00
11/01/00
11/02/00
Date

FIGURE 8

MEC Landfill
5 Minute Hydrogen Sulfide Air Concentrations
Location #1
11/02/00 - 01/13/01

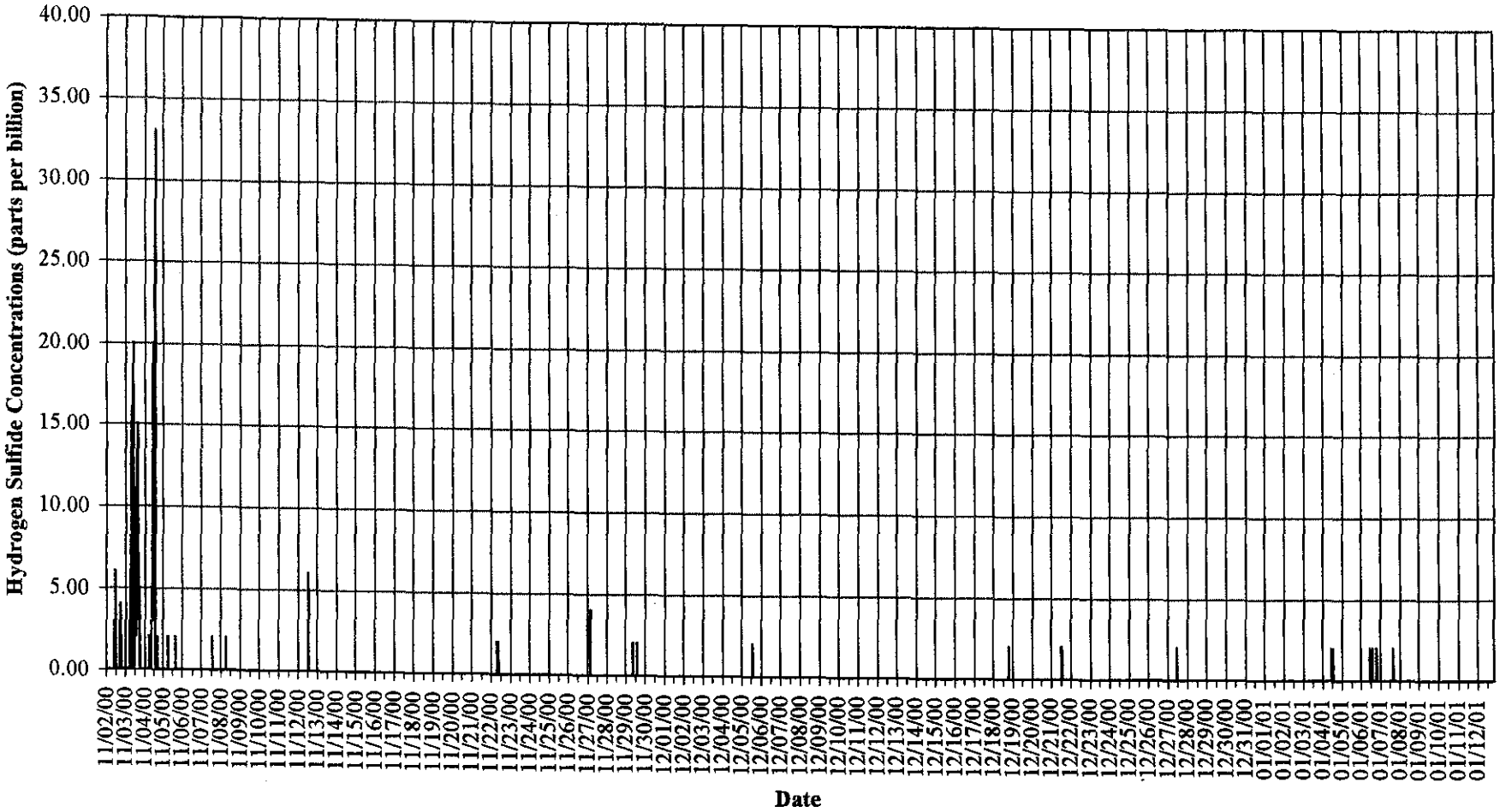


FIGURE 9

MEC Landfill
5 Minute Hydrogen Sulfide Air Concentrations
Location #1
01/13/01 - 03/14/01

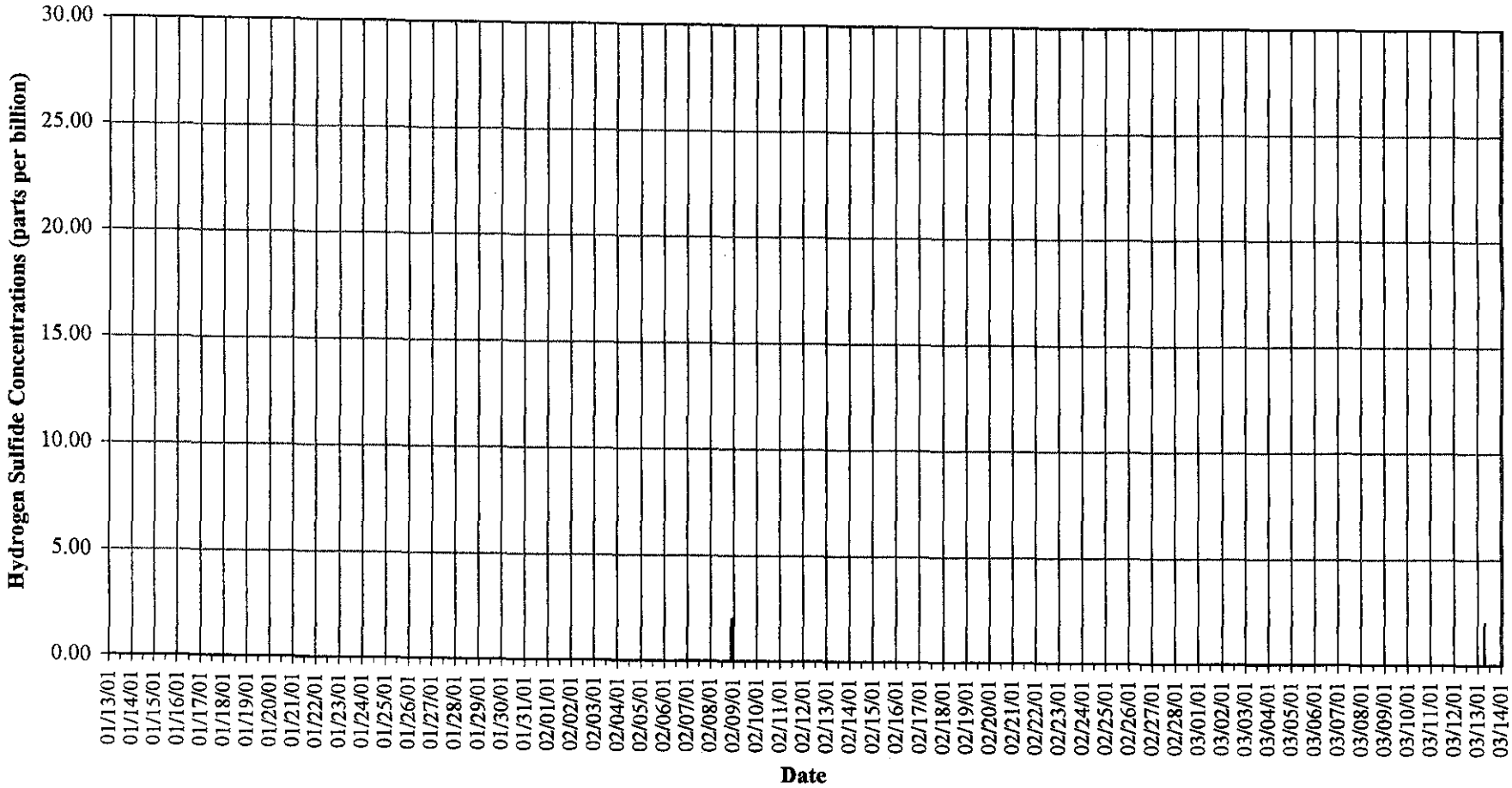


FIGURE 10

MEC Landfill
5 Minute Hydrogen Sulfide Air Concentrations
Location #2
07/17/00 - 08/24/00

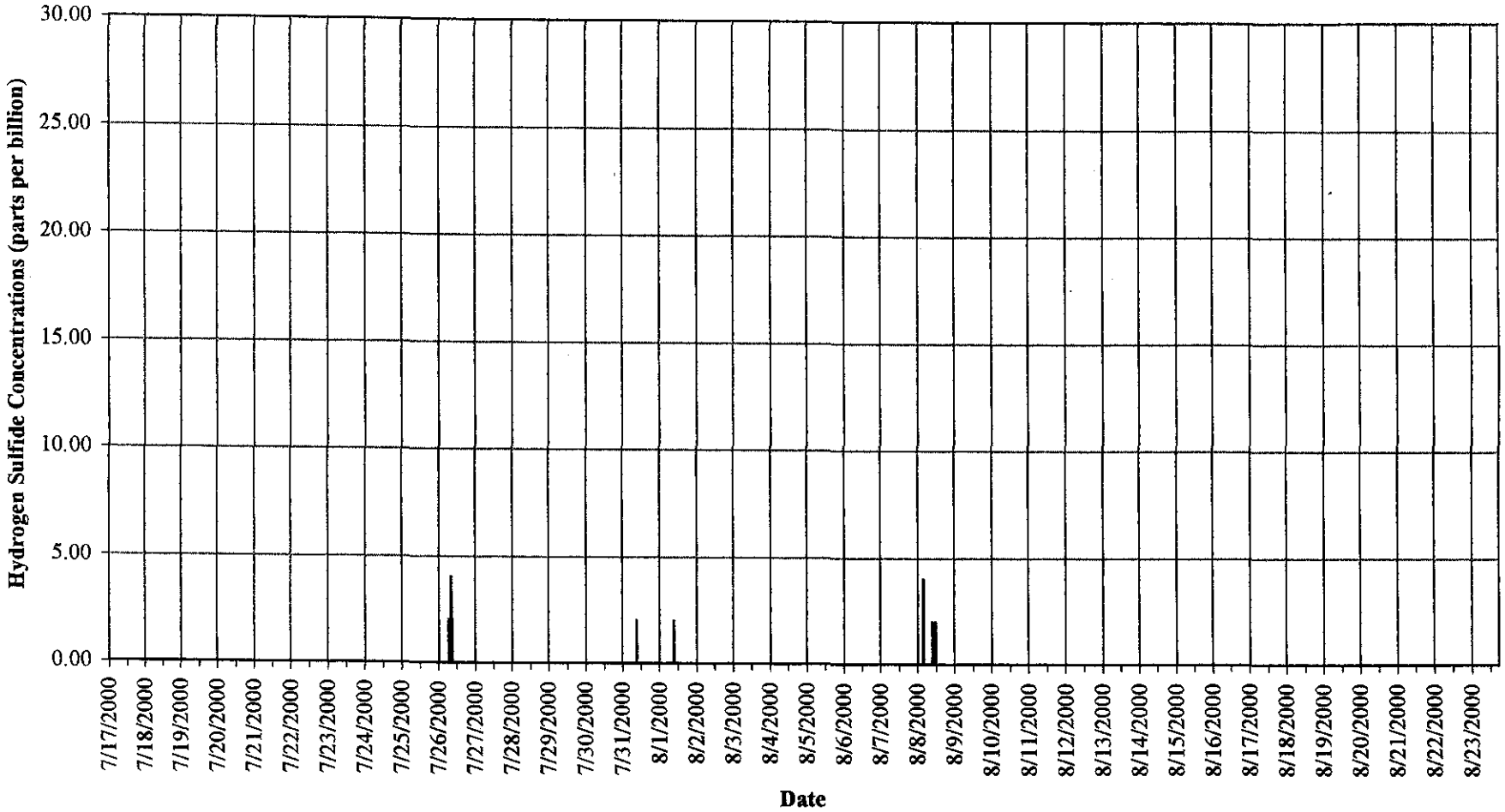


FIGURE 11

MEC Landfill
5 Minute Hydrogen Sulfide Concentrations
Location #2
08/24/00 - 09/20/00

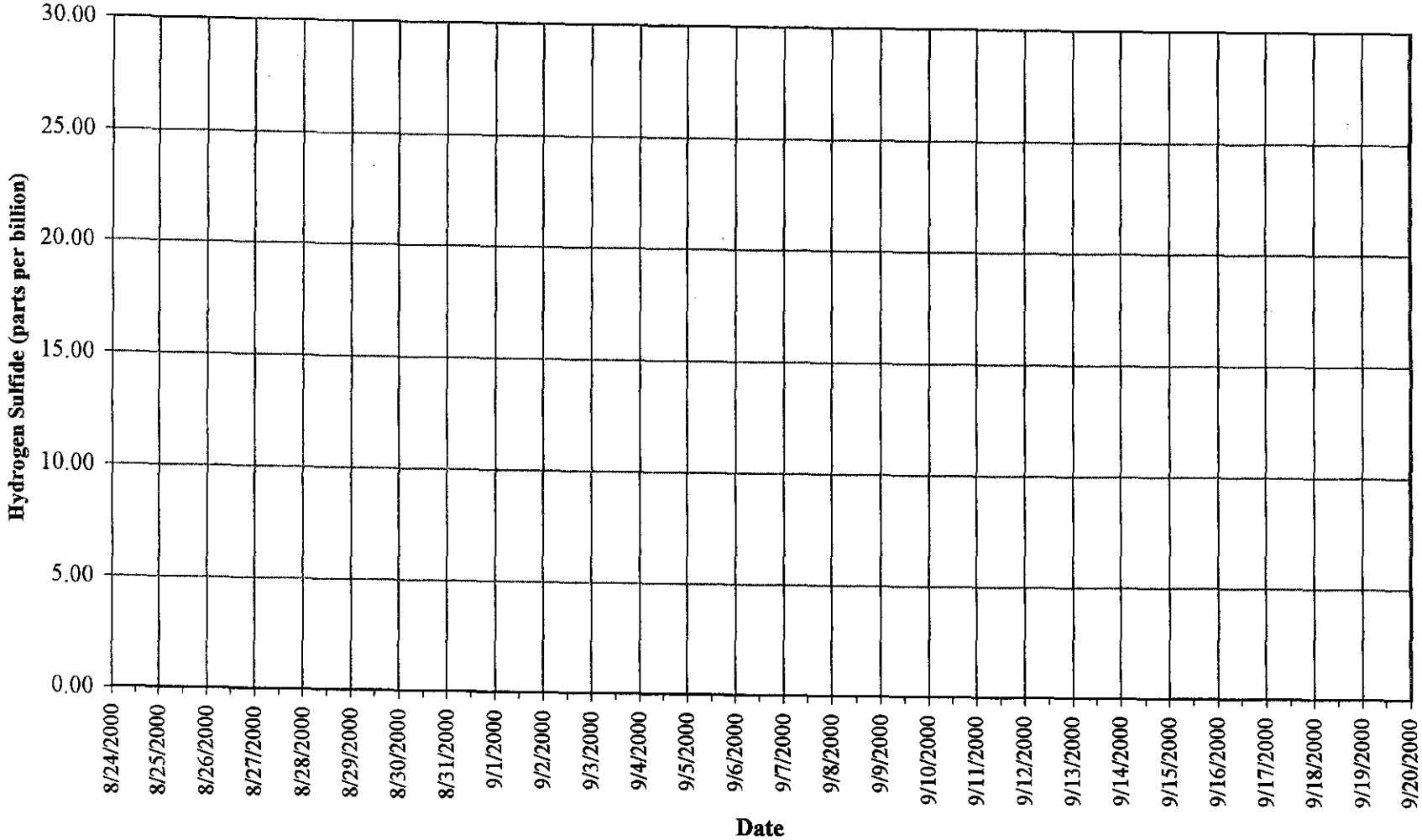
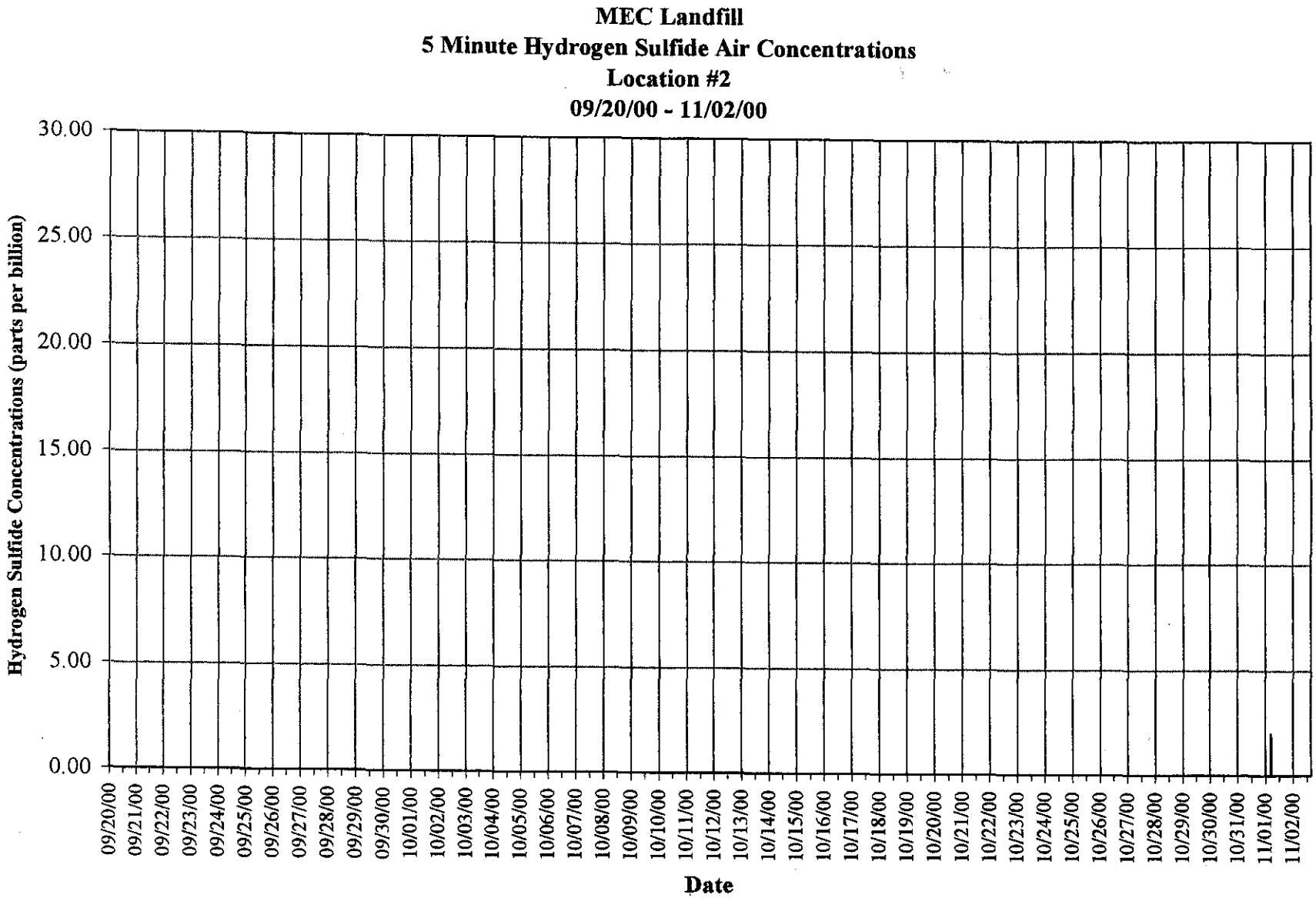


FIGURE 12


MEC Landfill
5 Minute Hydrogen Sulfide Air Concentrations
Location #2
09/20/00 - 11/02/00
Hydrogen Sulfide Concentrations (parts per billion)
30.00
25.00
20.00
15.00
10.00
5.00
0.00
09/20/00
09/21/00
09/22/00
09/23/00
09/24/00
09/25/00
09/26/00
09/27/00
09/28/00
09/29/00
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10/17/00
10/18/00
10/19/00
10/20/00
10/21/00
10/22/00
10/23/00
10/24/00
10/25/00
10/26/00
10/27/00
10/28/00
10/29/00
10/30/00
10/31/00
11/01/00
11/02/00
Date

FIGURE 13

MEC Landfill
5 Minute Hydrogen Sulfide Concentrations
Location #2
11/02/00 - 01/13/01

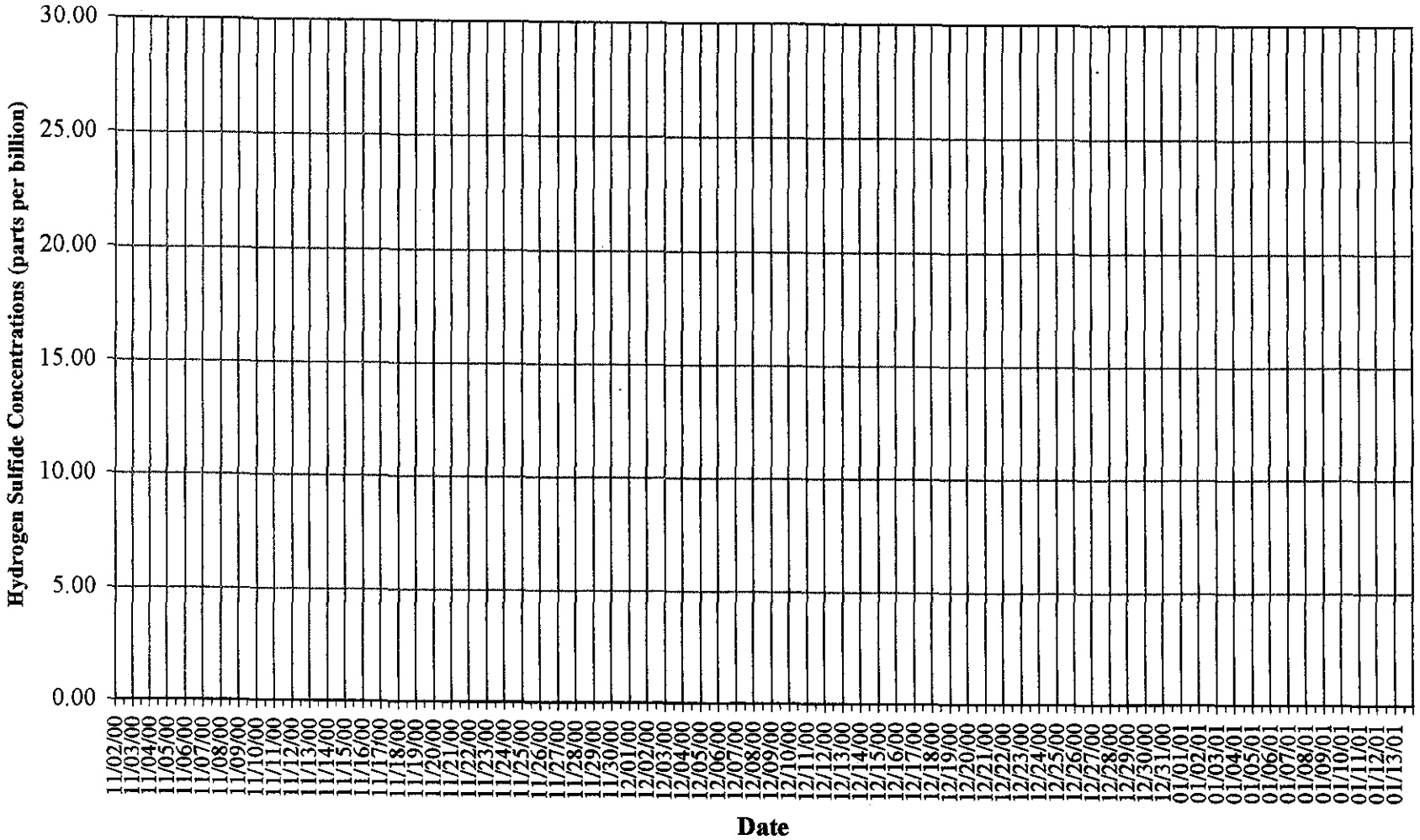


FIGURE 14

MEC Landfill
5 Minute Hydrogen Sulfide Air Concentrations
Location #2
01/13/01 - 03/14/01

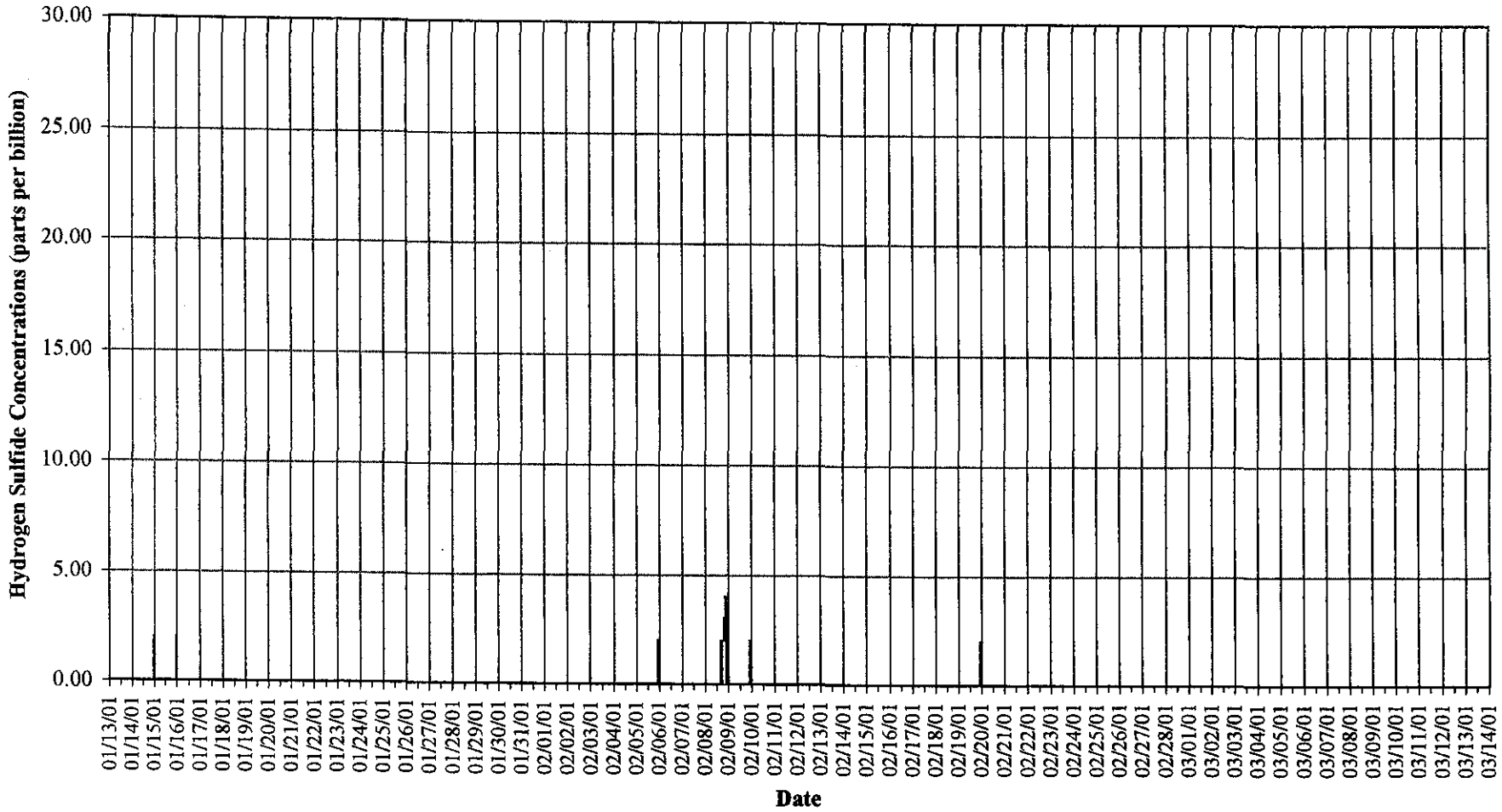


FIGURE 15

MEC Landfill
5 Minute Hydrogen Sulfide Air Concentrations
Location #3
07/17/00 - 08/24/00

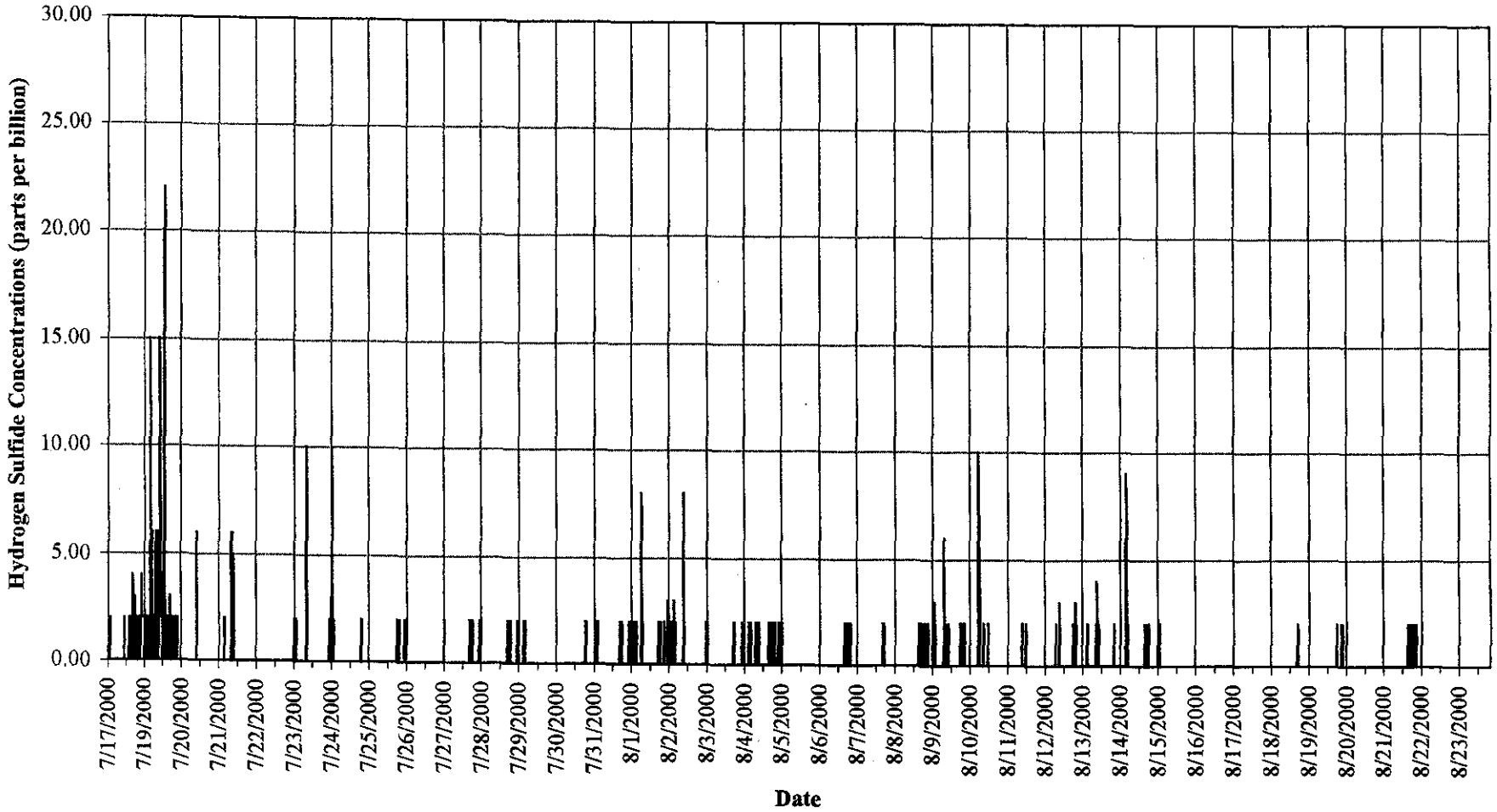


FIGURE 16

MEC Landfill
5 Minute Hydrogen Sulfide Concentrations
Location #3
08/24/00 - 09/20/00

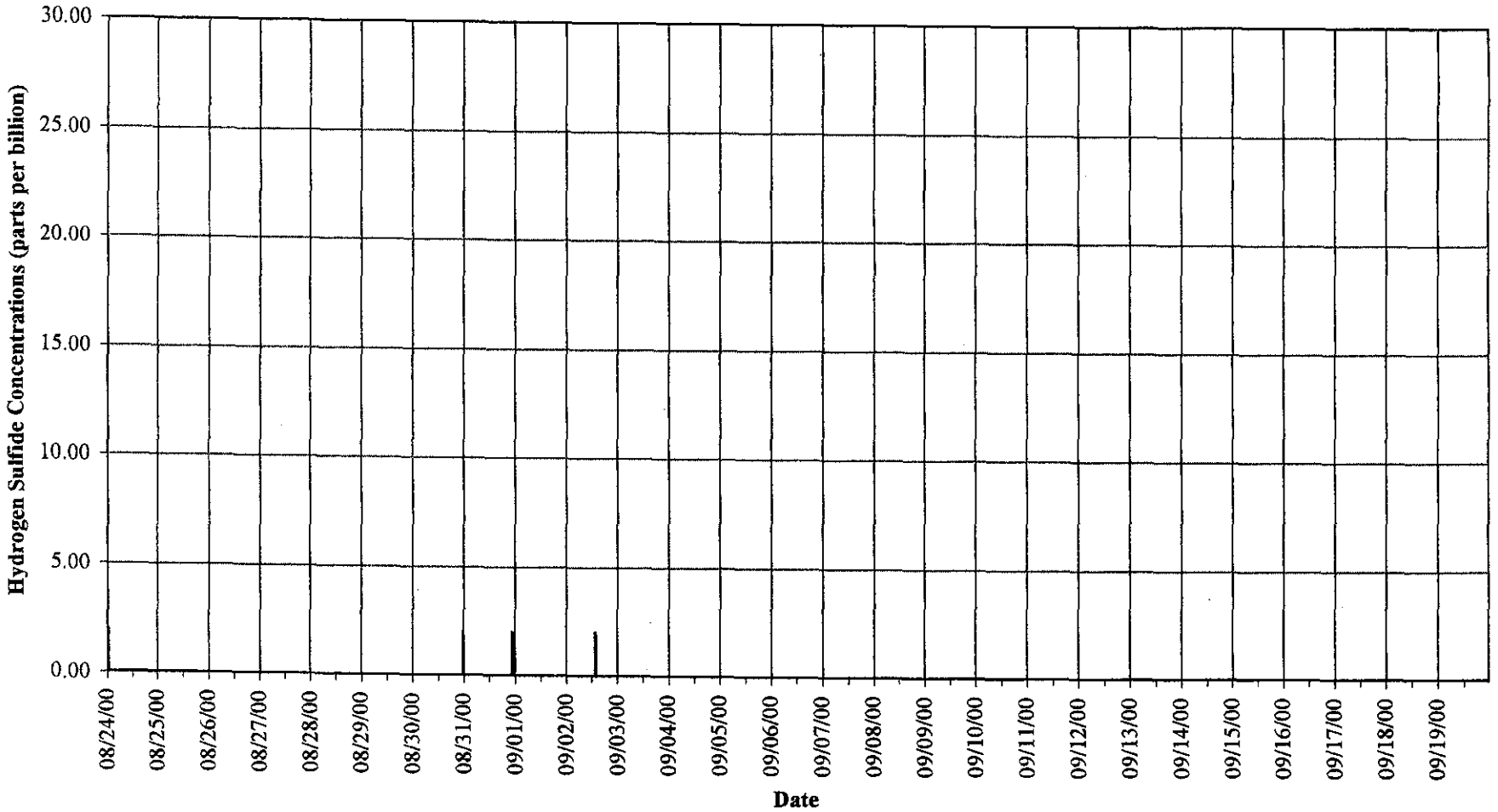
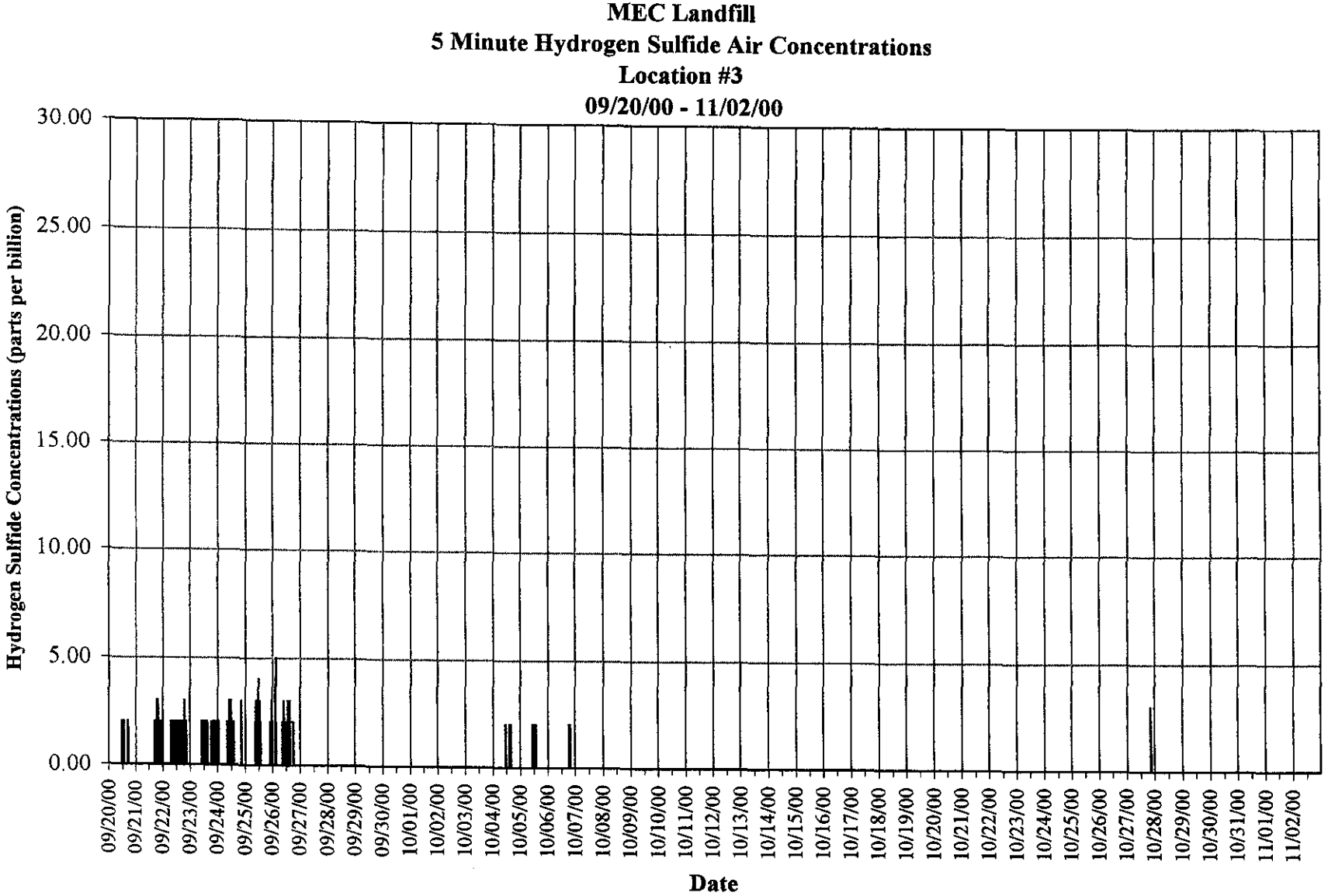


FIGURE 17


MEC Landfill
5 Minute Hydrogen Sulfide Air Concentrations
Location #3
09/20/00 - 11/02/00
Hydrogen Sulfide Concentrations (parts per billion)
30.00
25.00
20.00
15.00
10.00
5.00
0.00
09/20/00
09/21/00
09/22/00
09/23/00
09/24/00
09/25/00
09/26/00
09/27/00
09/28/00
09/29/00
09/30/00
10/01/00
10/02/00
10/03/00
10/04/00
10/05/00
10/06/00
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10/15/00
10/16/00
10/17/00
10/18/00
10/19/00
10/20/00
10/21/00
10/22/00
10/23/00
10/24/00
10/25/00
10/26/00
10/27/00
10/28/00
10/29/00
10/30/00
10/31/00
11/01/00
11/02/00
Date

FIGURE 18

MEC Landfill
5 Minute Hydrogen Sulfide Air Concentrations
Location #3
11/02/00 - 01/13/01

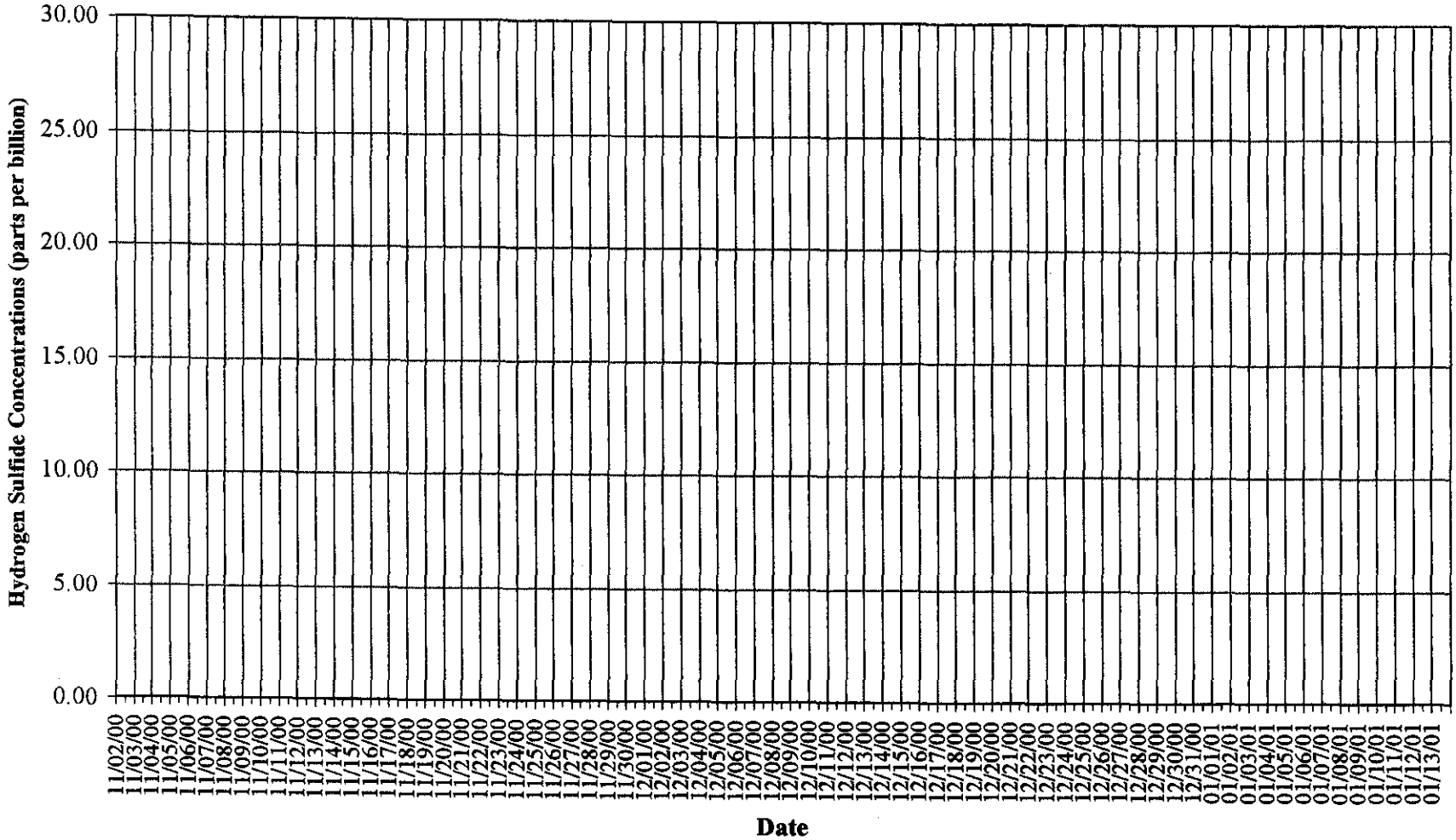

FIGURE 19

MEC Landfill
5 Minute Hydrogen Sulfide Air Concentrations
Location #3
01/13/01 - 03/14/01

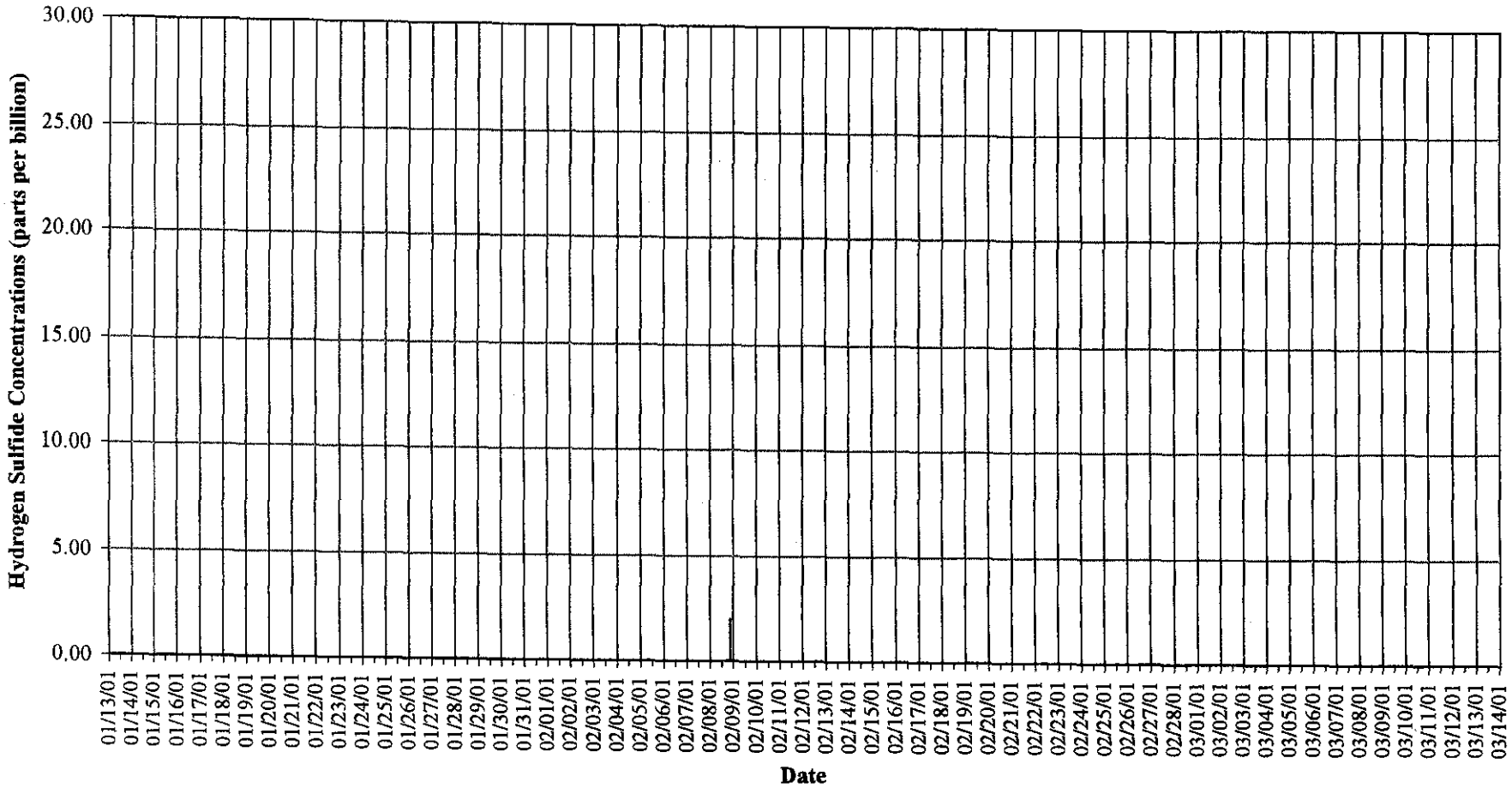

FIGURE 20

TABLE I

BROOKSVILLE AIRPORT WEATHER
OCTOBER 2000 - MARCH 2001

Date	Total Rainfall (inches)	Dominant Wind Direction	Average Wind Speed (mph)	Mean Temperature (degrees Fahrenheit)
July 1 - July 26, 1999	5.27	E	3.94	NA
Aug 1 - Aug 30 1999	7.45	ESE	4.4	NA
Sept 1 - Sept 26 1999	5.08	E	5.66	NA
Oct 1999	3.31	NE	6.90	NA
Nov 1999	6.28	NE	5.80	NA
Dec 1999	0.88	NNE	5.00	NA
Jan 2000	1.80	W	6.10	NA
Feb 2000	0.14	W	5.40	NA
Mar 2000	0.52	W	6.90	NA
Apr 2000	0.76	W	6.90	NA
May 2000	0.30	W	6.70	NA
June 2000	6.15	NE	5.70	78
July 2000	8.77	WSW	5.20	80.1
Aug 1 - Aug 30 1999	5.00	NE	4.10	80.2
Sept 22 - Sept 30	0.43	WNW/NE	6.50	80.1
October 2000	0.07	NNE	6.60	70.4

November 2000	1.4	NE	4.70	61.3
Date	Total Rainfall (inches)	Dominant Wind Direction	Average Wind Speed (mph)	Mean Temperature (degrees Fahrenheit)
December 2000	0.94	N	6.40	56.5
January 2001	3.65	WNW	5.30	51.5
February 2001	0.57	NE	5.90	65.4
March 1 - 14, 2001	1.75	W	7.73	62.9

July 1999 - March 2001 data is unedited data from ols.ncdc.noaa.gov from the Brooksville Airport
Dominant Wind Direction indicates direction from which wind blows
NA = Not Available

TABLE II

LOCATION #2 WEATHER
SEPTEMBER 22, 2000 - MARCH 14, 2001

Date	Total Rainfall (inches)	Dominant Wind Direction	Average Wind Speed (mph)	Mean Temperature (degrees Fahrenheit)
Sept 22 - 30, 2000	0.12	NNE	1.93	77.7
October 2000	0.08	NE	2.00	68.8
November 2000	1.93	N	1.30	59.8
December 2000	0.80	NE	2.10	53.9
January 2001	2.40	WNW	1.80	50.0
February 2001	0.35	NE	1.90	63.3
March 1 - 14, 2001	1.64	WNW	2.84	62.5

TABLE III

MAXIMUM HYDROGEN SULFIDE CONCENTRATIONS
LOCATION #1
JULY 17, 2000 - MARCH 14, 2001

Month	Maximum H_2S Concentration (ppb)	Date(s)	Time detected (min)
July 2000*	5	7/18/00 7/19/00	11:50 - 11:55 p.m. (5 min) 12:00 - 12:15 a.m (15 min)
August 2000	17	8/25/00	5:40 - 5:50 a.m. (10 min)
September 2000	3	9/24/00	2:02 - 2:42 a.m. (40 min)
October 2000	12 12	10/6/00 10/29/00	2:47 - 2:57 a.m. (10 min) 6:52 - 7:17 a.m. (25 min)
November 2000	33	11/5/00	4:40 - 5:05 a.m. (25 min)
December 2000	2**	12/6/00 12/19/00 12/22/00 12/28/00	4:35 - 4:45 a.m. (10 min) 9:55 - 10:05 a.m. (10 min) 3:35 - 4:30 a.m. (25 min) 2:15 - 2:25 a.m. (10 min)
January 2001	2** 2** 2**	1/5/01 1/7/01 1/8/01	2:20 - 3:15 a.m. (55 min) 3:50 - 4:00 a.m. (10 min) 4:20 - 4:30 a.m. (10 min) 1:55 - 2:05 a.m. (10 min) 5:25 - 5:35 a.m. (10 min) 10:15 - 10:40 a.m. (25 min) 7:05 - 7:15 a.m. (10 min)
February 2001	2**	2/9/01	8:49 - 8:59 a.m. (10 min)
March 2001	2**	3/13/01	5:04 - 5:14 p.m. (10 min)

* Note: From 7/21/00 - 8/23/00 the air monitor malfunctioned.

** Note: The air monitor's lowest detection limit is 2 ppb.

*** Several minutes less than 24 hours of Hydrogen sulfide readings were recorded on 7/17/00, 8/24/00, 9/20/00, 11/2/00 and 3/14/01 due to change in tapes

H_2S = hydrogen sulfide ppb = parts per billion

Hydrogen sulfide concentrations were recorded every five minutes

TABLE IV

MAXIMUM 24 HOUR AVERAGE HYDROGEN SULFIDE CONCENTRATIONS
LOCATION #1
JULY 17, 2000 - MARCH 14, 2001

	Maximum 24 Hour Average H_2S Concentration (ppb)	Date of Maximum 24 Hour H_2S Concentration
July 2000	1.6	7/19/00
August 2000	1.9	8/25/00
September 2000	1.1	9/24/00
October 2000	1.7	10/6/00
November 2000	3.9	11/5/00
December 2000	1.0	12/22/00
January 2001	1.1	1/5/01
February 2001	1.0	2/9/01
March 20001	1.0	3/13/01

Note: Calculated 24hr. averages using 1 ppb (½ detection limit of 2 ppb) rather than 0 ppb
Hydrogen sulfide concentrations were recorded every 5 minutes
H_2S = hydrogen sulfide ppb = parts per billion

TABLE V

MAXIMUM HYDROGEN SULFIDE CONCENTRATIONS
LOCATION #2
JULY 17, 2000 - MARCH 14, 2001

Month	Maximum H_2S Concentrations (ppb)	Date (s)	Time Detected (min)
July 2000	4	7/27/00	2:37 - 2:47 a.m. (10 min)
August 2000	4	8/8/00	10:17 - 10:27 p.m. (10 min)
September 2000	0	all month	all month
October 2000	0	all month	all month
November 2000	2*	11/1/00	4:29 - 5:09 a.m. (40 min)
December 2000	0	all month	all month
January 2001	2*	1/15/01 1/16/01	10:08 - 11:08 a.m. (60 min) 10:03 - 10:13 a.m. (10min)
February 2001	4	2/9/01	8:13 - 8:23 a.m. (10 min)
March 2001	0	up to 3/14/01	3/1/01 to 3/14/01

*Note: The air monitor's lowest detection limit is 2 ppb.
Hydrogen sulfide concentrations were recorded every 5 minutes.
Several minutes less than 24 hours of hydrogen sulfide concentrations were recorded on 7/17/00, 8/24/00 and 3/14/01 due to change in tapes
H_2S = hydrogen sulfide ppb = parts per billion

TABLE VI

MAXIMUM 24 HOUR AVERAGE HYDROGEN SULFIDE CONCENTRATIONS
LOCATION #2
JULY 17, 2000 - MARCH 14, 2001

	Maximum 24 Hour Average H_2S Concentration (ppb)	Date of Maximum 24 Hour H_2S Concentration
July 2000	1.1	7/27/00
August 2000	1.0	8/8/00
September 2000	0.0	all month
October 2000	0.0	all month
November 2000	1.0	11/1/00
December 2000	0.0	all month
January 2001	1.1	1/15/01
February 2001	1.3	2/9/01
March 20001	0.0	3/1/01 to 3/14/01

Note: Calculated 24hr. averages using 1 ppb (½ detection limit of 2 ppb) rather than 0 ppb.
Hydrogen sulfide readings were recorded every 5 minutes
H_2S = hydrogen sulfide ppb = parts per billion

TABLE VII

MAXIMUM HYDROGEN SULFIDE CONCENTRATIONS
LOCATION #3
JULY 17, 2000 - MARCH 14, 2001

Month	Maximum H2S Concentrations (ppb)	Date (s)	Time Detected (min)
July 2000	22	7/20/00	6:08 - 6:18a.m.(10min)
August 2000	10	8/10/00	10:28- 10:43a.m. (15min)
September 2000	5	9/26/00	2:33 -2:43 a.m. (10 min)
October 2000	3	10/27/00	8:18 8:28 p.m. (10 min)
November 2000	0	all month	all month
December 2000	0	all month	all month
January 2001	0	all month	all month
February 2001	2	2/9/01	8:03 - 8:08 a.m. (5 min)
March 2001	0	all month	every 5 minutes

*Note: The air monitor's lowest detection limit is 2 ppb.
Hydrogen sulfide concentrations were recorded every 5 minutes.
Several minutes less than 24 hours of hydrogen sulfide concentrations were recorded on 7/17/00, 8/24/00 and 3/14/01 due to change in tapes
H_2S = hydrogen sulfide ppb = parts per billion

TABLE VIII

MAXIMUM 24 HOUR AVERAGE HYDROGEN SULFIDE CONCENTRATIONS
LOCATION #3
JULY 17, 2000 - MARCH 14, 2001

	Maximum H2S 24 hour Average (ppb)	Date of Maximum 24 Hour H_2S Concentration
July 2000	2.3	7/20/00
August 2000	1.3	8/10/00
September 2000	1.4	9/26/00
October 2000	1.0	10/4/00
November 2000	0.0	11/1, 11/3 - 11/30/00
December 2000	0.0	all month
January 2001	0.0	all month
February 2001	1.0	all month
March 20001	0.0	3/1 - 3/14/01

Note: Calculated 24hr. averages using 1 ppb (½ detection limit of 2 ppb) rather than 0 ppb.
Hydrogen sulfide readings were recorded every 5 minutes
H_2S = hydrogen sulfide ppb = parts per billion

APPENDICES A THROUGH E

Agency for Toxic Substances and Disease Registry
U.S. Department of Health and Human Services
Atlanta, Georgia 30333
and the
Florida Department of Health
Bureau of Environmental Epidemiology
Tallahassee, Florida 32399-1712

Consent for Access to Property (Environmental Sample Collection)

The Materials Exchange Corporation Homosassa Springs, Florida Exposure Investigation

The Agency for Toxic Substances and Disease Registry (ATSDR) of the U.S. Department of Health and Human Services in conjunction with the Florida Department of Health (FDOH), are conducting an exposure investigation. Participation in this investigation is voluntary. The authority for collecting information in this investigation is the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (42 U.S.C. 9604 (i)). Your participation in this investigation will help to measure possible airborne concentrations of hydrogen sulfide and other sulfur-containing compounds in or near your home.

This part of the investigation involves air sampling on your property. The air will be continuously monitored using a hydrogen sulfide tape-meter. We may also take a limited number of grab samples that will be collected by capturing air into a glass coated stainless steel container.

Participation

Furnishing any information is voluntary and you may choose to stop participating at any time, even after signing this consent form. If you choose not to participate, or to stop at any time, there will be no penalty.

Results

The air sample results will be mailed to you within 2 months after the collection period has ended. A summary of all results will also be interpreted and made available without personal identification to the community, the US Environmental Protection Agency (EPA) and the Florida Department of Environmental Protection (FDEP). ATSDR will use the results to determine if the compounds and ranges of concentrations found in your air are at levels which would require additional sampling. ATSDR will prepare a report of their findings. FDOH will prepare a health consultation to explain the air monitoring data and share this information with the community. Please be advised that

FDOH field notes, data and reports are public records, and thus are available to the public upon request.

If you have any questions please contact:

Robert Johnson or Debra Gable, ATSDR at (404) 639-0616
or Susan Bland, FDOH at 1-877-798-2772 (toll free)

Directions: If you do not understand the description of this portion of the exposure investigation, please ask questions. If you agree to participate, please sign the attached consent form.

CONSENT FOR ACCESS TO PROPERTY, WAIVER AND RELEASE

Name:

Description of Property (include street address and phone number):

I hereby consent to the entry and presence on my property of employees of the Agency for Toxic Substances and Disease Registry (ATSDR), the Florida Department of Health (FDOH) and agents authorized by ATSDR, engaged in collection of samples on the above described property for the purposes of analysis. Should the assistance of an ATSDR or an FDOH representative be required, I consent to their access at reasonable times to the above described property.

I am the property owner, or an individual having the authority or the authorization of the property owner to make this access agreement.

I realize that these actions are taken pursuant to ATSDR's response authority under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, 42 U.S.C. 9601, et seq. I hereby release the FDOH and ATSDR, their employees and agents, from liability for any harm traceable to the ordinary use of the testing and monitoring equipment installed by them in and on my property. I further waive any claims arising now or in the future which relate to the collection of samples and data and conclusions based thereon.

This written permission is given by me voluntarily with full knowledge of my right to refuse and without threats or promises of any kind.

_____ _____

Signature Date

Agency for Toxic Substances and Disease Registry
U.S. Department of Health and Human Services
Atlanta, Georgia 30333
and the
Florida Department of Health
Bureau of Environmental Epidemiology
Tallahassee, Florida 32399-1712

Consent to Access to Property
(Environmental Sample Collection)

The Materials Exchange Corporation
Homosassa Springs, Florida
Exposure Investigation

The Agency for Toxic Substances and Disease Registry (ATSDR) of the U.S. Department of Health and Human Services in conjunction with the Florida Department of Health (FDOH), are conducting an exposure investigation. Participation in this investigation is voluntary. The authority for collecting information in this investigation is the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (42 U.S.C. 9604 (i)). Your participation in this investigation will help to measure possible airborne concentrations of hydrogen sulfide and other sulfur-containing compounds in or near your home.

This part of the investigation involves air sampling on your property. Your neighbor, _____ will collect a grab sample from your property. He will collect the sample by capturing air into a glass coated stainless steel canister. _____ will follow specific instructions given to him by the Florida Department of Health and Citrus County Health Department representatives. He will send the canister to DataChem Laboratories within 24 hours.

Participation

Furnishing any information is voluntary and you may choose to stop participating at any time, even after signing this consent form. If you choose not to participate, or to stop at any time, there will be no penalty.

Results

The air sample results will be mailed to you within 2 months after the collection period has ended. A summary of all results will also be interpreted and made available without personal identification to the community, the US Environmental Protection Agency (EPA) and the Florida Department of Environmental Protection (FDEP). ATSDR will use the results to determine if the compounds and ranges of concentrations found in your air are at levels which would require

additional sampling. ATSDR will prepare a report of their findings. FDOH will prepare a health consultation to explain the air monitoring data and share this information with the community.

If you have any questions please contact:

Susan Bland, FDOH at 1-877-798-2772 (toll free)
Robert Johnson or Debra Gable, ATSDR at (404) 639-0616

Directions: If you do not understand the description of this portion of the exposure investigation, please ask questions. If you agree to participate, please sign the attached consent form.

CONSENT FOR ACCESS TO PROPERTY

Name:

Description of Property (include address):

I hereby give consent for my neighbor, _____ to enter my property from _____ to _____ for the purpose of collecting air samples from the above described property according to ATSDR/FDOH's protocol. I understand that all sample gathering activity will comply with instructions of the FDOH and Citrus County Health Departments. I consent further to the same entry by County Health Department representatives if required for the same purpose.

I realize that these actions are taken pursuant to ATSDR's response authorities under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, 42 U.S.C. 9601 et seq.

I am the property owner, or have authority or the authorization of the property owner to make this access agreement.

This written permission is given by me voluntarily with full knowledge of my right to refuse and without threats or promises of any kind.

_____ _____

Signature Date

Instructions for collecting a grab air sample from a homeowner's property near MEC:

1. Dates for collecting air sample:

- Look at the calendar and note the dates during the month when you must collect a sample. You must collect an air sample within 2 weeks of receiving the silver Summa canister from the County Health Department. Otherwise, the sample results will be invalid.

- Note the odors outside your home. When the odors are strong, please collect an outdoor air sample on one of the dates allowed on the calendar. Collecting the sample on one of these specified dates is very important. The Data Chem laboratory is only open on certain days of the week. The laboratory must be open to receive the sample. They will analyze the air sample within 48 hours of receipt. The FDOH will receive a copy of the results within 30 days and mail you the results.

2. Completing the Analytical Request Form:

- Within 2 weeks of receiving the canister, pick a day on the calendar when there are high odors. Fill in the date of collection, time collected and date of shipment (same day or next day within 24 hours).

- Collector's name - please fill in your name and address.

3. Collecting an air sample:

- Please follow the instructions on the attached sheet , "DCL Instructions for grab sampling using 6 liter canisters" by Data Chem Laboratories.

- Label the canister as "Homossassa Springs - Your name" with piece of paper and affix to the canister with string or a twisty tie (no tape).

- Place the canister AND the completed analytical request form back in the original box.

- Tape box and affix Airborne shipping label (filled in by FDOH)

- Immediately, call Airborne Express at 1-800-247-2676 and tell them you have a overnight package. They will pick up the canister and deliver to DataChem Laboratories within 24 hours.

Summachecklistdec00.wpd

4. Shipping the air sample:

   Ship Overnight to: DataChem Laboratories
   960 West LeVoy Drive
   Salt Lake City, UT 84123

5. Note the smell of the odor and the times that day/week you smelled the odor. Call Susan Bland toll free at 1-877-798-2772 and give her this information. Also, let her know the date and time you mailed the canister back to the lab.

If you have any questions about these instructions, please call:

Susan Bland
Exposure Investigation Coordinator
Bureau of Environmental Epidemiology
Florida Department of Health

1-877-798-2772

DATA CHEM
LABORATORIES
A SORENSON COMPANY

DCL Instructions for grab sampling using 6 liter canisters

1) Remove canister from shipping container. Make sure valve handle on the canister is in the closed position. Black handled valve in closed position; Green handled valve closed hand tight. Remove the dust cap from the canister using a 9/16" wrench.

2) The canister is now ready to take a grab sample. Place the canister in the environment to be sampled. When sampling is to begin move the valve handle to the open position. Black handled valve one quarter turn to the open position. Green handled valve one full turn and **no more than one full turn.** A noticeable sound of air entering the canister should be heard. When there is no more sound of air entering the canister (approximately 1-2 minutes) the sampling is complete.

3) Close the valve and replace the dust cap on top of the canister. Place the canister in the shipping container and ship to DataChem Laboratories for analysis. immediately.

DataChem Laboratories
960 W. LeVoy Dr.
Salt Lake City, UT 84123
801-266-7700
1-800-356-9135

APPENDIX E
EXAMPLE OF RECORDED AIR MONITORING RAW DATA

Date	Time	Volts	Temp(F)	Conc(PPB)	Time	Date
02/08/01	22:33:52	2.02	68.91	0.00	22:33:52	2/8/01
02/08/01	22:38:52	2.02	68.80	0.00	22:38:52	2/8/01
02/08/01	22:43:52	2.02	68.54	0.00	22:43:52	2/8/01
02/08/01	22:48:52	2.02	68.39	0.00	22:48:52	2/8/01
02/08/01	22:53:52	2.02	68.30	0.00	22:53:52	2/8/01
02/08/01	22:58:52	2.01	68.08	0.00	22:58:52	2/8/01
02/08/01	23:03:52	2.02	67.99	0.00	23:03:52	2/8/01
02/08/01	23:08:52	2.02	67.91	0.00	23:08:52	2/8/01
02/08/01	23:13:52	2.02	67.76	0.00	23:13:52	2/8/01
02/08/01	23:18:52	2.02	67.56	0.00	23:18:52	2/8/01
02/08/01	23:23:52	2.02	67.17	0.00	23:23:52	2/8/01
02/08/01	23:28:52	2.01	66.77	0.00	23:28:52	2/8/01
02/08/01	23:33:52	2.01	66.50	0.00	23:33:52	2/8/01
02/08/01	23:38:52	2.02	66.34	0.00	23:38:52	2/8/01
02/08/01	23:43:52	2.01	66.07	0.00	23:43:52	2/8/01
02/08/01	23:48:52	2.02	65.80	0.00	23:48:52	2/8/01
02/08/01	23:53:52	2.02	65.59	0.00	23:53:52	2/8/01
02/08/01	23:58:52	2.01	65.59	0.00	23:58:52	2/8/01
02/09/01	0:03:52	2.01	65.41	0.00	0:03:52	2/9/01
02/09/01	0:08:52	2.02	65.29	0.00	0:08:52	2/9/01
02/09/01	0:13:52	2.02	65.14	0.00	0:13:52	2/9/01
02/09/01	0:18:52	2.02	64.95	0.00	0:18:52	2/9/01
02/09/01	0:23:52	2.14	64.81	0.00	0:23:52	2/9/01
02/09/01	0:28:52	2.13	64.83	0.00	0:28:52	2/9/01
02/09/01	0:33:52	2.14	64.81	0.00	0:33:52	2/9/01
02/09/01	0:38:52	2.23	64.95	0.00	0:38:52	2/9/01
02/09/01	0:43:52	2.23	65.04	0.00	0:43:52	2/9/01
02/09/01	0:48:52	2.23	65.04	0.00	0:48:52	2/9/01
02/09/01	0:53:52	2.14	65.02	0.00	0:53:52	2/9/01
02/09/01	0:58:52	2.14	64.87	0.00	0:58:52	2/9/01
02/09/01	1:03:52	2.14	64.75	0.00	1:03:52	2/9/01
02/09/01	1:08:52	2.11	64.59	0.00	1:08:52	2/9/01
02/09/01	1:13:52	2.11	64.55	0.00	1:13:52	2/9/01
02/09/01	1:18:52	2.11	64.53	0.00	1:18:52	2/9/01
02/09/01	1:23:52	2.01	64.55	0.00	1:23:52	2/9/01
02/09/01	1:28:52	2.01	64.53	0.00	1:28:52	2/9/01
02/09/01	1:33:52	2.02	64.55	0.00	1:33:52	2/9/01
02/09/01	1:38:52	2.02	64.55	0.00	1:38:52	2/9/01
02/09/01	1:43:52	2.01	64.38	0.00	1:43:52	2/9/01
02/09/01	1:48:52	2.01	64.29	0.00	1:48:52	2/9/01
02/09/01	1:53:52	2.14	64.24	0.00	1:53:52	2/9/01
02/09/01	1:58:52	2.14	64.19	0.00	1:58:52	2/9/01
02/09/01	2:03:52	2.14	64.09	0.00	2:03:52	2/9/01
02/09/01	2:08:52	2.17	63.99	0.00	2:08:52	2/9/01
02/09/01	2:13:52	2.17	63.85	0.00	2:13:52	2/9/01
02/09/01	2:18:52	2.17	63.68	0.00	2:18:52	2/9/01
02/09/01	2:23:52	2.20	63.47	0.00	2:23:52	2/9/01

Location #2

APPENDIX E
EXAMPLE OF RECORDED AIR MONITORING RAW DATA

02/09/01	2:28:52	2.20	63.20	0.00	2:28:52	2/9/01
02/09/01	2:33:52	2.20	63.00	0.00	2:33:52	2/9/01
02/09/01	2:38:52	2.20	62.76	0.00	2:38:52	2/9/01
02/09/01	2:43:52	2.20	62.51	0.00	2:43:52	2/9/01
02/09/01	2:48:52	2.20	62.35	0.00	2:48:52	2/9/01
02/09/01	2:53:52	2.26	62.30	2.00	2:53:52	2/9/01
02/09/01	2:58:52	2.26	62.32	2.00	2:58:52	2/9/01
02/09/01	3:03:52	2.27	62.23	2.00	3:03:52	2/9/01
02/09/01	3:08:52	2.26	62.18	2.00	3:08:52	2/9/01
02/09/01	3:13:52	2.26	62.05	2.00	3:13:52	2/9/01
02/09/01	3:18:52	2.26	61.75	2.00	3:18:52	2/9/01
02/09/01	3:23:52	2.24	61.41	0.00	3:23:52	2/9/01
02/09/01	3:28:52	2.23	61.10	0.00	3:28:52	2/9/01
02/09/01	3:33:52	2.23	60.85	0.00	3:33:52	2/9/01
02/09/01	3:38:52	2.23	60.60	0.00	3:38:52	2/9/01
02/09/01	3:43:52	2.23	60.43	0.00	3:43:52	2/9/01
02/09/01	3:48:52	2.23	60.20	0.00	3:48:52	2/9/01
02/09/01	3:53:52	2.23	60.03	0.00	3:53:52	2/9/01
02/09/01	3:58:52	2.23	59.91	0.00	3:58:52	2/9/01
02/09/01	4:03:52	2.23	59.80	0.00	4:03:52	2/9/01
02/09/01	4:08:52	2.26	59.61	2.00	4:08:52	2/9/01
02/09/01	4:13:52	2.26	59.52	2.00	4:13:52	2/9/01
02/09/01	4:18:52	2.27	59.31	2.00	4:18:52	2/9/01
02/09/01	4:23:52	2.26	59.14	2.00	4:23:52	2/9/01
02/09/01	4:28:52	2.26	58.95	2.00	4:28:52	2/9/01
02/09/01	4:33:52	2.26	58.77	2.00	4:33:52	2/9/01
02/09/01	4:38:52	2.33	58.62	2.00	4:38:52	2/9/01
02/09/01	4:43:52	2.33	58.44	2.00	4:43:52	2/9/01
02/09/01	4:48:52	2.32	58.32	2.00	4:48:52	2/9/01
02/09/01	4:53:52	2.36	58.22	2.00	4:53:52	2/9/01
02/09/01	4:58:52	2.36	58.17	2.00	4:58:52	2/9/01
02/09/01	5:03:52	2.36	58.14	2.00	5:03:52	2/9/01
02/09/01	5:08:52	2.35	58.09	2.00	5:08:52	2/9/01
02/09/01	5:13:52	2.36	58.01	2.00	5:13:52	2/9/01
02/09/01	5:18:52	2.36	57.94	2.00	5:18:52	2/9/01
02/09/01	5:23:52	2.36	57.91	2.00	5:23:52	2/9/01
02/09/01	5:28:52	2.33	57.99	2.00	5:28:52	2/9/01
02/09/01	5:33:52	2.33	58.01	2.00	5:33:52	2/9/01
02/09/01	5:38:52	2.33	57.99	2.00	5:38:52	2/9/01
02/09/01	5:43:52	2.33	57.99	2.00	5:43:52	2/9/01
02/09/01	5:48:52	2.33	57.91	2.00	5:48:52	2/9/01
02/09/01	5:53:52	2.33	57.96	2.00	5:53:52	2/9/01
02/09/01	5:58:52	2.35	57.96	2.00	5:58:52	2/9/01
02/09/01	6:03:52	2.36	57.99	2.00	6:03:52	2/9/01
02/09/01	6:08:52	2.36	58.04	2.00	6:08:52	2/9/01
02/09/01	6:13:52	2.42	58.22	3.00	6:13:52	2/9/01
02/09/01	6:18:52	2.42	58.49	3.00	6:18:52	2/9/01
02/09/01	6:23:52	2.42	58.59	3.00	6:23:52	2/9/01
02/09/01	6:28:52	2.42	58.59	3.00	6:28:52	2/9/01
02/09/01	6:33:52	2.42	58.64	3.00	6:33:52	2/9/01
02/09/01	6:38:52	2.42	58.72	3.00	6:38:52	2/9/01
02/09/01	6:43:52	2.42	58.77	3.00	6:43:52	2/9/01

Location #2

APPENDIX E
EXAMPLE OF RECORDED AIR MONITORING RAW DATA

02/09/01	6:48:52	2.41	59.00	3.00	6:48:52	2/9/01
02/09/01	6:53:52	2.42	59.26	3.00	6:53:52	2/9/01
02/09/01	6:58:52	2.42	59.46	3.00	6:58:52	2/9/01
02/09/01	7:03:52	2.42	59.66	3.00	7:03:52	2/9/01
02/09/01	7:08:52	2.42	59.83	3.00	7:08:52	2/9/01
02/09/01	7:13:52	2.36	59.91	2.00	7:13:52	2/9/01
02/09/01	7:18:52	2.35	60.03	2.00	7:18:52	2/9/01
02/09/01	7:23:52	2.36	60.16	2.00	7:23:52	2/9/01
02/09/01	7:28:52	2.33	60.28	2.00	7:28:52	2/9/01
02/09/01	7:33:52	2.33	60.40	2.00	7:33:52	2/9/01
02/09/01	7:38:52	2.33	60.60	2.00	7:38:52	2/9/01
02/09/01	7:43:52	2.35	60.67	2.00	7:43:52	2/9/01
02/09/01	7:48:52	2.36	60.71	2.00	7:48:52	2/9/01
02/09/01	7:53:52	2.36	60.74	2.00	7:53:52	2/9/01
02/09/01	7:58:52	2.45	60.76	3.00	7:58:52	2/9/01
02/09/01	8:03:52	2.45	60.91	3.00	8:03:52	2/9/01
02/09/01	8:08:52	2.45	60.96	3.00	8:08:52	2/9/01
02/09/01	8:13:52	2.51	61.02	4.00	8:13:52	2/9/01
02/09/01	8:18:52	2.51	61.07	4.00	8:18:52	2/9/01
02/09/01	8:23:52	2.52	61.10	4.00	8:23:52	2/9/01
02/09/01	8:28:52	2.42	61.13	3.00	8:28:52	2/9/01
02/09/01	8:33:52	2.42	61.21	3.00	8:33:52	2/9/01
02/09/01	8:38:52	2.42	61.24	3.00	8:38:52	2/9/01
02/09/01	8:43:52	2.42	61.33	3.00	8:43:52	2/9/01
02/09/01	8:48:52	2.42	61.46	3.00	8:48:52	2/9/01
02/09/01	8:53:52	2.42	61.57	3.00	8:53:52	2/9/01
02/09/01	8:58:52	2.33	61.77	2.00	8:58:52	2/9/01
02/09/01	9:03:52	2.33	61.96	2.00	9:03:52	2/9/01
02/09/01	9:08:52	2.32	62.21	2.00	9:08:52	2/9/01
02/09/01	9:13:52	2.29	62.46	2.00	9:13:52	2/9/01
02/09/01	9:18:52	2.29	62.70	2.00	9:18:52	2/9/01
02/09/01	9:23:52	2.29	62.95	2.00	9:23:52	2/9/01
02/09/01	9:28:52	2.23	63.18	0.00	9:28:52	2/9/01
02/09/01	9:33:52	2.23	63.41	0.00	9:33:52	2/9/01
02/09/01	9:38:52	2.23	63.68	0.00	9:38:52	2/9/01
02/09/01	9:43:52	2.20	63.88	0.00	9:43:52	2/9/01
02/09/01	9:48:52	2.20	64.11	0.00	9:48:52	2/9/01
02/09/01	9:53:52	2.20	64.44	0.00	9:53:52	2/9/01
02/09/01	9:58:52	2.17	64.77	0.00	9:58:52	2/9/01
02/09/01	10:03:52	2.17	65.10	0.00	10:03:52	2/9/01
02/09/01	10:08:52	2.17	65.49	0.00	10:08:52	2/9/01
02/09/01	10:13:52	2.14	65.86	0.00	10:13:52	2/9/01
02/09/01	10:18:52	2.13	66.22	0.00	10:18:52	2/9/01
02/09/01	10:23:52	2.14	66.56	0.00	10:23:52	2/9/01
02/09/01	10:28:52	2.01	66.97	0.00	10:28:52	2/9/01
02/09/01	10:33:52	2.01	67.37	0.00	10:33:52	2/9/01
02/09/01	10:38:52	2.02	67.78	0.00	10:38:52	2/9/01
02/09/01	10:43:52	2.02	68.08	0.00	10:43:52	2/9/01
02/09/01	10:48:52	2.02	68.52	0.00	10:48:52	2/9/01
02/09/01	10:53:52	2.02	68.96	0.00	10:53:52	2/9/01
02/09/01	10:58:52	2.01	69.42	0.00	10:58:52	2/9/01
02/09/01	11:03:52	2.02	69.84	0.00	11:03:52	2/9/01

Location #2

APPENDIX E
EXAMPLE OF RECORDED AIR MONITORING RAW DATA

02/09/01	11:08:52	2.02	70.24	0.00	11:08:52	2/9/01
02/09/01	11:13:52	2.01	70.63	0.00	11:13:52	2/9/01
02/09/01	11:18:52	2.01	71.01	0.00	11:18:52	2/9/01
02/09/01	11:23:52	2.01	71.42	0.00	11:23:52	2/9/01
02/09/01	11:28:52	2.02	71.74	0.00	11:28:52	2/9/01
02/09/01	11:33:52	2.02	72.03	0.00	11:33:52	2/9/01
02/09/01	11:38:52	2.02	72.29	0.00	11:38:52	2/9/01
02/09/01	11:43:52	2.01	72.63	0.00	11:43:52	2/9/01
02/09/01	11:48:52	2.01	72.91	0.00	11:48:52	2/9/01
02/09/01	11:53:52	2.01	73.15	0.00	11:53:52	2/9/01
02/09/01	11:58:52	2.01	73.49	0.00	11:58:52	2/9/01
02/09/01	12:03:52	2.02	73.75	0.00	12:03:52	2/9/01
02/09/01	12:08:52	2.02	74.00	0.00	12:08:52	2/9/01
02/09/01	12:13:52	2.02	74.24	0.00	12:13:52	2/9/01
02/09/01	12:18:52	2.02	74.45	0.00	12:18:52	2/9/01
02/09/01	12:23:52	2.01	74.72	0.00	12:23:52	2/9/01
02/09/01	12:28:52	2.01	75.00	0.00	12:28:52	2/9/01
02/09/01	12:33:52	2.02	75.28	0.00	12:33:52	2/9/01
02/09/01	12:38:52	2.01	75.52	0.00	12:38:52	2/9/01
02/09/01	12:43:52	2.02	75.77	0.00	12:43:52	2/9/01
02/09/01	12:48:52	2.02	76.04	0.00	12:48:52	2/9/01
02/09/01	12:53:52	2.02	76.30	0.00	12:53:52	2/9/01
02/09/01	12:58:52	2.02	76.52	0.00	12:58:52	2/9/01
02/09/01	13:03:52	2.02	76.63	0.00	13:03:52	2/9/01
02/09/01	13:08:52	2.02	76.89	0.00	13:08:52	2/9/01
02/09/01	13:13:52	2.02	77.24	0.00	13:13:52	2/9/01
02/09/01	13:18:52	2.02	77.42	0.00	13:18:52	2/9/01
02/09/01	13:23:52	2.02	77.65	0.00	13:23:52	2/9/01
02/09/01	13:28:52	2.01	77.80	0.00	13:28:52	2/9/01
02/09/01	13:33:52	2.02	78.04	0.00	13:33:52	2/9/01
02/09/01	13:38:52	2.01	78.28	0.00	13:38:52	2/9/01
02/09/01	13:43:52	2.01	78.45	0.00	13:43:52	2/9/01
02/09/01	13:48:52	2.02	78.64	0.00	13:48:52	2/9/01
02/09/01	13:53:52	2.02	78.94	0.00	13:53:52	2/9/01
02/09/01	13:58:52	2.02	79.11	0.00	13:58:52	2/9/01
02/09/01	14:03:52	2.01	79.34	0.00	14:03:52	2/9/01
02/09/01	14:08:52	2.02	79.53	0.00	14:08:52	2/9/01
02/09/01	14:13:52	2.01	79.70	0.00	14:13:52	2/9/01
02/09/01	14:18:52	2.02	79.83	0.00	14:18:52	2/9/01
02/09/01	14:23:52	2.02	80.00	0.00	14:23:52	2/9/01
02/09/01	14:28:52	2.01	80.16	0.00	14:28:52	2/9/01
02/09/01	14:33:52	2.02	80.23	0.00	14:33:52	2/9/01
02/09/01	14:38:52	2.01	80.31	0.00	14:38:52	2/9/01
02/09/01	14:43:52	2.01	80.41	0.00	14:43:52	2/9/01
02/09/01	14:48:52	2.01	80.48	0.00	14:48:52	2/9/01
02/09/01	14:53:52	2.02	80.54	0.00	14:53:52	2/9/01
02/09/01	14:58:52	2.02	80.60	0.00	14:58:52	2/9/01
02/09/01	15:03:52	2.01	80.65	0.00	15:03:52	2/9/01
02/09/01	15:08:52	2.01	80.72	0.00	15:08:52	2/9/01
02/09/01	15:13:52	2.01	80.91	0.00	15:13:52	2/9/01
02/09/01	15:18:52	2.02	81.01	0.00	15:18:52	2/9/01
02/09/01	15:23:52	2.01	81.13	0.00	15:23:52	2/9/01

Location #2

APPENDIX E
EXAMPLE OF RECORDED AIR MONITORING RAW DATA

02/09/01	15:28:52	2.01	81.20	0.00	15:28:52	2/9/01
02/09/01	15:33:52	2.01	81.20	0.00	15:33:52	2/9/01
02/09/01	15:38:52	2.02	81.27	0.00	15:38:52	2/9/01
02/09/01	15:43:52	2.01	81.29	0.00	15:43:52	2/9/01
02/09/01	15:48:52	2.01	81.41	0.00	15:48:52	2/9/01
02/09/01	15:53:52	2.02	81.48	0.00	15:53:52	2/9/01
02/09/01	15:58:52	2.02	81.56	0.00	15:58:52	2/9/01
02/09/01	16:03:52	2.02	81.68	0.00	16:03:52	2/9/01
02/09/01	16:08:52	2.02	81.70	0.00	16:08:52	2/9/01
02/09/01	16:13:52	2.01	81.77	0.00	16:13:52	2/9/01
02/09/01	16:18:52	2.02	81.75	0.00	16:18:52	2/9/01
02/09/01	16:23:52	2.02	81.63	0.00	16:23:52	2/9/01
02/09/01	16:28:52	2.02	81.58	0.00	16:28:52	2/9/01
02/09/01	16:33:52	2.02	81.56	0.00	16:33:52	2/9/01
02/09/01	16:38:52	2.02	81.41	0.00	16:38:52	2/9/01
02/09/01	16:43:52	2.01	81.37	0.00	16:43:52	2/9/01
02/09/01	16:48:52	2.01	81.27	0.00	16:48:52	2/9/01
02/09/01	16:53:52	2.01	81.27	0.00	16:53:52	2/9/01
02/09/01	16:58:52	2.02	81.20	0.00	16:58:52	2/9/01
02/09/01	17:03:52	2.02	81.13	0.00	17:03:52	2/9/01
02/09/01	17:08:52	2.02	80.87	0.00	17:08:52	2/9/01
02/09/01	17:13:52	2.02	80.67	0.00	17:13:52	2/9/01
02/09/01	17:18:52	2.02	80.54	0.00	17:18:52	2/9/01
02/09/01	17:23:52	2.02	80.41	0.00	17:23:52	2/9/01
02/09/01	17:28:52	2.01	80.31	0.00	17:28:52	2/9/01
02/09/01	17:33:52	2.01	80.06	0.00	17:33:52	2/9/01
02/09/01	17:38:52	2.02	79.89	0.00	17:38:52	2/9/01
02/09/01	17:43:52	2.01	79.81	0.00	17:43:52	2/9/01
02/09/01	17:48:52	2.01	79.70	0.00	17:48:52	2/9/01
02/09/01	17:53:52	2.02	79.58	0.00	17:53:52	2/9/01
02/09/01	17:58:52	2.02	79.41	0.00	17:58:52	2/9/01
02/09/01	18:03:52	2.02	79.17	0.00	18:03:52	2/9/01
02/09/01	18:08:52	2.01	78.94	0.00	18:08:52	2/9/01
02/09/01	18:13:52	2.01	78.75	0.00	18:13:52	2/9/01
02/09/01	18:18:52	2.01	78.56	0.00	18:18:52	2/9/01
02/09/01	18:23:52	2.02	78.39	0.00	18:23:52	2/9/01
02/09/01	18:28:52	2.02	78.15	0.00	18:28:52	2/9/01
02/09/01	18:33:52	2.01	77.96	0.00	18:33:52	2/9/01
02/09/01	18:38:52	2.02	77.72	0.00	18:38:52	2/9/01
02/09/01	18:43:52	2.01	77.42	0.00	18:43:52	2/9/01
02/09/01	18:48:52	2.01	77.20	0.00	18:48:52	2/9/01
02/09/01	18:53:52	2.02	76.94	0.00	18:53:52	2/9/01
02/09/01	18:58:52	2.01	76.70	0.00	18:58:52	2/9/01
02/09/01	19:03:52	2.02	76.41	0.00	19:03:52	2/9/01
02/09/01	19:08:52	2.02	75.99	0.00	19:08:52	2/9/01
02/09/01	19:13:52	2.01	75.52	0.00	19:13:52	2/9/01
02/09/01	19:18:52	2.01	75.00	0.00	19:18:52	2/9/01
02/09/01	19:23:52	2.01	74.51	0.00	19:23:52	2/9/01
02/09/01	19:28:52	2.02	74.06	0.00	19:28:52	2/9/01
02/09/01	19:33:52	2.01	73.67	0.00	19:33:52	2/9/01
02/09/01	19:38:52	2.02	73.35	0.00	19:38:52	2/9/01
02/09/01	19:43:52	2.01	72.89	0.00	19:43:52	2/9/01

Location #2

APPENDIX E
EXAMPLE OF RECORDED AIR MONITORING RAW DATA

02/09/01	19:48:52	2.02	72.47	0.00	19:48:52	2/9/01
02/09/01	19:53:52	2.02	72.13	0.00	19:53:52	2/9/01
02/09/01	19:58:52	2.01	71.84	0.00	19:58:52	2/9/01
02/09/01	20:03:52	2.01	71.46	0.00	20:03:52	2/9/01
02/09/01	20:08:52	2.02	71.15	0.00	20:08:52	2/9/01
02/09/01	20:13:52	2.01	70.76	0.00	20:13:52	2/9/01
02/09/01	20:18:52	2.02	70.47	0.00	20:18:52	2/9/01
02/09/01	20:23:52	2.02	70.18	0.00	20:23:52	2/9/01
02/09/01	20:28:52	2.01	69.86	0.00	20:28:52	2/9/01
02/09/01	20:33:52	2.02	69.62	0.00	20:33:52	2/9/01
02/09/01	20:38:52	2.01	69.36	0.00	20:38:52	2/9/01
02/09/01	20:43:52	2.01	69.11	0.00	20:43:52	2/9/01
02/09/01	20:48:52	2.02	68.85	0.00	20:48:52	2/9/01
02/09/01	20:53:52	2.02	68.57	0.00	20:53:52	2/9/01
02/09/01	20:58:52	2.01	68.28	0.00	20:58:52	2/9/01
02/09/01	21:03:52	2.01	68.02	0.00	21:03:52	2/9/01
02/09/01	21:08:52	2.02	67.82	0.00	21:08:52	2/9/01
02/09/01	21:13:52	2.01	67.56	0.00	21:13:52	2/9/01
02/09/01	21:18:52	2.01	67.35	0.00	21:18:52	2/9/01
02/09/01	21:23:52	2.02	67.24	0.00	21:23:52	2/9/01
02/09/01	21:28:52	2.02	67.09	0.00	21:28:52	2/9/01
02/09/01	21:33:52	2.01	66.88	0.00	21:33:52	2/9/01
02/09/01	21:38:52	2.02	66.65	0.00	21:38:52	2/9/01
02/09/01	21:43:52	2.02	66.40	0.00	21:43:52	2/9/01
02/09/01	21:48:52	2.01	66.19	0.00	21:48:52	2/9/01
02/09/01	21:53:52	2.01	66.05	0.00	21:53:52	2/9/01
02/09/01	21:58:52	2.01	65.84	0.00	21:58:52	2/9/01
02/09/01	22:03:52	2.01	65.59	0.00	22:03:52	2/9/01
02/09/01	22:08:52	2.01	65.44	0.00	22:08:52	2/9/01
02/09/01	22:13:52	2.01	65.29	0.00	22:13:52	2/9/01
02/09/01	22:18:52	2.02	65.12	0.00	22:18:52	2/9/01
02/09/01	22:23:52	2.01	65.02	0.00	22:23:52	2/9/01
02/09/01	22:28:52	2.02	64.90	0.00	22:28:52	2/9/01
02/09/01	22:33:52	2.02	64.75	0.00	22:33:52	2/9/01
02/09/01	22:38:52	2.02	64.65	0.00	22:38:52	2/9/01
02/09/01	22:43:52	2.02	64.44	0.00	22:43:52	2/9/01
02/09/01	22:48:52	2.02	64.04	0.00	22:48:52	2/9/01
02/09/01	22:53:52	2.02	63.83	0.00	22:53:52	2/9/01
02/09/01	22:58:52	2.01	63.80	0.00	22:58:52	2/9/01
02/09/01	23:03:52	2.02	63.75	0.00	23:03:52	2/9/01
02/09/01	23:08:52	2.01	63.85	0.00	23:08:52	2/9/01
02/09/01	23:13:52	2.01	64.09	0.00	23:13:52	2/9/01
02/09/01	23:18:52	2.01	64.38	0.00	23:18:52	2/9/01
02/09/01	23:23:52	2.02	64.53	0.00	23:23:52	2/9/01
02/09/01	23:28:52	2.02	64.59	0.00	23:28:52	2/9/01
02/09/01	23:33:52	2.01	64.65	0.00	23:33:52	2/9/01
02/09/01	23:38:52	2.01	64.83	0.00	23:38:52	2/9/01
02/09/01	23:43:52	2.02	64.87	0.00	23:43:52	2/9/01
02/09/01	23:48:52	2.01	64.81	0.00	23:48:52	2/9/01
02/09/01	23:53:52	2.01	64.83	0.00	23:53:52	2/9/01
02/09/01	23:58:52	2.01	64.87	0.00	23:58:52	2/9/01
02/10/01	0:03:52	2.01	64.75	0.00	0:03:52	2/10/01

Location #2

APPENDIX E
EXAMPLE OF RECORDED AIR MONITORING RAW DATA

02/10/01	0:08:52	2.02	64.46	0.00	0:08:52	2/10/01
02/10/01	0:13:52	2.02	64.22	0.00	0:13:52	2/10/01
02/10/01	0:18:52	2.01	63.93	0.00	0:18:52	2/10/01
02/10/01	0:23:52	2.01	63.85	0.00	0:23:52	2/10/01
02/10/01	0:28:52	2.01	63.77	0.00	0:28:52	2/10/01
02/10/01	0:33:52	2.01	63.68	0.00	0:33:52	2/10/01
02/10/01	0:38:52	2.01	63.53	0.00	0:38:52	2/10/01
02/10/01	0:43:52	2.02	63.47	0.00	0:43:52	2/10/01
02/10/01	0:48:52	2.01	63.34	0.00	0:48:52	2/10/01
02/10/01	0:53:52	2.02	63.20	0.00	0:53:52	2/10/01
02/10/01	0:58:52	2.01	63.11	0.00	0:58:52	2/10/01
02/10/01	1:03:52	2.01	63.08	0.00	1:03:52	2/10/01
02/10/01	1:08:52	2.02	63.02	0.00	1:08:52	2/10/01
02/10/01	1:13:52	2.01	62.92	0.00	1:13:52	2/10/01
02/10/01	1:18:52	2.01	62.79	0.00	1:18:52	2/10/01
02/10/01	1:23:52	2.01	62.76	0.00	1:23:52	2/10/01
02/10/01	1:28:52	2.02	62.76	0.00	1:28:52	2/10/01
02/10/01	1:33:52	2.02	62.70	0.00	1:33:52	2/10/01
02/10/01	1:38:52	2.01	62.73	0.00	1:38:52	2/10/01
02/10/01	1:43:52	2.02	62.81	0.00	1:43:52	2/10/01
02/10/01	1:48:52	2.02	62.70	0.00	1:48:52	2/10/01
02/10/01	1:53:52	2.01	62.56	0.00	1:53:52	2/10/01
02/10/01	1:58:52	2.01	62.35	0.00	1:58:52	2/10/01
02/10/01	2:03:52	2.01	62.13	0.00	2:03:52	2/10/01
02/10/01	2:08:52	2.02	62.10	0.00	2:08:52	2/10/01
02/10/01	2:13:52	2.02	62.10	0.00	2:13:52	2/10/01
02/10/01	2:18:52	2.02	62.05	0.00	2:18:52	2/10/01
02/10/01	2:23:52	2.01	62.07	0.00	2:23:52	2/10/01
02/10/01	2:28:52	2.01	62.19	0.00	2:28:52	2/10/01
02/10/01	2:33:52	2.02	62.38	0.00	2:33:52	2/10/01
02/10/01	2:38:52	2.01	62.70	0.00	2:38:52	2/10/01
02/10/01	2:43:52	2.02	62.98	0.00	2:43:52	2/10/01
02/10/01	2:48:52	2.02	63.20	0.00	2:48:52	2/10/01
02/10/01	2:53:52	2.01	63.53	0.00	2:53:52	2/10/01
02/10/01	2:58:52	2.02	63.77	0.00	2:58:52	2/10/01
02/10/01	3:03:52	2.11	63.93	0.00	3:03:52	2/10/01
02/10/01	3:08:52	2.11	64.14	0.00	3:08:52	2/10/01
02/10/01	3:13:52	2.11	64.30	0.00	3:13:52	2/10/01
02/10/01	3:18:52	2.01	64.40	0.00	3:18:52	2/10/01
02/10/01	3:23:52	2.02	64.49	0.00	3:23:52	2/10/01
02/10/01	3:28:52	2.01	64.49	0.00	3:28:52	2/10/01
02/10/01	3:33:52	2.01	64.51	0.00	3:33:52	2/10/01
02/10/01	3:38:52	2.01	64.55	0.00	3:38:52	2/10/01
02/10/01	3:43:52	2.01	64.59	0.00	3:43:52	2/10/01
02/10/01	3:48:52	2.01	64.59	0.00	3:48:52	2/10/01
02/10/01	3:53:52	2.01	64.53	0.00	3:53:52	2/10/01
02/10/01	3:58:52	2.02	64.47	0.00	3:58:52	2/10/01
02/10/01	4:03:52	2.01	64.33	0.00	4:03:52	2/10/01
02/10/01	4:08:52	2.02	64.19	0.00	4:08:52	2/10/01
02/10/01	4:13:52	2.01	63.99	0.00	4:13:52	2/10/01
02/10/01	4:18:52	2.02	63.85	0.00	4:18:52	2/10/01
02/10/01	4:23:52	2.02	63.72	0.00	4:23:52	2/10/01

Location #2

APPENDIX E
EXAMPLE OF RECORDED AIR MONITORING RAW DATA

02/10/01	4:28:52	2.02	63.56	0.00	4:28:52	2/10/01
02/10/01	4:33:52	2.02	63.44	0.00	4:33:52	2/10/01
02/10/01	4:38:52	2.01	63.34	0.00	4:38:52	2/10/01
02/10/01	4:43:52	2.02	63.23	0.00	4:43:52	2/10/01
02/10/01	4:48:52	2.02	63.11	0.00	4:48:52	2/10/01
02/10/01	4:53:52	2.02	63.03	0.00	4:53:52	2/10/01
02/10/01	4:58:52	2.01	62.95	0.00	4:58:52	2/10/01

Location #2