Health Consultation

781 Airways Boulevard

OWENS CORNING/EUTHER DAVIDSON
(a/k/a OWENS-CORNING/EUTHER DAVIDSON SITES)

JACKSON, MADISON COUNTY, TENNESSEE

EPA FACILITY ID: TND980559009

JULY 15, 2003

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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Prepared by

Tennessee Department of Health
Under a Cooperative Agreement with
The Agency for Toxic Substances and Disease Registry

Background and Statement of Issues

For several months, employees in the West Tennessee Health Care Facilities (WTHCF) office of the Tennessee Department of Health (TDH) in Jackson, Madison County, Tennessee, complained of a foul odor that irritated their eyes and caused nausea. Tennessee Department of Health Commissioner, Dr. Kenneth Robinson, asked Environmental Health Studies and Services (EHSS) to investigate the complaints to determine, "If the odor complaints were a health concern to the state employees?"

During an April 15, 2003 site visit, office manager Shirley Jones escorted Bonnie Bashor and David Borowski of EHSS through the 781 Airways Boulevard building in Jackson, TN, ZIP code 38301. Airways Boulevard is the local name for state Highway 70. 781 Airways Boulevard is a small strip mall with three tenants (Figure 1). The tenants, from west to east, or left to right as one faces the building, are Dollar General (781E), WTHCF (781B) (Figure 2), and a bakery store (781A). The WTHCF is a small administrative office with no patient care. In the state office and the neighboring businesses, approximately 30 people are routinely present. During the site visit, investigators learned that the 781 Airways Blvd building footprint might be over a former Superfund site.

The Owens Corning/Euther Davidson State of Tennessee Superfund site 57-506 was a result of potentially hazardous landfill. Following it use as a gravel pit, the site was used to dispose of wastes from September 1975 to May 1979. Mr. Levy Williams was the original owner of the site (DWSM 1984). In the fall of 1977, Mr. Euther Davidson purchased the land and had it evaluated for use as an industrial landfill. The property has since been subdivided and parcels sold to new owners. The site is approximately 40-acres and contains approximately 44,000 total cubic yards of waste (TSWM 1984; TDSF 1996). Owens Corning operated a fiberglass plant in the area for many years. In addition to Owens Corning waste fiberglass, their wastewater treatment sludge containing spent halogenated and non-halogenated solvents and chrome was dumped in excess of 10,995 cubic yards (TSWM 1989).

Other products were used as fill materials including: household garbage, lumber, construction debris, kiln-dried wood, old chemical drums, cardboard, sawdust, tires, and paper (TSWM 1984, 1989; TDSF 1996). The landfill was reported stretching back 150 feet from the roadside. The landfill was reported to be approximately 15 feet deep and would fill with underground water. The site was eventually covered with compacted soil.

The Tennessee Department of Environment and Conservation (TDEC) and the USEPA have evaluated the site. On June 7, 1990, DSF added Owens Corning/Euther Davidson to its list of inactive hazardous waste sites. Fear that rainwater could leach landfill constituents to adjacent properties led to the designation of the landfill as Tennessee Superfund site #57-506 (Figures 3 and 4). Under a voluntary cleanup agreement, Owens Corning investigated the site to determine how to minimize this leaching potential. During that investigation, it appeared that chromium was the main chemical of concern—most of the other fill materials were deemed fairly inert. In fact, a September 8 to October 28, 1995 remedial investigation found that no detected compounds were widespread and that wet weather testing indicated no migration. Investigators identified no threats to human health or the environment. After the remedial investigation, the TDEC Division of Superfund accepted a "no further action" plan (TSDF 1996). In April of 1996 the local newspaper, *The Jackson Sun*, reported to the community on the cleanup activities. The

site later received a "clean bill of health" and was removed from the list of inactive hazardous waste sites. By December 1997, the Tennessee Office of General Counsel closed the books on the Owens Corning/Euther Davidson site.

Discussion

With continued complaints of eye irritation and nausea due to the intermittent odor problem by the WTHCF staff, formal complaints were filed to the building management, TDEC Jackson Environmental Assistance Center (J-EAC), the Jackson Energy Authority (JEA), and the TDH central office.

In January 2003, the JEA performed tests at the bread store address (781A) and at WTHCF (781B). Three vacuum sample results detected an unknown hydrocarbon not associated with natural gas. The natural gas supply lines were pressure tested and a natural gas leak was ruled out. Methane gas, however, was detected in the samples. A nearby sample at 705 Airways Boulevard detected no natural gas, but did detect the presence of methane. The corresponding laboratory data is contained in Table 1. Note these values were obtained via Vacu-Sampler collection and do not represent ambient air/gas concentrations. Dunn Laboratories in Roswell, Georgia, concluded that the findings were indicative of methane gas from a landfill or sewer (JEA 2003).

TABLE 1 – Percentage of natural gas components measured by JEA in January 2003.

	705	*781B WTHCF break room*	*781A bread store*	*781B WTHCF*
Methane %	**4.0**	**0.3**	**3.0**	**5.0**
Ethane %	**N.D.**	**N.D.**	**N.D.**	**N.D.**
Propane %	**N.D.**	**N.D.**	**N.D.**	**N.D.**
Butanes %	**N.D.**	**N.D.**	**N.D.**	**N.D.**
Pentanes %	**N.D.**	**N.D.**	**N.D.**	**N.D.**
Hexanes %	**N.D.**	**N.D.**	**N.D.**	**N.D.**
Dilution Factor	**3.06**	**3.13**	**3.03**	**3.05**

N.D. – none detected Note: These values have been adjusted by their dilution factor.

In the WTHCF, inspection of buckling floor tile and carpet led to the discovery of cracks in the concrete slab foundation. The building management filled the cracks with foam and caulk. Some of the foundation cracks were true irregular fault lines and others were seams where various concrete slabs joined. Figures 5 and 6 illustrate where the floor buckled and the tile and carpet have been repaired. During the repair process, investigators inspected sewer pipes via tracer and determined they were in good working order, with no leaks.

To increase air exchange within 781B WTHCF the building management installed additional ductwork, including two vent ducts to exchange indoor and outdoor air (Figure 7). Two 30-foot PVC pipes ventilated with small holes were pushed into the building foundation. This forces the gases to migrate horizontally, out of the foundation rather than vertically into the building (Figure 8).

Environmental Sampling

On January 9, 2003, TDEC DSF Jackson Environmental Assistance Center staff visited the WTHCF to investigate the odor complaints. DSF staff agreed with the WTHCF complaints, finding that a foul odor did indeed permeate the office. In an attempt to discover the cause of the odor three types of outdated GASTEC analyzer tubes were used. Results follow in Table 2.

TABLE 2 – January 9, 2003, result of GASTEC analyzer tubes with detection ranges.

Indicator		*Detection Range*	*Result*
hydrogen sulfide	H_2S	5 - 60 ppm	not detected
total mercaptans	S-R	5 - 120 pmm	not detected
carbon dioxide	CO_2	25 - 500 ppm	not detected

Knoxville-based Environmental Systems Corporation (ESC), the Tennessee F&A environmental contractor, also obtained Tedlar bag and Summa gas canister samples from the WTHCF during on April 28, 2003. On this day, a slight odor was noticed in the women's restroom.

TABLE 3 – April 28, 2003, important analytical results of Tedlar bag and Summa gas canister samples.

Subject		*Result*	*Intermediate EMEG*
hydrogen sulfide	H_2S	not detected (<0.5 ppm)	
methane	CH_4	720 ppm	
carbon dioxide	CO_2	1300 ppm	
carbon monoxide	CO	1 ppm	
vinyl chloride	CH_2CHCl	not detected (<0.5 ppb)	300 ppb
dichloromethane	CH_2Cl_2	4.9 ppb	300 ppb
p-dichlorobenzene	$C_6H4_4Cl_2$	9.8 ppb	200 ppb

Landfill Gases

As natural decomposition occurs in a landfill, several compounds are known to be formed. Methane, non-methane organic compounds (NMOCs), organic sulfides, carbon dioxide, and ammonia are all common end products of landfill decomposition. Methane and carbon dioxide are the most abundant products; however, very small amounts of sulfides or NMOCs can create foul odor. A brief discussion of landfill gas issues important to this consultation follow. For a detailed discussion of landfill gases review Appendix A.

Methane CH_4

Measurements contained in Table 1 appear to be at 4% methane which is less than the safe level of the 10% lower explosive limit (LEL) for methane of 4,500 ppm; however, the vacuum sampling methods used do not establish an ambient air concentration—the dilution factor must be considered. The result is that the samples in Table 1 are below the LEL. Furthermore, an unknown type of measurement in the bakery store (Figure 9) detected 2% methane by volume. This was penned onto the concrete floor to be 56% of methane's LEL—an elevated yet non-explosive ambient level. Table 3 notes another methane sample at 720 ppm, again below the safe limit for methane in air.

Carbon Dioxide CO_2

Carbon dioxide is the second most common landfill gas. Table 3 shows a carbon dioxide measurement of 1,300 ppm on April 28, 2003, when the CO_2 level exceeded the recommended NIOSH (National Institute of Occupational Safety and Health) guideline of 1,000 ppm for indoor workplace air. This CO_2 level could explain the tiredness experienced by the employees.

Sulfides S-R

Humans are extremely sensitive to hydrogen sulfide odor and can detect ½ to 1 part per billion (ppb). A level of only 50 ppb is described as an offensive odor capable of causing headaches, fatigue, and nausea. This level is far below the 5–60 ppm detection range of the analyzer tubes used by TDEC DSF within 781B Airways Boulevard. Therefore, the results presented in Table 2 yield little information—in relation to sulfides, analyzer tube detection requires much greater concentrations than the human nose can detect. Furthermore, the samples collected by ESC presented in Table 3 cannot answer whether or not hydrogen sulfide is the cause of the foul odor as the detection limit of 0.5 ppm (500 ppb) is ten times higher than the offensive odor threshold.

Non-Methane Organic Compounds

Non-methane organic compounds (NMOCs) detailed in Table 3 were all below ATSDR intermediate EMEGs. Therefore, some NMOCs are present and may be a source of the odor, but are not a health threat.

Physical Hazards

Investigators measured the explosive potential of methane gas at the 781 Airways Boulevard building. Methane gas emissions from the landfill could pose an explosion hazard if the gas rapidly escaped from the landfill or accumulated in a confined area.

Weather Issues

Underground water entering landfills supplies moisture and nutrients to so-called decomposer bacteria. So supplied, these bacteria would increase decomposition rates. Underground water will also push landfill gases up from trapped spaces in soil and often out of the landfill completely. Close proximity to the South Fork of the Forked Deer River, ponds, wetlands, and water-filled gravel pits (Figures 10 and 11) increases the probability that underground water flows into the landfill during and after precipitation events.

Because natural decomposition of landfill organics proceeds more quickly in warm temperatures, landfill gas production will likely increase in the summer months.

Other properties/buildings

Although TDH has received no complaints about other buildings constructed over the Owens Corning/Euther Davidson former Superfund site, it is likely that the same landfill gases are migrating into these buildings as well.

Children's Health Considerations

In communities faced with air, water, or food contamination, the many physical differences between children and adults demand special emphasis. Children could be at greater risk than adults from certain kinds of exposure to hazardous substances. Children play outdoors and

sometimes engage in hand-to-mouth behaviors that increase their exposure potential. Children are shorter than adults; this means they breathe dust, soil, and vapors close to the ground. A child's lower body weight and higher intake rate results in a greater dose of hazardous substance per unit of body weight. If toxic exposure levels are high enough during critical growth stages, the developing body systems of children can sustain permanent damage. Finally, children are dependent on adults for access to housing, for access to medical care, and for risk identification. Thus, adults need as much information as possible to make informed decisions regarding their children's health.

In 1996, the Agency for Toxic Substances and Disease Registry (ATSDR) launched an initiative to place a special agency-wide emphasis on environmental hazards to children's health and to emphasize child health in all agency programs and activities (ATSDR 1997, 1998).

Insofar as the 781 Airways Boulevard building is concerned, children would not be employees and would be only occasional store shoppers. Accordingly, the exposure of children, to any odors or contaminants in this instance, is perceived to be minimal.

Conclusions

1. A past indeterminate health hazard existed at 781 Airways Boulevard.
2. While no apparent pubic health hazards currently exist, offensive odors from decomposing organic materials can adversely affect the quality of the WTHCF work environment.

Recommendations

1. Monitor methane gas levels to ensure worker safety.
2. Determine if landfill gas is migrating into other Airways Boulevard buildings.
3. Correct the landfill gas problems throughout the entire site.

Public Health Action Plan

Actions Completed:

1. TDEC DSF has been notified of the landfill gas problem.
2. TDEC DSF is working with building management to solve the 781 Airways Boulevard landfill gas migration problem.
3. TDH EHSS has applied for grant funding to contract with TDEC to determine if landfill gases are migrating into other Airways Boulevard buildings.

Future Actions:

1. Make sure the landfill gas problem is mitigated quickly.
2. Make sure that all buildings at the Owens Corning/Euther Davidson former Superfund site are safe and free of landfill gas.

References

[ATSDR] Agency for Toxic Substances and Disease Registry. 1997. Healthy children—toxic environments. Report of the Child Health Workgroup presented to the Board of Scientific Counselors. Atlanta: US Department of Health and Human Services.

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[ATSDR] Agency for Toxic Substances and Disease Registry. 2003a. Landfill gas primer. Available from: http://www.atsdr.cdc.gov/HAC/landfill/html/preface.html. Last accessed May 7, 2003.

[ESC] Environmental Systems Corporation. 2003. Interim summary memo – Jackson department of health leased space – air quality. Knoxville, TN.

[JEA] Jackson Energy Authority. 2003. Feb 18th letter to Shirley Jones from Eric Johnson regarding natural gas leak testing at West Tennessee Health Care Facilities. Jackson, TN.

[TDSF] Tennessee Division of Superfund. 1996. Declaration of record of decision for Owens Corning Davidson site. Nashville, TN: TDSF file #57-506.

[TSWM] Tennessee Division of Superfund. 1984. Potential hazardous waste site preliminary assessment—Owens-Corning/Euther Davidson site TND980559009. Nashville, TN: TDSF file #57-506.

[TSWM] Tennessee Division of Superfund. 1989. Potential hazardous waste site site inspection report—Owens-Corning Euther Davidson site TND980559009. Jackson, TN: TDSF file #57-506.

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Appendix A

Landfill Gases

Typical Landfill Gas Components		
Component	**Percent by Volume**	**Characteristics**
methane	45–60	Methane is a naturally occurring gas. It is colorless andodorless. Landfills are the single largest source of U.S. man-made methane emissions
carbon dioxide	40–60	Carbon dioxide is naturally found at small concentrations in the atmosphere (0.03%). It is colorless, odorless, and slightly acidic.
nitrogen	2–5	Nitrogen comprises approximately 79% of the atmosphere. It is odorless, tasteless, and colorless.
oxygen	0.1–1	Oxygen comprises approximately 21% of the atmosphere. It is odorless, tasteless, and colorless.
ammonia	0.1–1	Ammonia is a colorless gas with a pungent odor.
NMOCs (non-methane organic compounds)	0.01–0.6	NMOCs are organic compounds (i.e., compounds that contain carbon). (Methane is an organic compound but is not considered an NMOC.) NMOCs may occur naturally or be formed by synthetic chemical processes. NMOCs most commonly found in landfills include acrylonitrile, benzene, 1,1-dichloroethane, 1,2-cis dichloroethylene, dichloromethane, carbonyl sulfide, ethyl-benzene, hexane, methyl ethyl ketone, tetrachloroethylene, toluene, trichloroethylene, vinyl chloride, and xylenes.
sulfides	0–1	Sulfides (e.g., hydrogen sulfide, dimethyl sulfide, mercaptans) are naturally occurring gases that give the landfill gas mixture its rotten-egg smell. Sulfides can cause unpleasant odors even at very low concentrations.
hydrogen	0–0.2	Hydrogen is an odorless, colorless gas.
carbon monoxide	0–0.2	Carbon monoxide is an odorless, colorless gas.
Source: Tchobanoglous, Theisen, and Vigil 1993; EPA 1995		

Methane CH_4

Methane is a colorless, odourless gas. It is the simplest carbon-based organic molecule, having one carbon atom surrounded by four hydrogen atoms. Occurring naturally through decomposition of organics, methane gas is highly flammable (ATSDR 2003).

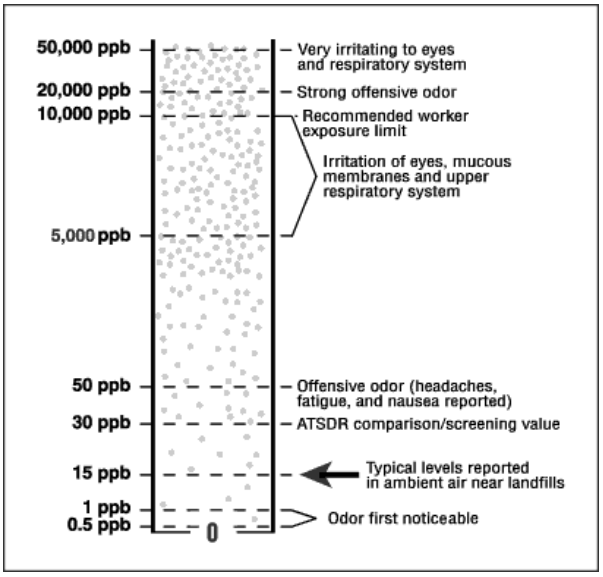
In landfills, methane is often found to comprise 50% of the gases by volume. At that level, methane dominants the atmosphere and cannot combust. If, however, the methane migrates away from the landfill and mixes with oxygen in ambient air to 5%–15% of the atmosphere by volume, an explosion potential arises, which needs only an ignition source.

Sulfides S-R

Sulfides, including hydrogen sulfide, dimethyl sulfide, and mercaptans, are common odorous gases associated with landfills. These gases produce a strong rotten-egg smell—even at very low concentrations. Hydrogen sulfide is the most common of the three. Humans are extremely

sensitive to hydrogen sulfide odor and can detect ½ to 1 part per billion (ppb). The following diagram details the effects of sulfides with increasing air concentration (ATSDR 2003). Notice that a level of only 50 ppb is described as an offensive odor capable of causing headaches, fatigue, and nausea.

Sulfide Level–Human Discomfort Comparison



Sulfides can cause eye irritation and can lead to headaches, fatigue, and nausea. That said, no known adverse health effects have been associated with prolonged exposure to low levels of sulfides. Studies of workers in animal processing and sewage treatment plants found that eye irritations due to hydrogen sulfide often occurred between 5,000 pbb and 10,000 ppb (ATSDR 2003).

Ammonia NH_3

Ammonia is another odorous gas produced by the decomposition of organic matter in landfills. Ammonia is common in the environment and is required by plant and animal life. Ammonia has a familiar smell, stemming from its use as a common household cleaner. Humans are much less sensitive to the odor of ammonia than they are to sulfide odors. The odor threshold for ammonia is between 28 and 50 parts per million (ppm) (ATSDR 2003).

Non-Methane Organic Compounds

Non-methane organic compounds (NMOCs) associated with landfill gases is a generic grouping for compounds other than methane. NMOCs such as vinyl chloride and hydrocarbons can also cause odors. In general, however, NMOCs are emitted at very low (trace) concentrations and are unlikely to pose severe odor problems (ATSDR 2003).

Carbon Dioxide CO_2

Carbon dioxide is a by-product of natural decomposition and is associated with landfills. A simple molecule, carbon dioxide is common in the atmosphere and formed by cellular processes. Accumulation of CO_2 in air results in a reduction in the percentage of oxygen present in that air. Any level of oxygen below 21% can lead to impaired night vision, increased breathing volume,

accelerated heart beat, poor muscle coordination, and fatigue. Carbon dioxide is denser than air and can accumulate at ground level in confined spaces. Extremely high levels CO_2, resulting in oxygen levels below 10%, will lead to unconsciousness and eventually death via suffocation (ATSDR 2003a).

Carbon monoxide CO

Carbon monoxide is produced in landfills below 1% of the total gas products. Carbon monoxide has similar suffocation risks as carbon dioxide.

Hydrogen H_2

Hydrogen gas is the simplest molecule consisting of two hydrogen atoms bonded together. Hydrogen is produced in trace amounts in landfills. The gas is colorless and odorless. Hydrogen is extremely light and highly flammable.

Figure 1
781 Airways Boulevard (Highway 70) building
Jackson, Madison County, Tennessee
(Photo credit: David Borowski, TDH 4/15/03)

Figure 2

781B – West Tennessee Health Care Facility cubicles where strongest odors were reported
Jackson, Madison County, Tennessee
(Photo credit: David Borowski, TDH 4/15/03)

Figure 3

1995 map of the Owens Corning/Euther Davidson TN Superfund site 57-506
Jackson, Madison County, Tennessee
(Map credit: TDEC DSF 1995)

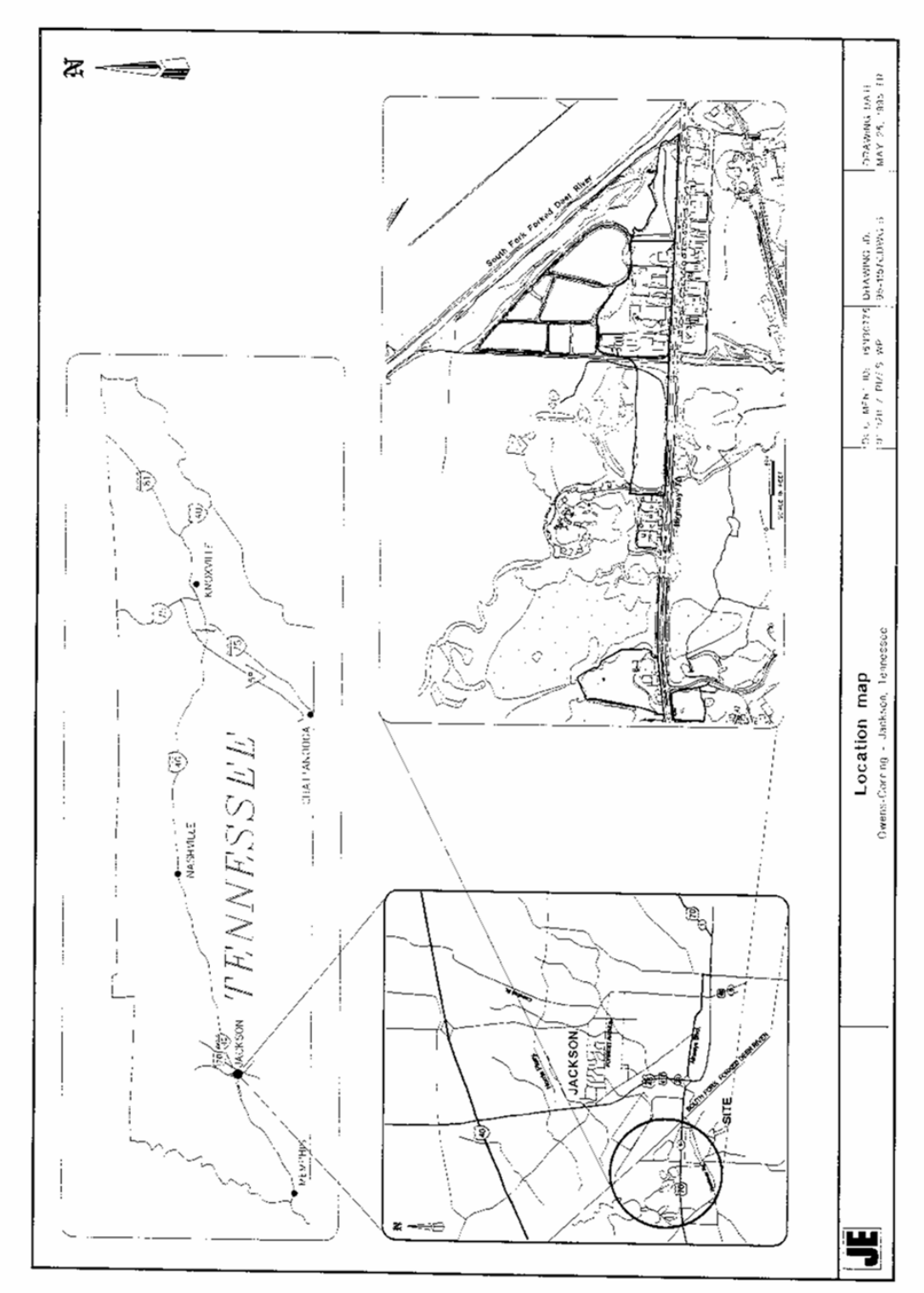


Figure 4

Map of the Owens Corning/Euther Davidson site with arrow approximating 781 Airways Boulevard, Jackson, Madison County, Tennessee (Map credit: TDEC DSF 1995)

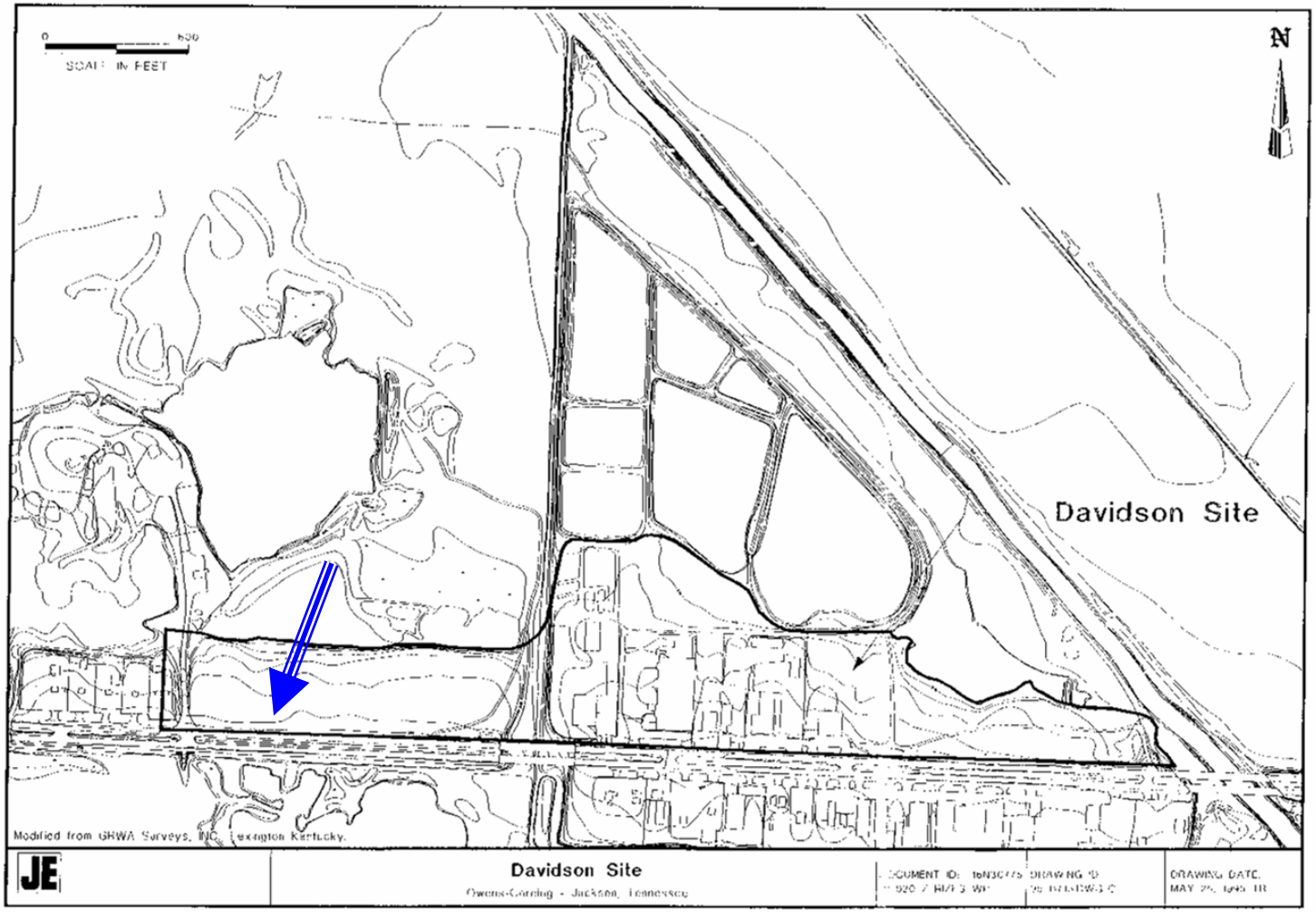


Figure 5

781B – West Tennessee Health Care Facility break room floor tile buckle
Jackson, Madison County, Tennessee
(Photo credit: Shanda Hunt, TDEC DSF 1/09/03)

Figure 6

781B – West Tennessee Health Care Facility buckle in carpeted cubicles
Jackson, Madison County, Tennessee
(Photo credit: Shanda Hunt, TDEC DSF 1/09/03)

Figure 7

781B – Two recently installed vents to increase indoor/outdoor air exchange
Jackson, Madison County, Tennessee
(Photo credit: David Borowski, TDH 4/15/03)

Figure 8

781B – One of two recently installed PVC vent pipes through solid foundation
Jackson, Madison County, Tennessee
(Photo credit: David Borowski, TDH 4/15/03)

Figure 9

781A – Bakery store concrete floor
"56% LEL 2% gas sample point"
Jackson, Madison County, Tennessee
(Photo credit: David Borowski, TDH 4/15/03)

Figure 10

781B – Backside parking looking north toward gravel mining and wetlands
Jackson, Madison County, Tennessee
(Photo credit: Shanda Hunt, TDEC DSF 1/09/03)

Figure 11

781B – Edge of backside parking lot looking north toward gravel mining and wetlands
Jackson, Madison County, Tennessee
(Photo credit: David Borowski, TDH 4/15/03)

Certification

This Health Consultation: 781 Airways Blvd Building, Jackson, Madison County Tennessee, was prepared by the Tennessee Department of Health Environmental Health Studies and Services under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was begun.

Alan W. Yarbrough

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Technical Project Officer, SPS, SSAB, DHAC, ATSDR

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

Roberta Erlwein

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Chief, State Program Section, SSAB, DHAC, ATSDR