# Health Consultation

WISCONSIN DEPARTMENT OF COMMERCE BUILDING

LA CROSSE, LA CROSSE COUNTY, WISCONSIN

MAY 19, 2005

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

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# HEALTH CONSULTATION

## WISCONSIN DEPARTMENT OF COMMERCE BUILDING

## LA CROSSE, LA CROSSE COUNTY, WISCONSIN

Prepared by:

Wisconsin Department of Health and Family Services
Under Cooperative Agreement with the
U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry

HEALTH CONSULTATION

# Wisconsin Department of Commerce Building

La Crosse, La Crosse County, Wisconsin

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## Summary

The Wisconsin Department of Health and Family Services (DHFS) was requested by the Wisconsin Department of Commerce (DOC) to evaluate odor concerns and air quality inside of a state office building in La Crosse, Wisconsin. Indoor air in the building at times contains volatile organic compounds and sulfide-related compounds. Investigation findings suggest there are several sources of indoor air contaminants, including 1) the back-drawing of landfill leachate vapors and sewer gas coming from plumbing vents into the air handling system, 2) the ambient air emissions from a neighboring landfill, 3) a petroleum lab inside the building, and 4) vehicle exhaust from a nearby interstate highway.

The data collected for individual chemical components indicates indoor air in the office building currently represents *no apparent health hazard* for building occupants. However, varied and sometimes elevated airborne benzene concentrations, the wide array of compounds detected and the uncertainty about human exposures warrant additional data collection. Pending analysis of additional data, future exposure to airborne contaminants in the building is considered *an indeterminate public health hazard*.

To reduce odors and inhalation exposures and improve indoor air quality, DHFS recommends corrective actions that will prevent sewer and leachate gas from entering the building. Once mitigation actions halt sewer and leachate vapors from entering the DOC building, vapors from other nearby sources, such as the airborne landfill emissions or vehicle exhaust may continue entering the building. These vapor levels are expected to be low and pose *no apparent public health hazard*. DHFS recommends installation of carbon filtration on the building's ventilation system to filter out and reduce volatile compounds that enter the building. DHFS also recommends continued indoor air monitoring to evaluate potential future exposures, particularly to benzene.

## Background

The Wisconsin Department of Commerce (DOC) building in La Crosse was built in 1999 and is located at 4003 North Kinnee Coulee Road. The building is privately owned and leased to the State of Wisconsin. It is a single story and metal frame construction building. It contains two office suites staffed by the Wisconsin Department of Commerce and Wisconsin Department of Health and Family Services. The west half of the building is vacant and undeveloped. The building is located adjacent to and south of the La Crosse County landfill.


**Figure 1**: Aerial Photo of Site Location

In 2002, an indoor environmental quality assessment was conducted by Michaels Engineering in response to employee concerns regarding indoor air quality. The report documented a number of occupant symptoms including comfort complaints, odors, headaches, and eye irritation. Recommendations included:

- improving air handling unit maintenance,
- sealing common walls,
- improving task lighting,
- maintaining the office area under positive pressure, and
- installation/use of air monitoring equipment.

In August 2004, DOC contacted DHFS regarding recurrent hydrogen sulfide-like odors. DOC expressed concern over whether the odors were associated with landfill gas, leachate pumping, or perhaps swamp gas, as some occupants reported the building was built on a marshy area. The Wisconsin Department of Natural Resources (DNR) was contacted by DHFS. DNR staff indicated they were aware of the problem and believed it was related to how leachate was piped from the landfill in close proximity to the building. DOC had collected indoor air samples for analysis of volatile organic compounds. A number of compounds were detected, including benzene.

Based on conversations with landfill and La Crosse city sewer treatment officials, it appears that leachate collected from the landfill goes to a 20,000 gallon holding tank and is regularly pumped, usually early in the morning. Leachate exits the tank and flows into the sanitary sewer via a manhole that is about 15 feet from the northwest corner of the DOC building. The county landfill pays a surcharge to the city sewer district based on the amount of leachate pumped into the sanitary sewer, which ends up at the treatment plant. The presence of hydrogen sulfide gas in the manhole has been reported on a number of occasions by landfill employees. DHFS, in coordination with the DOC, performed a number of site visits to help identify the pathway(s) for how odors were entering the building and to evaluate the level of DOC employee exposure to these compounds. A description of these site visits to the DOC office building follows.

## Site Visits

### September 2, 2004

The following instruments were used to evaluate air quality at the building.

- A Gray Wolf TG-501 Indoor Air Quality Probe was used to measure hydrogen sulfide, sulfur dioxide, carbon dioxide and nitrogen dioxide.
- A MSA Orion Multi-gas detector was used to measure carbon monoxide, explosivity, and oxygen.
- A Rae Systems PPB Rae photoionization detector (PID) was used to measure total volatile organic compounds (VOCs).

Monitoring results inside the DOC office suite were unremarkable. A low level of VOCs were observed in several locations, though much lower than outdoors. Of note was the lack of positive VOC readings in the petroleum lab where gasoline samples were analyzed. This was an indication that the lab ventilation was working effectively. Data is presented in Appendix A.

Instrument readings in a DHFS office suite in the DOC building were unremarkable as well, though staff did report recurrent sulfide odors, sometimes in the parking lot.

In the vacant, unfinished suite area on the west side of the DOC building, a plumbing stub was observed that was capped with a rubber screw plug. Upon removal of the plug, VOC readings were elevated and a slight elevation in the lower explosive limit reading and lower oxygen was observed. These observations were momentary and readings stabilized at a lower level shortly thereafter. The vacant space was under positive pressure with respect to the DOC suite. The drain stub represented a possible pathway for sewer gas to enter the building.

Interviews with building occupants suggested that the sulfide odor was at times very strong and sometimes could be noticed in the parking lot. It also was reported to be worse shortly after rain events. This suggested a possible outdoor pathway. Concern was also expressed regarding the potential for impacted soil under the building.

Following the visit, recommendations included:

- Securing information about leachate composition and pumping schedule.
- Determining if the building sewer system has a connection with the leachate collection system.
- Having staff in the building record date, time and weather conditions associated with odors.
- Having SUMMA canisters available to collect air samples in the DOC suite and possibly in the vacant space and outdoors during both a leachate pumping event and/or incident of strong odor.

Data collected was to be evaluated against leachate composition data and pumping schedule. If the data and scheduling suggested a leachate-related source, it would better focus corrective action efforts. If data suggested another source, subsurface investigation may have been appropriate.

The presence of VOCs including benzene in the samples collected by DOC in a building with a petroleum lab was not surprising (see August 19 and August 26, 2004 sample results in Appendix B). However, observations suggested lab ventilation was effective in isolating lab air from the rest of the building. Total VOC monitoring with a photoionization detector at supply diffusers did not suggest re-entrainment of VOCs. Benzene levels reported in samples collected by DOC did not approach the OSHA Permissible Exposure Level of 1 part per million, but were higher than the acute ATSTDR minimal risk level of 50 parts per billion. At the time of the site visit, further tests were recommended to characterize benzene and other volatile compound exposure.

**October 8, 2004**

Prior to this visit, DOC employees recognized a clear association of building odor with the presence of hydrogen sulfide coming from the sewer and pumping of landfill leachate. A site visit was scheduled to determine if a pathway for odor entry into the building may have been the plumbing vent stacks on the roof. Two 2-inch plumbing vent stacks were located on the south end of the roof and a 3-inch stack was located on the north end. Also on the roof were four packaged air handling units that serve the entire building.

To evaluate the plumbing vents stacks as a possible pathway for leachate and sewer gas entry into the building, peppermint essence (mostly alcohol) was poured in the sewer line at the cleanout access at the north end of the building in the parking lot. Prior to the test, a photoionization detector (PID) was used to survey the building and outdoor air. Indoor counts ranged from 0 to 50 parts per billion (ppb). After the odorant (peppermint essence) was placed in the sewer, DHFS accessed the roof, and readings from the PID monitor began to climb at the discharge point of the plumbing vent stacks. Upon returning to the inside of the building, PID readings were over 2,000 ppb. The potential for gas and vapor from the sewer line to enter the building was clearly established.

**October 29, 2004**

Air admittance valves had been loosely placed on the rooftop 2-inch plumbing stacks as a temporary measure to limit sewer/leachate gas entry into the DOC building. DOC contacted the building owner and asked for the 2 and 3-inch vent stacks to be connected and for the discharge pipe to be routed over the east side of the building. Prior to the more permanent connection of the plumbing vent stacks, it was desired to collect baseline data. DOC and DHFS collected 8-hour air samples for VOC analysis using modified OSHA Method PV2120 with a stainless steel SUMMA canister. Several phenol compounds were detected at several hundred ppb, both in indoor and outdoor samples. Thirteen compounds were detected in the rooftop sample. Phenol was highest at 480 ppb. The outdoor sample at the front of the building had seventeen compounds detected. N-propyl acetate was highest at 139 ppb. The indoor sample (Suite 2, Rm. 106) had 25 compounds detected. Octamethylcyclotetrasiloxane was highest at 33 ppb. Benzene

was not detected in any of the three samples. The level of detection was 5 ppb. Results are summarized in Appendix B.

**November 22, 2004**

DHFS and DOC used a GasTech methane monitor and Interscan hydrogen sulfide monitor to survey the building and in particular, plumbing drain locations. A slight instrument response was noted at a plumbing stub in the vacant area and in floor drain of the women's restroom. Otherwise, neither instrument responded over baseline values (1 part per million for the methane monitor and approximately 6 parts per billion for the hydrogen sulfide monitor).

**December 10, 2004**

A site visit was scheduled to test the effectiveness of rooftop plumbing corrections in limiting sewer gas entry into the building. Plumbing vents had previously been connected to a common vent line, which was routed over the east side of the building. A survey of indoor building air with a PID indicated baseline levels of 0-40 ppb. Readings from the vent stack outlet indicated levels of 79 to 112 ppb. Following introduction of the odorant (peppermint essence), levels inside the building remained unchanged. Readings at the plumbing vent outlet were above 3,000 ppb. The plumbing vent changes were effective at limiting sewer gas entry into the building. Of note during this site visit was the presence of a garbage/sulfide odor outside of the building. Wind direction was directly over active landfill operations. This suggested that ambient odors still may enter and impact indoor air quality in the building.

## Summary of Collected Air Quality Data

Air samples were collected on a number of occasions for hydrogen sulfide, volatile organic compounds and other indoor air quality parameters. Data was collected by both the DHFS and DOC. Sample results are discussed below.

### Hydrogen Sulfide

Hydrogen sulfide had been detected in the manhole near the building on a number of occasions by the La Crosse county solid waste department. The presence of hydrogen sulfide was attributed to the pumping of landfill leachate through the sewer. The odor threshold for hydrogen sulfide is 0.5 to 300 parts per billion (ATSDR 2004). Sulfide-like odors were noticed in the building on a number of occasions by numerous staff and seemed to correlate with the pumping of leachate. Air samples (both grab and time-integrated samples) were collected on a number of occasions associated with these odor events. With the exception of the February 3, 2005 sample, hydrogen sulfide was not detected. The February 3, 2005 result was 290 parts per billion. This level should have been associated with a very strong odor in the building. No staff in the building reported an odor at the time of sample collection. In addition, a direct reading hydrogen sulfide monitor in

the building did not indicate significant elevation in hydrogen sulfide during this time. Therefore, this data point is considered an anomaly. Since plumbing vent stacks have been re-routed on the roof, there have not been significant odor events attributed to leachate pumping, although ambient odors associated with landfill operations still enter the building. The lack of confirmed hydrogen sulfide exposure in the building may relate to a lack of testing during the strongest odor events, other sulfur-compounds not detected in the tests, or very low levels that were present, but below analytic detection.

**Table 1**
**Summary of Hydrogen Sulfide Data (parts per billion)**
August through February 2005
Wisconsin Department of Commerce Building
Kinnee Coulee Road, La Crosse, WI

| Date | Location | Hydrogen Sulfide (ppb) | Comments |
|---|---|---|---|
| 8/2/04 | Manhole, northeast corner of building | ND | Reported by La Crosse county solid waste dept. |
| 8/3/04 | Manhole, northeast corner of building | ND | Reported by La Crosse county solid waste dept. |
| 8/4/04 | Manhole, northeast corner of building | 34,000 | Reported by La Crosse county solid waste dept. |
| 8/5/04 | Manhole, northeast corner of building | ND | Reported by La Crosse county solid waste dept. |
| 8/9/04 | Suite 2, General offices (DOC) | ND <6 | Sorbent tube sample |
| 8/13/04 | Suite 2, General offices (DOC) | ND <6.5 | Sorbent tube sample |
| 8/13/04 | Suite 2, General offices, east central | ND <20 | SUMMA canister grab sample |
| 8/19/04 | Suite 2, Rm. 106 (DOC) | ND <20 | SUMMA canister grab sample |
| 9/16/04 | Manhole, northeast corner of building | 54,000 | Reported by La Crosse county solid waste dept. to DOC staff |
| 9/16/04 | Suite 2, General offices (DOC) | ND <26 | Sorbent tube 2- hour sample |
| 9/17/04 | Suite 2, General offices (DOC) | ND <12 | Sorbent tube 4- hour sample |
| 9/16/04 | Suite 2, General offices (DOC) | ND <25 | SUMMA canister grab sample |
| 9/16/04 | Men's Restroom | ND <25 | SUMMA canister grab sample |
| 10/29/04 | Rooftop, outdoors at front door and in Suite 2, Rm. 104 | ND | SUMMA canister 8- hour sample |
| 11/4/04 | Suite 1 | | SUMMA canister 8- hour sample |
| 12/13/04 | Suite 2, Rm. 104 | ND | SUMMA canister 6- hour sample |
| 12/23/04 | Suite 2, General offices | ND | SUMMA canister 8- hour sample |
| 2/3/05 | Suite 2, General offices, east central | 290 | SUMMA canister grab sample |
| 2/17/05 | Suite 2, General offices, east central | ND <40 | SUMMA canister grab sample |

**Volatile Organic Compounds**

Air samples from the DOC building were collected for laboratory analysis on 13 occasions between August 9, 2004 and February 17, 2005. The results for samples collected for VOC analysis on October 26, 2004, are not included in Appendix B because the samples were not analyzed, due to improper sample media. Sample periods ranged from instantaneous (grab) to 8 hours. A number of these samples were collected either during or shortly after a strong odor event.

Results varied greatly among samples. The number of compounds detected varied from 7 to 119. Concentrations for most compounds were below 5 parts per billion, the laboratory limit of quantitation. To facilitate data review, reported compounds that had significant toxicity were regularly reported, or were reported above 100 parts per billion are shown in Appendix B. Each compound is shown with the appropriate date and associated comparison values, where such values were available. Comparison values are levels of exposure that have been derived by governmental or professional organizations that are not expected to result in adverse health effects. With few exceptions, observed concentrations were well below comparison values. Exceptions were as follows:

- Hexachlorobutadiene was detected in outdoor air at the front of the building and in an office in two samples collected on 10/29/04. The concentrations were low enough that the lab could not confidently assign a concentration above the detection limits of 16 and 5 parts per billion. This compound is used in the synthesis of chlorinated hydrocarbons and background levels in urban environments can be as high as 36 parts per trillion (ATSDR 1995). Hexachlorobutadiene was not found in any other samples. The risk-based comparison value for USEPA Region 3 is 7 parts per trillion. This is an exceedingly low level and in many cases may be below ambient background values. If hexachlorobutadiene is present in subsequent air samples, consideration should be given to using analytical methods capable of lower detection limits in order to better characterize exposures.

- 1,3-butadiene was detected in only one sample on 8/19/04 at a level at which the laboratory was not confident in quantifying below the detection limit of 5 parts per billion. It is used commonly in formulating plastic and rubber components. Its presence in ambient air is common, and it has been associated with automobile exhaust, gasoline and cigarette smoke. The risk-based comparison value for USEPA Region 3 is 29 parts per trillion. Ambient air background levels of 1,3-butadiene range between from a fraction of a part per billion (ppb) to a few ppb (ATSDR 1993). This compound was detected only below detection limits and the detection limit is not far from background levels. Therefore exposure to such a level of 1,3-butadiene poses *no apparent public health hazard,* and no further action is recommended.

- Benzene was found in several samples ranging from 11 to 122 ppb. The result of 122 ppb was from a grab sample on August 19, 2004 while the highest 8-hour sample result was 44 ppb on December 23, 2004. The ATSDR acute minimum risk level (MRL) for benzene is 50 ppb and the intermediate MRL is 4 ppb. Benzene was not detected in each of the three eight

hour samples collected on October 29, 2004. However it was detected at 44 ppb in the December 23, 2004 sample. Further sampling is recommended to better characterize exposure. Some employees work with the petroleum program and may have benzene exposures greater than other staff in the building. As such, these exposures should continue to be evaluated. Pending further data, future exposure to benzene at this site is considered an *indeterminate health hazard*.

**Pathway Analysis**

Approximately 20 employees work in the building during typical business hours of 7:45 am to 4:30 pm, Monday through Friday. There are several sources in or near the DOC building that may contribute benzene, sulfides or other contaminants to the atmosphere. First, a petroleum product analysis laboratory is located inside the building, at the north end of the DOC office suite. Second, the landfill can be a source of benzene and sulfide, either released to ambient air via the landfill gas extraction system, or vapors originating from leachate. USEPA records indicate benzene is emitted both to air and through leachate (USEPA , WI DNR). Testing performed by the La Crosse county public works has confirmed hydrogen sulfide presence in a manhole near the building. Third, the DOC building is located about 100 meters across from Interstate 90, a major highway that serves the Chicago to La Crosse corridor.

The petroleum lab has dedicated makeup air and air is exhausted directly outdoors through a vent stack that is approximately 10 feet high. Air is exchanged in the lab at a rate of 20 air changes per hour. Photoionization detector (PID) readings were zero at the outside of the lab door on the office suite side and again zero inside the lab. Petroleum samples and test apparatus were located in a constantly operating fume hood. Flammable liquid storage cabinets in the lab were also vented. DOC facility staff indicated that the ventilation system for the lab cycles down during evening hours and returns on in the early morning. To evaluate the potential of the cycling to create higher exposure in the office, between October 26 to 29, 2004, the PID was placed in Suite 2, Rm. 106 which was nearest the common wall and set to run for 3 days. A chart presenting the data is shown in Appendix C. There were several small peaks of elevated VOCs noted around the lunch hour, but no evidence of effect from the ventilation system. It did not appear likely the lab operations were contributing to indoor VOC levels.

Landfill contributions to benzene in the building might come from vapor associated with leachate, from discharge of landfill gas or perhaps from the handling of petroleum-contaminated soils. Highway traffic may also contribute to volatile organics associated with gasoline such as benzene, ethylbenzene, toluene and xylene. To evaluate the sewer system as a possible exposure pathway, an odorant was placed in the sewer and monitoring was conducted at the sewer vent stacks on the rooftop. Monitoring results on the rooftop and inside the building confirmed that a completed exposure pathway exists between the plumbing exhaust system and building occupants.

## Occupant Health Symptoms

A number of DOC employees reported recurrent health symptoms that included headaches and a strong burning sensation of nasal passages. These symptoms sometimes corresponded to odor events but were sometimes experienced without noticeable odors. Comparing sampling data from August 19, 2004, a day when odor was strong (832 ppb TVOCs), to October 29, 2004, a day without odor (123 ppb TVOCs) suggests that odor and VOC levels may be correlated. When occupant symptoms did occur, onset was generally quick and symptoms would subside by the end of the day. DOC staff were advised to log symptoms, the presence of odors, and environmental conditions, particularly wind direction. With the exception of benzene, there have been no compounds regularly detected that have exceeded or approached comparison value levels.

## Public Health Implications

In summary, air in the La Crosse DOC building contains a mixture of volatile compounds at low concentrations. Sample data has shown that air quality in the Wisconsin Department of Commerce office space is not optimal, but currently is a *no apparent public health hazard*. However, because of elevated benzene levels in several samples, the wide array of compounds detected, and uncertainty about human exposures, further data collection is necessary. Therefore pending additional data, exposure to volatile compounds at this site is considered an *indeterminate public health hazard.* The basis for this determination is discussed below. As more indoor air data becomes available for the DOC building, DHFS will evaluate the data and re-evaluate the human health implications of exposures to employees.

### Benzene

Benzene is a common industrial solvent and feedstock for chemical synthesis. It is a colorless liquid with a sweet odor and is highly flammable. It has an odor threshold of 1.5 to 4.7 ppm. Benzene can originate from both natural and man-made sources. Major sources include tobacco smoke, service stations, vehicle exhaust and industrial emissions. Background benzene levels in outdoor air range from 2.8 to 20 ppb, with higher levels observed in more urban areas. Elevated exposure produces disruption in blood cell formation and affects the immune system. Benzene is a known human carcinogen of the blood forming organs (leukemia). It may also be harmful to reproductive organs. The acute MRL of 50 ppb is based on an animal study in which blood system changes were observed (ATSDR 1997). The intermediate MRL is 4 ppb, a value that is not much different than values found in background air concentrations.

**Table 2**
**Summary of Benzene Data (parts per billion)**
August 2004 through February 2005
Wisconsin Department of Commerce Building
Kinnee Coulee Road, La Crosse, WI

| Date | Location | Benzene Concentration (ppb) | Comments |
|---|---|---|---|
| 8/19/04 | Suite 2, Rm. 106 | 122 | Grab sample |
| 8/26/04 | Suite 2, General ofcs., east central | 17 | Grab sample |
| 9/16/04 | Men's Restroom | 11 | Grab sample |
| 9/16/04 | Suite 2 General ofcs. | Trace | Grab sample |
| 10/29/04 | Suite 2, Rm. 106 | ND | 8- hour sample |
| 11/4/04 | Suite 1 | ND | 8- hour sample |
| 12/13/04 | Suite 2, Rm. 104 | ND | 6- hour sample |
| 12/23/04 | General office | 44 | 8- hour sample |
| 2/3/05 | Suite 2, General ofcs., east central | 7.9 | Grab sample |
| 2/17/05 | Suite 2, General ofcs., east central | 9.8 | Grab sample |

The level of benzene exposure in the building has at times been close to or above the ATSDR acute minimal risk level, but in other instances was not detected. Additional 8- hour sample data is recommended to better characterize exposure. Pending further sample data, exposure to benzene at this site represents an *indeterminate heath hazard.*

**Mixtures of Volatile Organic Compounds/ Total Petroleum Hydrocarbons**

Several staff in the building raised questions and concerns about how their health is affected by the mixture of chemicals found in indoor air of the DOC office building. Volatile organic compounds (VOCs) are those chemicals containing carbon that evaporate readily at room temperature and pressure. Because they evaporate readily, they often represent health and safety concerns. This is due to their ability to be easily inhaled and because they are often flammable. Many VOCs are known carcinogens.

Toxicity data is available only for a limited number of organic compounds to which we are exposed. This presents challenges in assessing the risk of multiple exposures. One approach is to assume that similar effects would be observed for compounds of similar chemical structure. For assessing the multitude of compounds present in petroleum products, the compounds benzene, ethylbenzene, toluene, and xylene are often used as indicators of overall exposure risk.
In the sample data set for the DOC building, benzene, ethylbenzene, toluene, and xylene are often reported. The highest combined concentrations of ethylbenzene, toluene, and xylene did not exceed the lowest chronic MRL of 80 ppb for toluene. Benzene is not included as its toxicity warrants individual assessment as was discussed previously.

The majority of compounds detected were present either in low part per billion (ppb) quantity or below the limit of quantitation, typically 5 ppb. In most cases, these compounds were well below relevant comparison values or comparison values were not available. There are no regulatory standards that define acceptable exposure levels to combined low level volatile contaminants in non-occupational settings. As general guidance for indoor air quality, a level of 3 milligrams per cubic meter or 1 part per million has been proposed as a level above which building occupants may experience discomfort (Molhave 1990). This level was approached or exceeded in the DOC office on several occasions. This level of exposure represents *no apparent public health hazard.* However, it is possible that such exposure may contribute to discomfort of building occupants.

## Risk Communication

Meetings were held with building employees on September 2, 2004, October 8, 2004, November 22, 2004 and December 15, 2004. At these meetings, collected data was discussed including methodology, suspected odor/exposure pathways, and relevant comparison values. A primary focus of these discussions was a determination of the potential pathways for exposure and the progress being made in formulating and implementing corrective actions. The role of ATSDR was also discussed in relation to a submitted petition, as was the role of NIOSH in occupational exposure investigation.

## Conclusion

Indoor air in the La Crosse DOC building has contained numerous volatile organic compounds as well as sulfide-related compounds. While the data collected thus far indicates indoor air of the DOC building does not represent a health hazard for DOC employees, the varied and sometimes elevated levels of benzene detected, the wide array of compounds detected and uncertainty of combined effects warrants consideration of future exposures at this site as *an indeterminate public health hazard*.

The primary source of these compounds in indoor air is not certain, but suspected to be primarily petroleum-related and coming from several possible sources, including ambient emissions from the neighboring landfill, leachate and sewer gas that was entrained from plumbing vents, a petroleum lab in the building and vehicle exhaust from a well traveled interstate.

Once mitigation actions halt sewer and leachate vapors from entering the DOC building and benzene levels have been better characterized and controlled, vapors may continue being found inside the building originating from other nearby sources. These vapor levels are expected to be low and pose *no apparent public health hazard.*

## Recommendations

To reduce odors, inhalation exposures and improve general indoor air quality, DHFS recommends corrective actions that will prevent sewer and leachate gas from continuing to enter the DOC building.

DHFS recommends installation of carbon filtration on the DOC building's ventilation system to filter out and reduce volatile compounds that enter the building. DHFS also recommends continued indoor air monitoring inside the DOC building to evaluate potential future exposures.

## Public Health Action Plan

DOC staff should continue to collect air samples using the mini SUMMA canisters. Grab samples should be collected during significant odor events, those in which numerous staff acknowledge as strong. Observations should be made of wind direction and the presence or absence of odor in other building locations, as well as outdoors. In addition, monitoring should continue for total VOCs and benzene over 8 hour time periods using a NIOSH or OSHA method or EPA method TO-14. The rooftop air handling units should be evaluated for the feasibility of upgrading filtration to evaluate potential for installing upgraded/charcoal-adsorbing filters. Staff in the building should continue to be informed of actions taken to control odors and exposure and of new data as it becomes available.

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## CERTIFICATION

This Wisconsin Department of Commerce La Crosse Building Health Consultation was prepared by the Wisconsin Department of Health and Family 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 public health consultation was begun.

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Technical Project Officer, CAT, SPAB, DHAC

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

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Team Leader, CAT, SPAB, DHAC, ATSDR

## Appendix A

Indoor Air Quality Data
Wisconsin Department of Commerce Building
Kinnee Coulee Road, La Crosse, WI
September 2, 2004

**Appendix A**

Indoor Air Quality Data [1]

Wisconsin Department of Commerce Building, Kinnee Coulee Road, La Crosse, WI

September 2, 2004

| LOCATION | Volatile Organic Compounds (ppb) | Carbon Monoxide (ppm) | % Lower Explosive Limit | % Oxygen | Carbon Dioxide (ppm) | Chlorine (ppm) | Sulfur Dioxide (ppm) | Nitrogen Dioxide (ppm) | Hydrogen Sulfide (ppm) |
|---|---|---|---|---|---|---|---|---|---|
| Outdoors | 0-360 | ND | ND | 20.8 | 394 | ND | ND | ND | ND |
| Lobby | 32 | ND | ND | 20.8 | 418 | ND | ND | ND | ND |
| Suite 2 Rm. 101 (DOC reception) | 71 | ND | ND | 20.8 | 558 | ND | ND | ND | ND |
| Suite 2 Rm. 108 offices- south end | 31 | ND | ND | 20.8 | 587 | ND | ND | ND | ND |
| Suite 2 Rm. 108- south central | 2 | ND | ND | 20.8 | 611 | ND | ND | ND | ND |
| Suite 2 Rm. 104 | 19 | ND | ND | 20.8 | 646 | ND | 0.0-0.1 | ND | ND |
| Suite 2 Rm. 106 | 8 | ND | ND | 20.8 | 593 | ND | ND | ND | ND |
| Suite 2 Rm. 108 offices- north end | ND | ND | ND | 20.8 | 521 | ND | ND | ND | ND |
| Suite 2 Rm. 107- Lab door | ND | - | - | - | - | - | - | - | - |
| Suite 2 Rm. 107- Lab door slightly | ND | - | - | - | - | - | - | - | - |

| LOCATION | Volatile Organic Compounds (ppb) | Carbon Monoxide (ppm) | % Lower Explosive Limit | % Oxygen | Carbon Dioxide (ppm) | Chlorine (ppm) | Sulfur Dioxide (ppm) | Nitrogen Dioxide (ppm) | Hydrogen Sulfide (ppm) |
|---|---|---|---|---|---|---|---|---|---|
| Suite 2 Rm. 107 Table | ND | - | - | - | 568 | ND | ND | ND | ND |
| Suite 2 Rm. 101 | ND | - | - | - | - | - | - | - | - |
| Suite 2 Supply air diffusers | ND | - | - | - | - | - | - | - | - |
| Suite 3- Vacant Space West side of bldg. (plumbing trap) | 700+ | - | - | - | - | ND | 0.1 | ND | ND |
| Suite 3Vacant area garage | 255 | ND | - | 20.8 | 437 | - | ND | ND | - |
| Suite 1HFS entry door | ND | ND | - | 20.8 | 518 | ND | ND | ND | ND |
| Suite 2 general offices- east | ND | ND | - | 20.8 | 540 | ND | ND | ND | ND |
| Suite 2 Rear Door | 0-9 | - | - | - | - | 0.0-0.1 | 0.2-0.4 | ND | - |

1 A Gray Wolf TG-501 Indoor Air Quality Probe was used to measure hydrogen sulfide, sulfur dioxide, carbon dioxide and nitrogen dioxide. A MSA Orion Multi-gas detector was used to measure carbon monoxide, explosivity, and oxygen. A Rae Systems PPB Rae photoionization detector was used to measure volatile organic compounds (VOCs).

## Appendix B

Volatile Organic Compound Data
Wisconsin Department of Commerce Building, Kinnee Coulee Road, La Crosse, WI
August 2004 to February 2005

**Appendix B**
**Volatile Organic Compound Data (parts per billion)[1]**
Wisconsin Department of Commerce Building, Kinnee Coulee Road, La Crosse, WI
August 2004 to November 2004

| **Compounds** | **Date and Duration of Sample** | | | | | | | | | | | | **ATSDR MRLs[2]** | | | **USEPA Reg. 3 Risk-Based Conc.** | **ACGIH TLVs (2003)[3]** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 8/19/04 Suite 2 Rm. 106 Grab | 8/26/04 Suite 2 Gen. ofcs. east central Grab | 9/16/04 Men's Restrm. Grab | 9/16/04 Suite 2 Gen. ofcs. Grab | 10/29/04 Rooftop 8- hour | 10/29/04 Front Door 8 hr. | 10/29/04 Suite 2 Rm. 106 8- hour | 11/4/04 Suite 1 8-hour | 12/13/04 Suite 2 Gen. ofcs. South east 6- hour | 12/23/05 Suite 2 General ofcs. 8-hour | 2/3/05 Suite 2 Gen. ofcs. South east Grab | 2/17/05 Suite 2 Gen. ofcs. South east Grab | Acute | Int. | Chronic | | |
| 1,3-Butadiene | <5 est. | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | - | - | - | 0.029 (c) | 2,000 (c) |
| 1,3-Butadiene, 1,1,2,3,4,4-hexachloro- | ND | ND | ND | ND | ND | <16 | <5 | ND | ND | ND | ND | ND | - | - | - | 0.007 (c) | 20 (c) |
| 1-Butene, 2,3-dimethyl | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 1,740, est., ? | - | - | - | - | - |
| 3-Butan-2-one, 3-methyl- | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 130 est., ? | - | - | - | - | - |
| 1-Hexanol, 2-ethyl- | ND | ND | ND | ND | ND | ND | ND | <17 est., ? | <33 est., ? | ND | ND | ND | - | - | - | - | - |
| 1-Pentene, 4-methyl- | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 370 est., ? | - | - | - | - | - |
| 2-Propanethiol, 2-methyl- | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 1,400 est., ? | - | - | - | - | - |
| 2-Propanol, 2-methyl- | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 100 est., ? | - | - | - | - | - |
| Benzene | 122 | 17 | 11 | trace | ND | ND | ND | ND | ND | 44 | 7.9 | 9.8 | 50 | 4 | - | 0.72 (c) | 500 (c) |
| Butane | ND | <5 est.., ? | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | - | - | - | - | 800,000 |
| Carbon disulfide | ND | ND | ND | ND | ND | ND | 10 est., ? | ND | ND | ND | ND | ND | - | - | 300 | - | 10,000 |
| Carbonyl sulfide | ND | ND | ND | ND | ND | ND | <5 est. | ND | ND | ND | ND | ND | - | - | - | - | - |
| Cyclotetrasiloxane, octamethyl | 280 est., ? | <5 est., ? | 11 est., ? | <5 est., ? | ND | 51 est., ? | 33 est., ? | 31 est., + | 70 est. | 46 est., ? | 800 est., ? | ND | - | - | - | - | - |
| Cyclotrisiloxane, hexamethyl- | 71 est. | <5 est. | 7 est. | <5 est., ? | 35 est. | 27 est., + | 14 est. | <17 est. | 50 est., + | | 470 | ND | - | - | - | - | - |
| Ethylbenzene | 17 | 22 | 10 | trace | ND | ND | ND | ND | ND | 40 | 7.8 | ND | - | - | 1,000 | 253.73 | 100,000 (c) |
| Hydrogen sulfide | ND <20 | ND <20 | ND <25 | ND <25 | ND | ND | ND | ND | ND | ND | 290 | <40 | 70 | 30 | - | 1.51 | 10,000 |
| Isobutane | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 170 est., ? | - | - | - | - | - |
| m-&p-Xylene | ND | ND | ND | ND | <32 | ND | ND | ND | ND | ND | 14 | ND | 1,000 | 700 | 100 | 25.37 | 100,000 |
| Methanethiol | <10 | ND <10 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | - | - | - | - | - |
| Propene | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 110 est. | - | - | - | - | - |

| Compounds | Date and Duration of Sample | | | | | | | | | | | | ATSDR MRLs[2] | | | USEPA Reg. 3 Risk-Based Conc. | ACGIH TLVs (2003)[3] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 8/19/04 Suite 2 Rm. 106 Grab | 8/26/04 Suite 2 Gen. ofcs. east central Grab | 9/16/04 Men's Restrm. Grab | 9/16/04 Suite 2 Gen. ofcs. Grab | 10/29/04 Rooftop 8- hour | 10/29/04 Front Door 8 hr. | 10/29/04 Suite 2 Rm. 106 8- hour | 11/4/04 Suite 1 8-hour | 12/13/04 Suite 2 Gen. ofcs. South east 6- hour | 12/23/05 Suite 2 General ofcs. 8-hour | 2/3/05 Suite 2 Gen. ofcs. South east Grab | 2/17/05 Suite 2 Gen. ofcs. South east Grab | Acute | Int. | Chronic | | |
| n-Propyl acetate | ND | ND | ND | ND | ND | 139 est., + | 25 est., + | 89 est., + | 61 est., + | <31 est., + | ND | ND | - | - | - | - | 200,000 |
| Phenol | ND | ND | ND | ND | 280 est. | 39 est. | <5 est. | ND | ND | ND | ND | ND | - | - | - | - | 5,000 |
| Phenol , 2,3-dimethyl | ND | ND | ND | ND | 110 est. | ND | ND | ND | ND | ND | ND | ND | - | - | - | - | - |
| Phenol , 2,4-dimethyl | ND | ND | ND | ND | 39 est. | <16 est. | <5 est. | ND | ND | ND | ND | ND | - | - | - | 14.6 | - |
| Phenol , 2,6-dimethyl | ND | ND | ND | ND | ND | <16 est. | ND | ND | ND | ND | ND | ND | - | - | - | 0.44 | - |
| Phenol , 2-methyl | ND | ND | ND | ND | 480 est. | 48 est. | <5 est. | ND | ND | ND | ND | ND | - | - | - | 40.75 | - |
| Phenol , 4-methyl | ND | ND | ND | ND | 74 est. | <16 est. | <5 est., ? | ND | ND | ND | ND | ND | - | - | - | 4.08 | - |
| p-Xylene | 8 | 11 | 6.6 | trace | ND | ND | ND | ND | ND | ND | ND | ND | 1,000 | 700 | 100 | 25.37 | 100,000 |
| Sulfur Dioxide | ND | ND | ND | ND | ND | ND | ND | ND | ND | <31 est. | ND | ND | - | - | - | - | - |
| Toluene | 43 | 35 | 13 | trace | <32 | ND | <5, + | ND | ND | 42 | 9.3 | ND | 1,000 | - | 80 | 111.62 | 50,000 |
| # of VOCs | 42 | 21 | 11 | 8 | 13 | 17 | 25 | 11 | 7 | 11 | 47 | 119 | - | - | - | - | - |
| Total VOCs | 832 | 136 | 76.6 | 0 | 1,150 | 413 | 123 | 120 | 181 | 269 | 1,721.6 | 4,942.4 | - | - | - | - | - |

"est." and "?" are designations used by the laboratory on sample reports to indicate level of confidence in compound identification. "est." indicates identification based on internal library match by instrument and not by comparison to an internal standard and "?" indicates uncertainty about compound identity.

(c) = Carcinogen

[1] Samples collected in 400 ml SUMMA canisters and analyzed using modified OSHA Method PV2120.

[2] Agency for Toxic Substances and Disease Registry Minimal Risk Levels (ATSDR MRLs) are found at http://www.atsdr.cdc.gov/mrls.html and United States Environmental Protection Agency Region 3 Risk Based Concentrations are found at http://www.epa.gov/reg3hwmd/risk/human/index.htm. Both of these values are intended to be screening values that are protective of the general public, including sensitive populations for 24 hour, lifetime exposures.

[3] American Conference of Governmental Industrial Hygienists Threshold Limit Values. These values are intended to be protective of healthy adults for workshifts of 8 hours a day and 40 hours a week.

**Appendix C**

Volatile Organic Compound Readings
Suite 2, Room 106 (Closest to Petroleum Lab)
WI DOC Building, La Crosse, WI
October 26, 2004 to October 29, 2004

**Appendix C**

Volatile Organic Compounds Collected with ppb Rae Photoionization Detector (ppb)
Suite 2, Rm. 106 (Closest to Petroleum Lab)
WI DOC Building, La Crosse, WI
October 26, 2004 to October 29, 2004