Texas Commission on Environmental Quality

INTEROFFICE MEMORANDUM

To: Leroy Biggers, Regional Director
Charles Murray, Air Section Manager
TCEQ Region 5 - Tyler

Date: December 20, 2005

From: Shannon Ethridge, M.S.
Toxicology Section, Chief Engineer's Office

Subject: Health Effects Review of 2004 Ambient Air Network Monitoring Data in Region 5, Tyler

Conclusion

- Annual average concentrations of all reported VOCs at both sites were below their long-term ESLs and are not a health concern.
- Reported carbonyl annual average concentrations, including formaldehyde which exceeded its long-term ESL at the monitoring site located at Highway 143 and Spur 449 in Karnack, were not of health concern.

Background

This memorandum conveys the Toxicology Section's evaluation of ambient air sampling conducted at two monitoring network sites in Region 5–Tyler during 2004. Summary results for Volatile Organic Compounds (VOCs) and carbonyls collected every sixth day from a site located at Highway 143 and Spur 449 in Karnack, Texas, as well as VOCs collected every sixth day from a site located at Gregg County Airport in Longview, Texas, were evaluated. Information about the monitoring sites, the only locations in TCEQ Region 5 with a monitor, is presented in Table 1. The specific chemicals evaluated are listed in Table 2 and the locations of the sites are shown in Figures 1 and 2. This memorandum evaluates air monitoring data on a chemical-by-chemical basis.

Table 1. Monitoring Sites Located in TCEQ Region 5

City and Site Location	County	Monitor ID	Monitored Compounds	Begin Date
Longview, Gregg County Airport	Gregg	481830001	VOCs	November 5, 1997
Karnack, Highway 143 and Spur 449	Harrison	482030002	VOCs and carbonyls	August 28, 2001

Table 2. Monitored Chemicals		
CATMN VOCs		
1,1,1-Trichloroethane	Bromomethane	m-Diethylbenzene
1,1,2,2-tetrachloroethane	Butyl Acetate	m-Ethyltoluene
1,1,2-Trichloroethane	Butyraldehyde	methyl chloride
1,1-Dichloroethane	CIS 1,3-dichloropropylene	n-Butane
1,1-Dichloroethylene	Carbon Tetrachloride	n-Decane
1,2,3-Trimethylbenzene	Chlorobenzene	n-Heptane
1,2,4-Trimethylbenzene	Chloroform	n-Hexane
1,2-Dibromoethane	Chloroprene	n-Nonane
1,2-Dichloroethane	Cyclohexane	n-Octane
1,2-Dichloropropane	Cyclopentane	n-Pentane
1,3,5-Trimethylbenzene	Cyclopentene	n-Propyl Acetate
1,3-Butadiene	Ethane	n-Propylbenzene
1-Butene	Ethyl Acetate	n-Undecane
1-Hexene+2-methyl-1-pentene	Ethyl Benzene	o-Ethyltoluene
1-Pentene	Ethylene	o-Xylene
2,2,4-Trimethylpentane	Isobutane	p-Diethylbenzene
2,2-Dimethylbutane - Neohexane	Isopentane	p-Ethyltoluene
2,3,4-Trimethylpentane	Isoprene	p-Xylene + m-Xylene
2,3-Dimethylbutane	Isopropylbenzene	t-2-Butene
2,3-Dimethylpentane	Methyl Butyl Ketone (MBK)	t-2-Hexene
2,4-Dimethylpentane	Methyl t-Butyl ether	t-2-Pentene
2-Butanone	Methylcyclohexane	trans-1-3-dichloropropylene
2-Chloropentane	Methylcyclopentane	
2-Methyl-2-Butene	Methylene Chloride	
2-Methylheptane	Methylisobutylketone	
2-Methylhexane	Propane	
2-Methylpentane - Isohexane	Propylene	
2-methyl-3-hexanone	Styrene	
3-Methyl-1-Butene	Tetrachloroethylene - Perchloroethylene	
3-Methylheptane	Toluene	
3-Methylhexane	Trichloroethylene	
3-Methylpentane	Trichlorofluoromethane	
3-heptanone	Vinyl Chloride	
3-hexanone	c-2-Butene	
3-pentanone	c-2-Hexene	

Table 2. Monitored Chemicals		
4-Methyl-1-Pentene	c-2-Pentene	
Acetylene	dichlorodifluoromethane	
Benzene	isobutyraldehyde	
Carbonyls		
2,5-Dimethylbenzaldehyde	Crotonaldehyde - 2-Butenal	Propanal - Propionaldehyde
Acetaldehyde	Formaldehyde	Valeraldehyde
Acetone	Heptaldehyde	m-Tolualdehyde
Acrolein	Hexanaldehyde	o-Tolualdehyde
Benzaldehyde	Isovaleraldehyde	p-Tolualdehyde
Butyraldehyde	MEK/Methacrolein	

The TCEQ Monitoring Operations Division reported data for all chemicals evaluated in this memorandum. The data return for the Karnack monitor met completeness requirements for estimating annual average concentrations for 97 of 98 VOCs and 15 of 17 carbonyls. The data return for the Longview monitor met completeness requirements for estimating annual average concentrations for 95 out of 98 VOCs. For all VOCs and carbonyls that met completeness requirements, annual average concentrations were compared to their respective long-term TCEQ health-based Effects Screening Levels (ESLs). Because 24-hour air samples are designed to provide representative long-term average concentrations, annual averages from 24-hour samples were evaluated for potential chronic health concerns. Short-term or peak concentrations are not captured by 24-hour samples; therefore, daily maximum concentrations have limited use in evaluating the potential for acute health effects.

An ESL is a guideline concentration which is protective of the general public including sensitive members of the population, such as the elderly, children, and persons with pre-existing health conditions. Health-based ESLs are guideline comparison levels set well below levels at which adverse health effects have been reported in the scientific literature. If an air concentration of a pollutant is below the ESL, we do not expect adverse health effects to occur. If an air concentration of a pollutant is above the health-based ESL, it does not indicate that adverse effects will necessarily occur; however, further evaluation may be warranted.

Evaluation

All annual average concentrations of VOCs that met data completeness requirements were below their long-term ESLs and would not be expected to cause adverse health effects. With the exception of formaldehyde, all annual average concentrations of carbonyls that met data completeness requirements were below their long-term ESLs and would not be expected to cause adverse health effects. Although formaldehyde exceeded its long-term ESL at the monitoring site located at Highway 143 and Spur 449 in Karnack, these concentrations were not of health

concern. Formaldehyde is discussed below. Data for acetone, MEK/methacrolein, 1,1-dichloroethane, 3-heptanone, and 3-pentanone did not meet completeness requirements and could not be evaluated.

Formaldehyde

The 2004 annual average formaldehyde concentration of 1.3 ppbv slightly exceeded the current long-term ESL of 1.2 ppbv. Assuming continuous lifetime exposure to the measured levels and using the EPA unit risk factor, the excess cancer risk estimate is approximately 2 in 100,000. However, the current EPA formaldehyde unit risk factor, which was promulgated in 1991 based on rat data from a 1987 study, does not represent the best available science in the peer-reviewed literature and is generally believed to substantially overestimate risk. EPA is currently reviewing this risk factor in light of significant new data and analyses. Use of a new risk factor (published in 2004) that incorporates more recent toxicological research affecting formaldehyde carcinogenicity (e.g., anatomical differences between rat and human nasal passages, regional dosimetry throughout the human respiratory tract, mode of action information) results in de minimus risk estimates of 1 in 10 million to 2 in 10 million for lifetime exposure to these formaldehyde levels. The new risk factor is considered more scientifically-defensible as it utilizes more recently available mechanistic and dosimetric science on the dose-response for portal of entry (i.e., respiratory tract) cancers due to formaldehyde exposure.

If you have any questions about this evaluation, please call me at (512) 239-1822 or e-mail me at sethridg@tceq.state.tx.us.

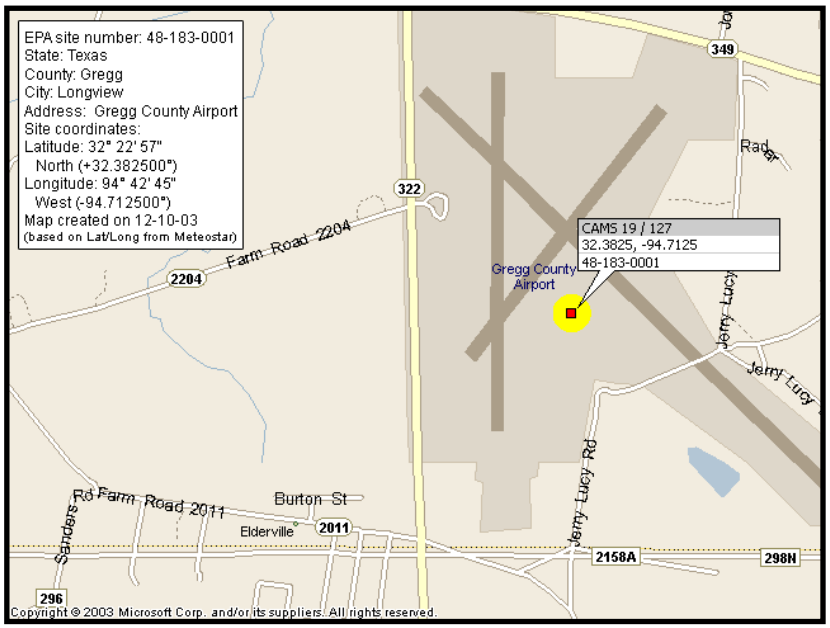

Figure 1. Location of Gregg County Airport Monitor

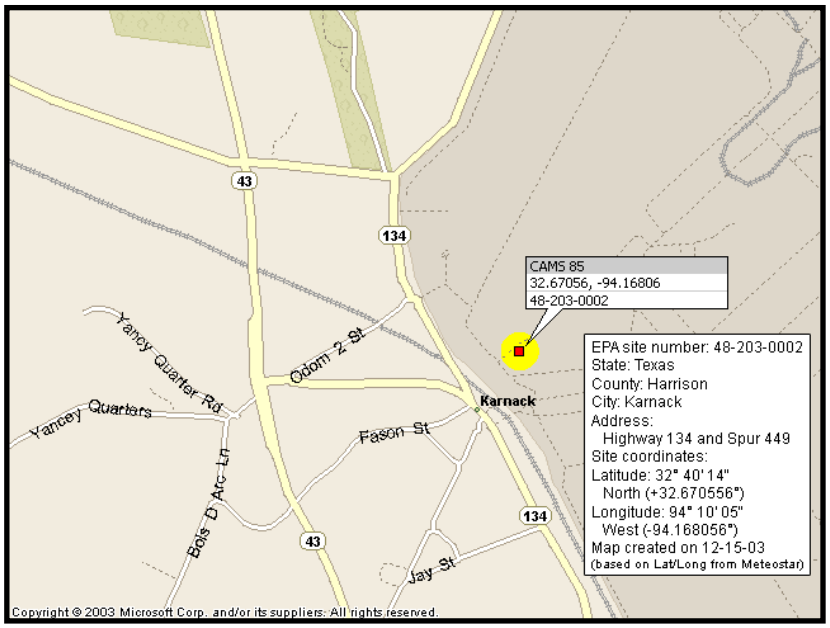

Figure 2. Location of Karnack Monitoring Site

cc: Casso, Ruben – EPA Region 6, Dallas (via e-mail)