Texas Commission on Environmental Quality

INTEROFFICE MEMORANDUM

To: Tony Walker, Regional Director
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TCEQ Region 4-Dallas/Fort Worth
Frank Espino, Area Director

Date: November 1, 2006

From: Neeraja K. Erraguntla, Ph.D.
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Subject: Health Effects Review of 2005 Ambient Air Network Monitoring Sites in Region 4-Dallas/Fort Worth

Conclusions

- Annual average concentrations of all 96 volatile organic compounds (VOCs) and metals at the 11 Dallas/Fort Worth sites, except nickel at the Dallas-Morrell site were below their long-term ESLs and are not a health concern.
- Annual nickel levels at the Dallas-Morrell site have historically exceeded the long-term nickel ESL and did so again in 2005. Metallic nickel is likely the major form of nickel detected at the site due to emissions from Dal Chrome Co., Inc. However, the presence of other nickel species in the particulate matter samples and other nickel sources in the area cannot be excluded. Nickel levels will continue to be monitored and assessed at the Dallas-Morrell site in the future, and the toxicology section (TS) advises reductions in nickel concentrations to levels less than or equal 0.06 µg/m^3. Nickel will remain on Texas Commission on Environmental Quality's (TCEQ) Air Pollutant Watch List (APWL), and TS will continue to encourage efforts to reduce nickel emissions in this area.

Background

This memorandum conveys TS's evaluation of ambient air sampling conducted at 11 monitoring network sites in Region 4-Dallas/FortWorth during 2005. Table 1 contains information regarding the 11 sites located in TCEQ's Region 4. TS reviewed summary results for volatile organic compounds (VOCs) and carbonyls expressed in parts per billion by volume (ppb_v) for their potential to cause short-term adverse health effects, odorous conditions, and vegetative damage. In addition, TS reviewed summary results for metals from 24-hour $PM_{2.5}$ and total suspended particulate (TSP) filter samples collected every third or sixth day. Metal concentrations were reported in micrograms per cubic meter (µg/m^3). TS also evaluated annual average VOC, carbonyl, and metal concentrations for chronic health effects.

The TCEQ Monitoring Operations Division reported the data for all chemicals evaluated. This memorandum evaluates air monitoring data on a chemical-by-chemical basis. For a complete list of all examined chemicals, please see Table 2. The measured chemical concentrations are compared to their respective short-term and long-term TCEQ Effects Screening Levels (ESLs)

and other health protective values. Reported data for VOCs, carbonyls, and metals met the data completeness requirements. Information on the ESLs can be obtained by contacting TCEQ at 512-239-1795 or by visiting the TCEQ website:
http://www.tceq.state.tx.us/implementation/tox/esl/ESL.Main.htm

Evaluation
Except for select carbonyls at the Fort Worth-North West site (formaldehyde, methyl ethyl ketone (MEK)/methacrolein, and acrolein) and the Dallas-Hinton site (MEK) reported annual average concentrations of all carbonyls were below their respective long-term ESLs and are not a health concern. All reported VOCs and metals annual average concentrations at all of the 11 sites, except nickel at the Dallas-Morrell site were below their long-term ESLs and are not a health concern. Formaldehyde, MEK, acrolein, and nickel are further discussed below.

Fort Worth – North West and Dallas-Hinton
MEK/Methacrolein

The reported MEK/methacrolein annual averages at the North West site in Fort Worth (0.17 ppb_v) and at the Hinton site in Dallas (3.6 ppb_v) were above the methacrolein long-term ESL of 0.13 ppb_v. MEK and methacrolein are not analytically separated by the method, and it is unknown whether the reported concentrations were only MEK, only methacrolein, or both MEK and methacrolein. However, exposure to the reported MEK/methacrolein concentrations would not be expected to cause adverse health effects even if they were comprised entirely of methacrolein.

Fort Worth – North West
Formaldehyde and Acrolein

The annual average formaldehyde concentration (3.14 ppb_v) at the North West site in Fort Worth exceeded the long-term ESL for formaldehyde (1.2 ppb_v). Exposure to this annual average is not expected to pose unacceptable long-term health risks based on U.S. Environmental Protection Agency's (EPA) current review of formaldehyde's toxicity data. The reported high concentration of acrolein at the North West site in Fort Worth (1.35 ppb_v) slightly exceeded the short-term ESL for acrolein (1.0 ppb_v). However, this concentration is significantly below the concentration of 250 ppb_v, which has been reported to cause upper respiratory irritation (i.e. irritation of the mucus membranes) in humans. Therefore, no short-term adverse health effects would be expected as a result of exposure to this concentration.

Table 1: Monitoring Site Information for Region 4-Dallas/Fort Worth

County	City and Site Location	EPA Site ID	Monitored Compounds
Dallas	Dallas, 1415 Hinton St.	48-113-0069	VOCs, Carbonyl, Metals ($PM_{2.5}$)
Dallas	Dallas, 3004 N. Westmoreland	8-113-0057	VOCs
Dallas	Dallas, 3049 Morrell St	48-113-0018	Metals (TSP)
Dallas	Dallas, 717 South Akard Street	48-113-0050	Metals ($PM_{2.5}$)
Denton	Denton, Denton Municipal Air port	48-121-0034	VOCs
Ellis	Midlothian, 1241 East Wyatt Road	48-139-0017	VOCs
Ellis	Midlothian, 4252 Waterworks	48-139-0015	VOCs , Metals ($PM_{2.5}$)
Kaufman	Kaufman, 3790 South Houston St.	48-257-0005	VOCs, Metals ($PM_{2.5}$)
Tarrant	Fort Worth (North West), 3317 Ross Avenue	48-439-1002	VOCs, Carbonyl
Tarrant	Grapevine, 4100 Fairway Dr.	48-439-3009	VOCs
Hunt	Greenville, 824 Sayle St	48-231-1006	VOCs

Dallas-Morrell
Nickel

The 2005 annual average nickel concentration (0.189 µg/m^3) exceeded the long-term ESL (0.015 µg/m^3) by 12.6 times. Dal Chrome Co., Inc. (Dal Chrome) is likely the major contributor to the elevated nickel measurements at the Morrell St. monitor. However, it should be noted that other potential sources may exist in the vicinity of the site and contribute to the observed measurements. The 2005 annual nickel concentration for the Dallas-Morrell site is reported as total nickel which is potentially comprised of a variety of different nickel species. Based on the process operations occurring at Dal Chrome, metallic nickel is likely to be the main nickel species emitted from the facility, and metallic nickel alone is non-carcinogenic. Also, emissions of other nickel species can not be excluded. Therefore, in assessing the nickel levels detected at the Morrell site, it is assumed that a mixture of species is potentially present, with metallic nickel being a predominant form.

The annual average nickel concentration for the year 2005 (0.19 µg/m^3) was 1.7 times less than the 2004 annual average nickel concentration (0.33 µg/m^3). TS is aware of elevated annual nickel levels being detected at the Morrell site since 1987. From 1987 – 1994, the annual nickel concentrations ranged from approximately 0.6 to 0.9 µg/m^3. Beginning in 1995, the annual nickel levels decreased and since 1997 have stabilized in the range of 0.1 to 0.3 µg/m^3 (Figure 1). The reductions in annual nickel levels first observed in 1995 are attributed to actions taken by Dal Chrome, a known source of nickel upwind from the Morrell site.

EPA has classified nickel refinery dust and nickel subsulfide as human carcinogens, and nickel carbonyl as a probable human carcinogen. However, the estimated cancer risk on exposures to the ambient concentrations of nickel in the Dallas-Morrell area is within the EPA's estimated cancer risk range. In addition to cancer, other health concerns from long-term exposure to nickel include effects to the respiratory system and blood. However it is unclear at this time if these effects are a relevant concern for the monitored annual nickel concentrations. As additional information on the toxicity of nickel becomes available, reassessment and clarification of chronic non-cancer health effects can and will be made.

It should be further emphasized that nickel levels will continue to be monitored and assessed at the Dallas-Morrell site in the future and TS advises reductions in nickel concentrations to levels less than or equal to 0.06 $\mu g/m^3$ to reflect TCEQ's long-term goal for ambient nickel levels. Nickel will remain on TCEQ's APWL, and TS will continue to encourage efforts to reduce nickel emissions in this area.

If you have any questions about this evaluation, please call me at (512)-239-2492 or email me at nerragun@tceq.state.tx.us

cc (via email):
Casso, Ruben – EPA Region 6
Prosperie, Susan- Department of State Health Services

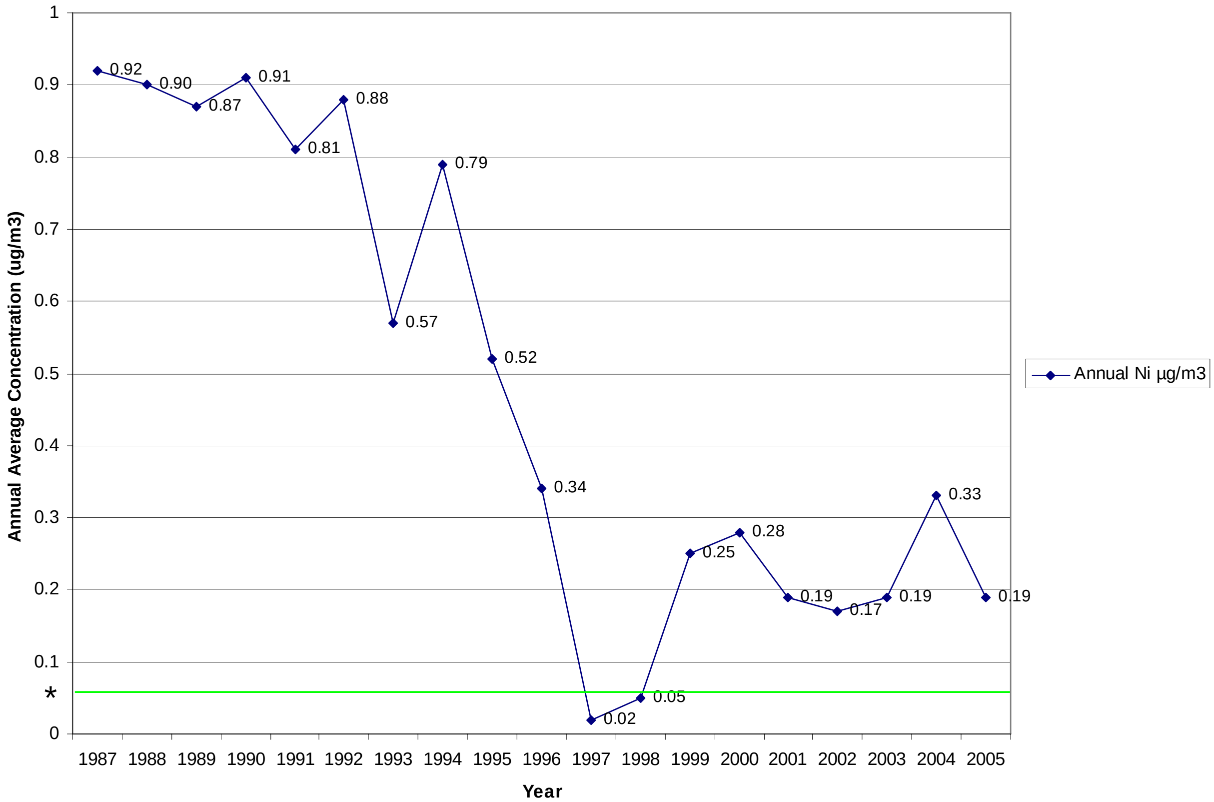
Table 2: Target Analytes for Ambient Air Monitoring Network in Region 4-Dallas/Fort Worth

CATMN VOCs		Metals
1,1,1-Trichloroethane	Ethyl Benzene	Aluminum ($PM_{2.5}$)
1,1,2,2-tetrachloroethane	Ethylene	Antimony ($PM_{2.5}$)
1,1,2-Trichloroethane	Isobutane	Arsenic ($PM_{2.5}$)
1,1-Dichloroethylene	Isopentane	Barium ($PM_{2.5}$)
1,2,3-Trimethylbenzene	Isoprene	Cadmium ($PM_{2.5}$)
1,2,4-Trimethylbenzene	Isopropylbenzene	Chromium ($PM_{2.5}$)
1,2-Dibromoethane	Methyl Butyl Ketone (MBK)	Cobalt ($PM_{2.5}$)
1,2-Dichloroethane	Methyl t-Butyl ether	Copper ($PM_{2.5}$)
1,2-Dichloropropane	Methylcyclohexane	Manganese($PM_{2.5}$)
1,3,5-Trimethylbenzene	Methylcyclopentane	Molybdenum ($PM_{2.5}$)
1,3-Butadiene	Methylene Chloride	Nickel ($PM_{2.5}$, TSP)
1-Butene	Methylisobutylketone	Selenium ($PM_{2.5}$)
1-Hexene+2-methyl-1-pentene	Propane	Tin ($PM_{2.5}$)
1-Pentene	Propylene	Zinc ($PM_{2.5}$)
2,2,4-Trimethylpentane	Styrene	
2,2-Dimethylbutane - Neohexane	Tetrachloroethylene - Perchloroethylene	
2,3,4-Trimethylpentane	Toluene	
2,3-Dimethylbutane	Trichloroethylene	
2,3-Dimethylpentane	Trichlorofluoromethane	
2,4-Dimethylpentane	Vinyl Chloride	
2-Butanone	c-2-Butene	
2-Chloropentane	c-2-Hexene	
2-Methyl-2-Butene	c-2-Pentene	
2-Methylheptane	dichlorodifluoromethane	
2-Methylhexane	isobutyraldehyde	
2-Methylpentane - Isohexane	m-Diethylbenzene	
2-methyl-3-hexanone	m-Ethyltoluene	
3-Methyl-1-Butene	methyl chloride	
3-Methylheptane	n-Butane	
3-Methylhexane	n-Decane	
3-Methylpentane	n-Heptane	
3-hexanone	n-Hexane	
3-pentanone	n-Nonane	
4-Methyl-1-Pentene	n-Octane	
Acetylene	n-Pentane	
Benzene	n-Propyl Acetate	
Bromomethane	n-Propylbenzene	
Butyl Acetate	n-Undecane	
Butyraldehyde	o-Ethyltoluene	
CIS 1,3-dichloropropylene	o-Xylene	
Carbon Tetrachloride	p-Diethylbenzene	
Chlorobenzene	p-Ethyltoluene	
Chloroform	p-Xylene + m-Xylene	
Chloroprene	t-2-Butene	
Cyclohexane	t-2-Hexene	
Cyclopentane	t-2-Pentene	
Cyclopentene	trans-1-3-dichloropropylene	
Ethane		
Ethyl Acetate		

MultiCan VOCs		**Carbonyls**
1,1,1-Trichloroethane	Isopentane	2,5-Dimethylbenzaldehyde
1,1,2,2-tetrachloroethane	Isoprene	Acetaldehyde
1,1,2-Trichloroethane	Isopropylbenzene	Acetone
1,1-Dichloroethylene	Methyl Butyl Ketone (MBK)	Acrolein
1,2,3-Trimethylbenzene	Methyl t-Butyl ether	Benzaldehyde
1,2,4-Trimethylbenzene	Methylcyclohexane	Butylaldehyde
1,2-Dibromoethane	Methylcyclopentane	Crotonaldehyde - 2-Butenal
1,2-Dichloroethane	Methylene Chloride	Formaldehyde
1,2-Dichloropropane	Methylisobutylketone	Heptaldehyde
1,3,5-Trimethylbenzene	Propane	Hexanaldehyde
1,3-Butadiene	Propylene	Isovaleraldehyde
1-Butene	Styrene	m-Tolualdehyde
1-Hexene+2-methyl-1-pentene	Tetrachloroethylene - Perchloroethylene	MEK/Methacrolein
1-Pentene	Toluene	o-Tolualdehyde
2,2,4-Trimethylpentane	Trichloroethylene	p-Tolualdehyde
2,2-Dimethylbutane - Neohexane	Trichlorofluoromethane	Propanal - Propionaldehyde
2,3,4-Trimethylpentane	Vinyl Chloride	Valeraldehyde
2,3-Dimethylbutane	c-2-Butene	
2,3-Dimethylpentane	c-2-Hexene	
2,4-Dimethylpentane	c-2-Pentene	
2-Butanone	Dichlorodifluoromethane	
2-Chloropentane	Isobutyraldehyde	
2-Methyl-2-Butene	m-Diethylbenzene	
2-Methylheptane	m-Ethyltoluene	
2-Methylhexane	Methyl chloride	
2-Methylpentane - Isohexane	n-Butane	
2-methyl-3-hexanone	n-Decane	
3-Methyl-1-Butene	n-Heptane	
3-Methylheptane	n-Hexane	
3-Methylhexane	n-Nonane	
3-Methylpentane	n-Octane	
3-hexanone	n-Pentane	
3-pentanone	n-Propyl Acetate	
4-Methyl-1-Pentene	n-Propylbenzene	
Acetylene	n-Undecane	
Benzene	o-Ethyltoluene	
Bromomethane	o-Xylene	
Butyl Acetate	p-Diethylbenzene	
Butyraldehyde	p-Ethyltoluene	
CIS 1,3-dichloropropylene	p-Xylene + m-Xylene	
Carbon Tetrachloride	t-2-Butene	
Chlorobenzene	t-2-Hexene	
Chloroform	t-2-Pentene	
Chloroprene	trans-1-3-dichloropropylene	
Cyclohexane		
Cyclopentane		
Cyclopentene		
Ethane		
Ethyl Acetate		
Ethyl Benzene		
Ethylene		
Isobutane		

Auto-GC VOCs	
1,2,3-Trimethylbenzene 1,2,4-Trimethylbenzene 1,3,5-Trimethylbenzene 1,3-Butadiene 1-Butene 1-Hexene 1-Pentene 2,2,4-Trimethylpentane 2,2-Dimethylbutane 2,3,4-Trimethylpentane 2,3-Dimethylbutane 2,3-Dimethylpentane 2,4-Dimethylpentane 2-Methyl-1-Pentene 2-Methyl-2-Butene 2-Methylheptane 2-Methylhexane 2-Methylpentane 3-Methyl-1-Butene 3-Methyl-1-Butene+Cyclopentene 3-Methylheptane 3-Methylhexane 3-Methylpentane 4-Methyl-1-Pentene Acetylene Benzene Cyclohexane Cyclopentane Cyclopentene Ethane Ethyl Benzene Ethylene Isobutane Isobutene Isopentane Isoprene Isopropyl Benzene - Cumene Methylcyclohexane Methylcyclopentane Propane Propylene Styrene Toluene a-Pinene b-Pinene c-2-Butene c-2-Hexene c-2-Pentene m-Diethylbenzene m-Ethyltoluene n-Butane	n-Decane n-Heptane n-Hexane n-Nonane n-Octane n-Pentane n-Propylbenzene n-Undecane o-Ethyltoluene o-Xylene p-Diethylbenzene p-Ethyltoluene p-Xylene + m-Xylene t-2-Butene t-2-Hexene t-2-Pentene

Figure 1: Annual Ni (µg/m^3) at the Dallas-Morrell Site



* - 0.06µg/m^3 reflects TCEQ's long-term goal for ambient Ni levels