

# TCEQ Interoffice Memorandum

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**To:** Susan Clewis, Regional Director  
Kelly Keel, Coastal and East Texas Area Director

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**Subject:** Health Effects Review of 2012 Ambient Air Network Monitoring Data in Region 14, Corpus Christi

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## Conclusions

- Annual average concentrations of all targeted analytes, except Ethylene dichloride (EDC) at two Formosa-sponsored monitoring sites in Point Comfort, were either not detected or were below their respective long-term air monitoring comparison values (AMCVs). All reported concentrations including EDC, would not be expected to cause chronic adverse health or vegetation effects. However, the Toxicology Division (TD) encourages efforts to minimize EDC emissions that would contribute to concentrations that exceed the long-term AMCV.
- The reported hourly concentrations of the target analytes at all monitoring sites were below their respective short-term AMCVs, except for one 1-hour value of benzene at the Corpus Christi Industrial Monitoring Network Group (CCNET) site. No adverse health, vegetation or odor nuisances are expected as a result of short-term exposure to all reported concentrations, including the event related benzene concentration at the CCNET site.

## Background

This memorandum conveys the TD's evaluation of ambient air sampling measurements from:

- TCEQ's Community Air Toxics Monitoring Network (CATMN) sites,
- AutoGCs from the CCAQP network monitoring sites,
- An autoGC from the Corpus Christi Industrial Monitoring Network Group (CCNET),
- Canister samplers from the Formosa Plastic Corporation Monitoring sites at Point Comfort in Corpus Christi, Texas.

Table 1 lists the sampling locations and provides links to more information on the TCEQ and CCAQP sites. Lists of target analytes at these monitoring locations are also included in Attachment A.

Figure 2 is a map indicating the specific locations of the TCEQ, CCAQP, and CCNET air monitoring sites. Figure 3 is a map indicating the specific locations of the Formosa Plastic Corporation air monitoring sites in Point Comfort, Corpus Christi, Texas. For additional information on other VOC canister sampling data from the CCAQP network, please see [http://www.utexas.edu/research/ceer/ccaqp/canister\\_data.htm](http://www.utexas.edu/research/ceer/ccaqp/canister_data.htm).

The TCEQ Monitoring Division reported the data for TCEQ sites evaluated in this memorandum and the TD reviewed all air monitoring summary results. From the CATMN sites, the TD reviewed data for 84 VOCs from three 24-hour every sixth-day canister samplers and 15 speciated metals (as PM<sub>2.5</sub>) from 24-hour filter samples collected from one 24-hour every sixth-day canister sampler. Except for lead, data for criteria pollutants (i.e., compounds having National Ambient Air Quality Standards) were not evaluated for this memorandum. All VOC and PM<sub>2.5</sub> data evaluated from the TCEQ CATMN monitoring sites met TCEQ's 75 percent annual data completeness objective; therefore, annual averages of these data are considered representative of long-term ambient air conditions and potential subsequent exposure.

The TD also evaluated data reported by monitors maintained by both industry (CCNET, Formosa Plastics Corporation) and academia (CCAQP). The CCNET included an autoGC that was collocated with TCEQ's every sixth-day canister. The Formosa Plastics Corporation at Point Comfort included a total of five air monitoring sites. The TD reviewed data for five VOCs from five 24-hour every sixth-day canister samplers. All VOC data evaluated by TD met TCEQ's 75 percent annual data completeness objective; therefore, annual averages of these data are considered representative of long-term ambient air conditions and potential subsequent exposure.

Because 24-hour air samples are designed to provide representative long-term average concentrations, annual averages from 24-hour samples were only evaluated for the potential to contribute to chronic health and welfare concerns. Short-term or peak concentrations are not captured by 24-hour sample duration; therefore, daily maximum concentrations have limited use in evaluating the potential to cause acute health effects.

For the short-term health and welfare evaluations, the TD compared the hourly measured concentrations of the VOCs collected from four autoGC sites to their respective short-term AMCVs. VOCs from the autoGCs that did not meet the TCEQ's 75 percent data completeness objective are indicated in List 3 and were not evaluated from a long-term health and welfare perspective. More information about AMCVs is available online at: <http://www.tceq.state.tx.us/implementation/tox/AirToxics.html#amcv>.

**Table 1: Air Monitoring Sites in Region 14, Corpus Christi**

Site Location	Monitor ID	Monitoring Sites	County	Monitored Chemicals
<a href="#">Huisache</a> <a href="#">3810 Huisache St</a>	48-355-0032	TCEQ	Nueces	VOCs (every 6th-day 24-hr canister)
<a href="#">Hillcrest</a> <a href="#">1802 Nueces Bay Blvd</a>	48-355-0029	TCEQ	Nueces	VOCs (every 6th-day 24-hr canister)
<a href="#">Dona Park</a> <a href="#">5707 Up River Rd</a>	48-355-0034	TCEQ	Nueces	VOCs (every 6th-day 24-hr canister) Metals (every 6th-day 24-hr PM <sub>2.5</sub> )
<a href="#">Palm</a> <a href="#">1515 Palm Drive</a>	48-355-0083	TCEQ	Nueces	VOCs (hourly autoGC)
<a href="#">Williams Park**</a>	48-355-1024	TCEQ	Nueces	Event Triggered Canister (hourly VOCs)
<a href="#">Solar Estates</a> <a href="#">9122 Leopard St</a>	48-355-0041	CCAQP	Nueces	VOCs (hourly autoGC)
<a href="#">Oak Park</a> <a href="#">842 Erwin St</a>	48-355-0035	CCAQP	Nueces	VOCs (hourly autoGC)
Point Comfort, Park Site	N/A	Formosa Plastics Corporation	Calhoun	VOCs (every t-day 24-hr canister)*
Point Comfort, City Hall site	N/A	Formosa Plastics Corporation	Calhoun	VOCs (every 6th-day 24-hr canister)*
Point Comfort, School Site	N/A	Formosa Plastics Corporation	Calhoun	VOCs (every 6th-day 24-hr canister)*
Point Comfort, Plant Site	N/A	Formosa Plastics Corporation	Calhoun	VOCs (every 6th-day 24-hr canister)*

Site Location	Monitor ID	Monitoring Sites	County	Monitored Chemicals
Point Comfort, North Site	N/A	Formosa Plastics Corporation	Calhoun	VOCs (24-hour every 6th-day canister)*
Huisache AutoGC_URS	N/A	The Corpus Christi Industrial Monitoring Network Air Quality Program (CCNET)	Nueces	Benzene (autoGC)

\*Five VOCs (see List 1)

\*\* Event Triggered

## Evaluation

### Short-Term Data

The reported hourly average concentrations of each of the 46 VOCs reviewed from both the CCAQP (Oak Park and Solar Estates) and the TCEQ (Palm) autoGC monitoring sites were below their respective short-term AMCVs. The reported concentrations of VOCs from the TCEQ's Williams Park event triggered canister were below their respective short-term AMCVs. Therefore, acute adverse health or vegetation effects and odor nuisances are not expected to occur as a result of short-term exposure to the reported levels of these chemicals.

The reported hourly average concentrations of benzene at the CCNET autoGC (Huisache) were below benzene's short-term AMCV, except for one 1-hour value that exceeded the short-term AMCV for benzene. A 1-hour exceedance of 264 ppb<sub>v</sub> was reported on November 4, 2012 and this event was documented with TCEQ to have happened during material transfer from tanks. The 24-hour benzene concentration on that particular day was reported to be 17 ppb<sub>v</sub>. Because, there was only one hour exceedance of the short-term AMCV from a total of 8760 autoGC values and because the reported 24-hour average benzene concentration was below TCEQ's draft 24-hour AMCV for benzene, no adverse health, vegetation or odor nuisances can be expected as a result of short-term exposure to benzene at the Huisache autoGC site. More detail is provided when long-term benzene is discussed below.

### Long-Term Data

The TD evaluated the reported annual average concentrations for each target analyte for potential chronic health and vegetation concerns by comparing the measured chemical concentrations to their respective long-term AMCVs or, for lead, the applicable health comparison value.

The reported and evaluated annual average concentrations of the VOCs and PM<sub>2.5</sub> were evaluated from a health and welfare perspective. Based on these criteria, annual average

concentrations of 44 VOCs at the Oak Park and 45 VOCs at the Solar Estates CCAQP autoGC monitoring sites and annual average concentrations of 46 VOCs at the Palm TCEQ autoGC monitoring site were reported to be below their respective long-term AMCVs.

In addition, the reported annual average concentrations of the 84 VOCs evaluated at the TCEQ canister monitoring sites (i.e., Huisache, Hillcrest, and Dona Park) were also below their respective long-term AMCVs. Long-term exposures to the reported concentrations of VOCs and metals would not be expected to result in long-term adverse health or vegetation effects.

The reported 2012 annual average concentrations of five VOCs measured in 24-hour canisters collected every sixth day and/or second day from the five monitoring sites (see Table 1) at the Formosa Plastic Corporation were below the TCEQ's AMCVs, except for EDC at the Park site and Plant site locations. The reported annual average concentration of EDC at the Park site for 2012 (1.33 ppb<sub>v</sub>) and the Plant site (1.48 ppb<sub>v</sub>) exceeded the TCEQ's long-term AMCV of 1.00 ppb<sub>v</sub>. On reviewing the data from the last five years (2008-2012) it appears that at both the Plant and Park sites a few relatively higher 24-hour values seem to drive the 2012 annual averages. Based on wind direction, TCEQ recommends continuing monitoring at the Point Comfort sites and supports all efforts to reduce peak 24-hour values as these contribute to the elevated long-term average levels.

### **Benzene Trends at the TCEQ, CCAQP, and CCNET Air Monitoring Sites**

The 2012 reported annual average benzene concentration at the TCEQ Huisache monitor (1.22 ppb<sub>v</sub>) was below the TCEQ's long-term AMCV of 1.4 ppb<sub>v</sub> but was above the 2011 (0.90 ppb<sub>v</sub>) annual average benzene concentration at the same site. The 2012 reported annual benzene concentration at the CCNET Huisache autoGC was 1.00 ppb<sub>v</sub> and was below the TCEQ's long-term AMCV of 1.4 ppb<sub>v</sub>. A 1-hour exceedance of 264.40 ppb<sub>v</sub> was reported at the CCNET Huisache autoGC on November 4, 2012, and this event was documented by CITGO with TCEQ to have happened during material transfer from tanks. The 24-hour benzene concentration on that particular day was reported to be 18 ppb<sub>v</sub>.

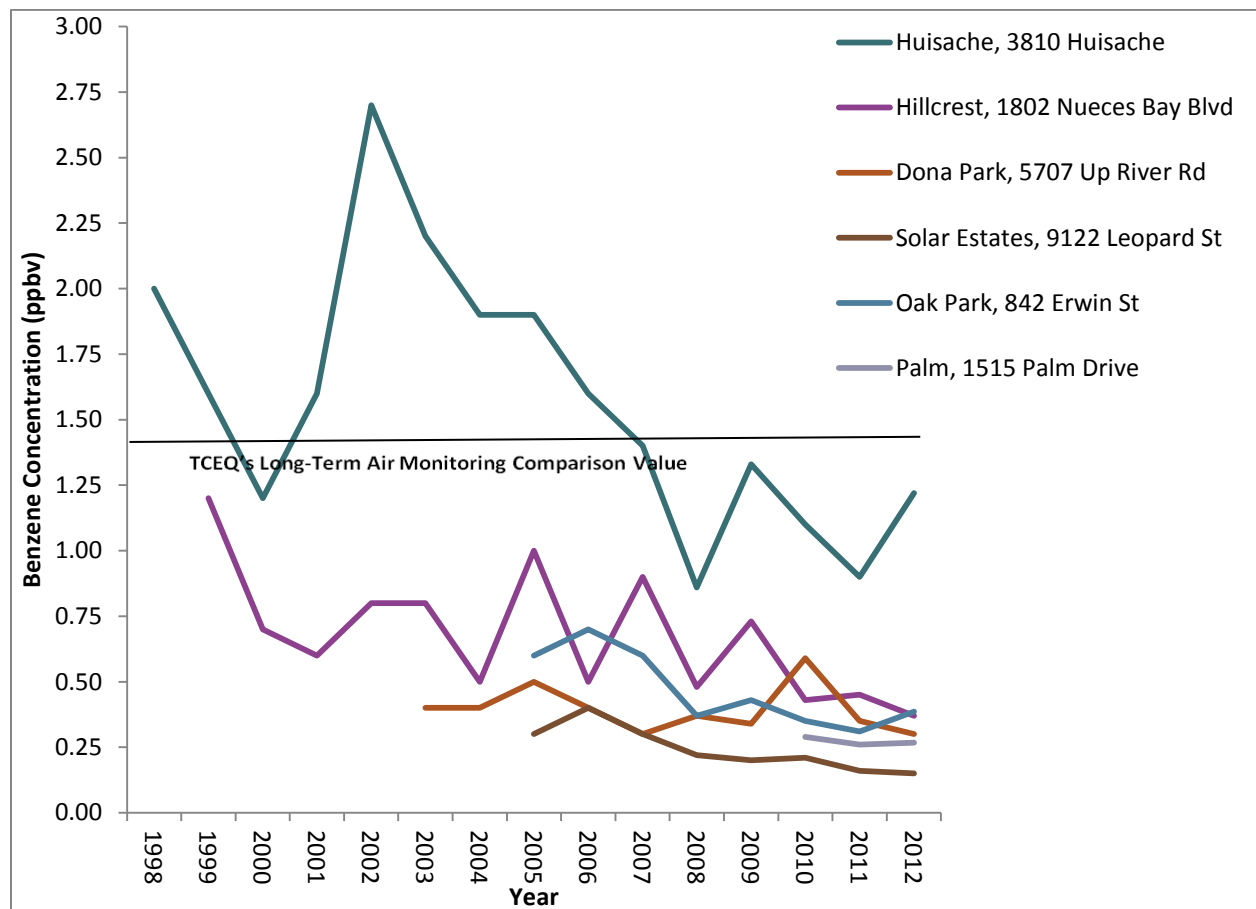
The predominant wind direction at the Huisache monitors is southeasterly and away from the nearby neighborhood. The TCEQ Huisache monitoring site is no longer considered to be located in a residential area as it was when it was first established in 1998. With the exception of one residential lot, the former neighborhood surrounding the TCEQ Huisache monitoring site is now industrial property. Given the local meteorology and proximity of the Huisache monitors to industrial sources of benzene, it is expected that the sources that impact these monitors would have less influence on benzene concentrations in residential areas to the east, south and west of the Huisache site. Indeed, annual average benzene levels at other TCEQ and CCAQP sites in residential areas showed lower benzene concentrations than those at the Huisache sites and are much lower than the TCEQ's long-term AMCV and are as follows: 0.37 ppb<sub>v</sub> at Hillcrest, 0.30 ppb<sub>v</sub> at Dona Park, 0.27 ppb<sub>v</sub> at Palm, 0.15 ppb<sub>v</sub> at Solar Estates, and 0.39 ppb<sub>v</sub> at Oak Park). Long-term exposure to these reported levels would not be expected to cause chronic adverse health effects or vegetation effects (Figure 1).

## Regional Information

The regional staff has heightened awareness on matters involving benzene emissions through both scheduled and reactive compliance investigations. These investigations include hand held sampling and other monitoring equipment. In addition, the regional staff regularly participates in cooperative and constructive efforts with local community and industry representatives through a monthly forum which actively focuses on the potential sources and reductions of localized benzene emissions.

If you have any questions regarding this memorandum, please contact Neeraja Erraguntla by phone at (512) 239-2492 or by email at [Neeraja.erraguntla@tceq.texas.gov](mailto:Neeraja.erraguntla@tceq.texas.gov).

Figure1. Annual Average Benzene Levels at TCEQ and CCAQP Air Toxics Monitoring Sites in Corpus Christi, Texas, 1998-2012



**Attachment A****List 1. Target VOC Analytes in TCEQ and/or Formosa\* Canister Samples**

1,1,2,2-Tetrachloroethane	Bromomethane	Methyl Chloroform (1,1,1-
1,1,2-Trichloroethane	Carbon Tetrachloride	Trichloroethane)
1,1-Dichloroethane	Chlorobenzene	Methylcyclohexane
1,1-Dichloroethylene	Chloroform	Methylcyclopentane
1,2,3-Trimethylbenzene	Chloromethane (Methyl	N-Butane
1,2,4-Trimethylbenzene	Chloride)	N-Decane
1,2-Dichloropropane	Cis 1,3-Dichloropropene	N-Heptane
1,3,5-Trimethylbenzene	Cis-2-Butene	N-Hexane
1,3-Butadiene *	Cis-2-Hexene	N-Nonane
1-Butene	Cis-2-Pentene	N-Octane
1-Hexene+2-Methyl-1-Pentene	Cyclohexane	N-Pentane
1-Pentene	Cyclopentane	N-Propylbenzene
2,2,4-Trimethylpentane	Cyclopentene	N-Undecane
2,2-Dimethylbutane (Neohexane)	Dichlorodifluoromethane	O-Ethyltoluene
2,3,4-Trimethylpentane	Dichloromethane (Methylene	O-Xylene
2,3-Dimethylbutane	Chloride)	P-Diethylbenzene
2,3-Dimethylpentane	Ethane	P-Ethyltoluene
2,4-Dimethylpentane	Ethylbenzene	Propane
2-Chloropentane	Ethylene*	Propylene
2-Methyl-2-Butene	Ethylene Dibromide (1,2-	Styrene
2-Methylheptane	Dibromoethane)	Tetrachloroethylene
2-Methylhexane	Ethylene Dichloride (1,2-	Toluene
2-Methylpentane (Isohexane)	Dichloroethane)*	Trans-1-3-Dichloropropylene
3-Methyl-1-Butene	Isobutane	Trans-2-Butene
3-Methylheptane	Isopentane (2-Methylbutane)	Trans-2-Hexene
3-Methylhexane	Isoprene	Trans-2-Pentene
3-Methylpentane	Isopropylbenzene (Cumene)	Trichloroethylene
4-Methyl-1-Pentene	M-Diethylbenzene	Trichlorofluoromethane
Acetylene	M-Ethyltoluene	Vinyl Chloride*
Benzene*	M/P Xylene	

\*Formosa Target Analytes

**List 2. Target Metal Analytes**

Aluminum (PM <sub>2.5</sub> )	Chromium (PM <sub>2.5</sub> )	Molybdenum (PM <sub>2.5</sub> )
Antimony (PM <sub>2.5</sub> )	Cobalt (PM <sub>2.5</sub> )	Nickel (PM <sub>2.5</sub> )
Arsenic (PM <sub>2.5</sub> )	Copper (PM <sub>2.5</sub> )	Selenium (PM <sub>2.5</sub> )
Barium (PM <sub>2.5</sub> )	Lead (PM <sub>2.5</sub> )	Tin (PM <sub>2.5</sub> )
Cadmium (PM <sub>2.5</sub> )	Manganese (PM <sub>2.5</sub> )	Zinc (PM <sub>2.5</sub> )

**List 3. Target VOC Analytes in TCEQ, CCNET\*, and CCAQP AutoGCs**

1-Butene	Benzene <sup>3</sup>	n-Heptane
1-Pentene	c-2-Butene <sup>2</sup>	n-Hexane
1,2,3-Trimethylbenzene <sup>1</sup>	c-2-Pentene	n-Nonane
1,2,4-Trimethylbenzene	Cyclohexane	n-Octane
1,3-Butadiene	Cyclopentane	n-Pentane
1,3,5-Trimethylbenzene	Ethane	n-Propylbenzene
2-Methylheptane	Ethyl Benzene	o-Xylene
2-Methylhexane	Ethylene	p-Xylene + m-Xylene
2,2-Dimethylbutane	Isobutane	Propane
2,2,4-Trimethylpentane	Isopentane	Propylene
2,3-Dimethylpentane	Isoprene	Styrene
2,3,4-Trimethylpentane	Isopropyl Benzene - Cumene	t-2-Butene
2,4-Dimethylpentane	Methylcyclohexane	t-2-Pentene
3-Methylheptane	Methylcyclopentane	Toluene
3-Methylhexane	n-Butane	
Acetylene <sup>2</sup>	n-Decane	

1 Did not meet TCEQ 75 Percent Data Quality Completeness Objective at Solar Estates AutoGC and were not evaluated from a long-term health and welfare perspective.

2 Did not meet TCEQ 75 Percent Data Quality Completeness Objective at Oak Park AutoGC and were not evaluated from a long-term health and welfare perspective.

3Also a CCNET Target Analyte.



Figure 2: Air Monitor Locations in the Corpus Christi Bay Area, Nueces County, Texas

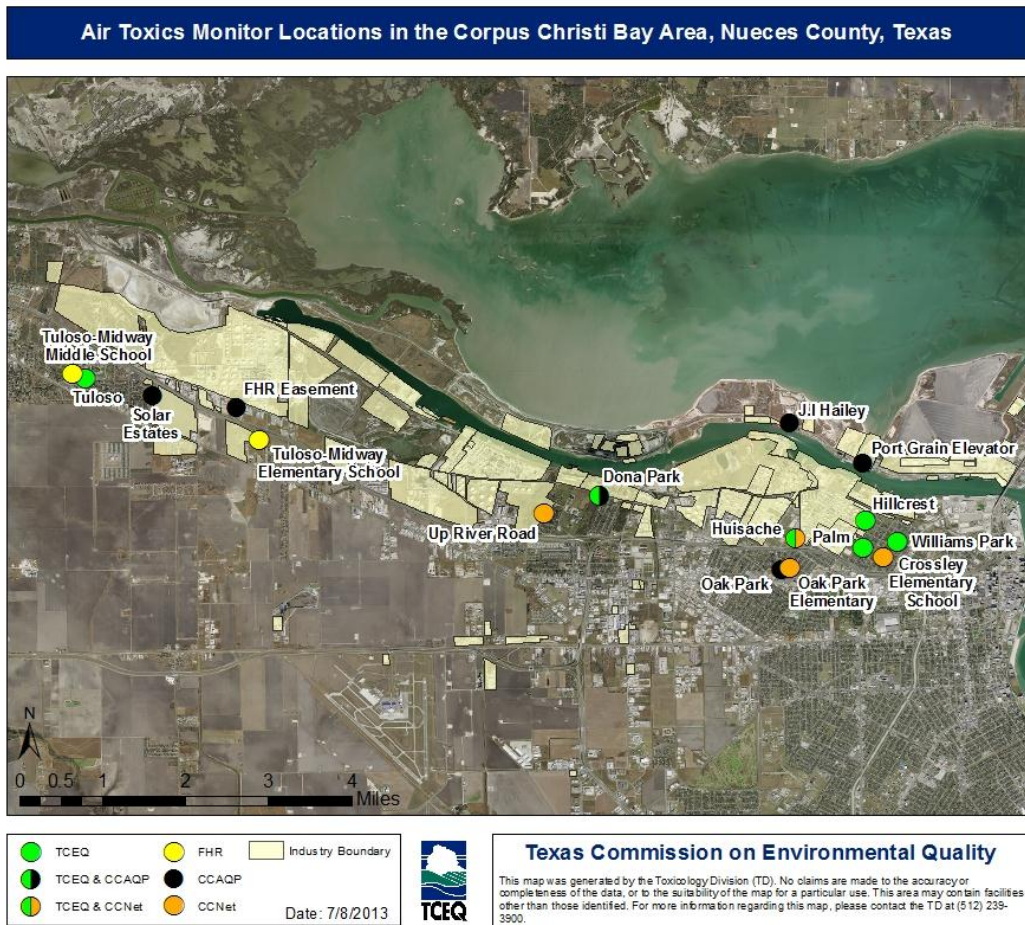


Figure 3: Industry-Sponsored Air Toxics Monitoring Locations in Point Comfort, Calhoun County, Texas

