TCEQ Interoffice Memorandum

To: Kathryn Sauceda, Regional Director, Region 10, Beaumont

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Date: March 26, 2021

Subject: Health Effects Review of 2017 - 2019 Ambient Air Network Monitoring Data in Region 10, Beaumont

Conclusions

- All reported annual- and three-year average concentrations for all monitored volatile organic compounds (VOCs), except for acetaldehyde measured by the South East Texas Regional Planning Commission (SETRPC) at some of their canister samplers, were below their long-term air monitoring comparison values (AMCVs) and would not be expected to cause long-term (chronic) adverse human health or vegetation effects.
- Except for one elevated hourly concentration of benzene on August 4, 2017 at the Jefferson Middle School site, all hourly VOC concentrations gathered from automated gas chromatograph (autoGC) monitoring sites were below their respective short-term AMCVs (including odor thresholds) and would not be expected to cause adverse human health or welfare effects.
- All 24-hour concentrations were below their 24-hour AMCVs and would not be expected to cause adverse health or welfare effects, except for a few exceedances of the odor AMCV for acetaldehyde reported in SETRPC data, which could have been odorous.
- All reported concentrations of hydrogen sulfide (H_2S) were below the value of the 30-minute state standard for residential areas (80 ppb).
- All reported levels of carbon disulfide (CS_2) were below their respective short-and long-term AMCVs and would not be of concern to human health or welfare.

Background

This memorandum conveys the Toxicology, Risk Assessment, and Research Division's (TD's) evaluation of ambient air sampling conducted at monitoring sites in Region 10-Beaumont from January 1, 2017 through December 31, 2019. Information about the locations of the monitoring sites, monitored compounds, and hyperlinks to more information on the sites is provided in Table 1.

A brief summary of the monitoring sites is provided below:

- 1-hour autoGC VOC monitoring at 3 sites
- Every sixth-day 24-hour canister VOC sampling at 6 sites (the City Service Center monitor was deactivated on April 29, 2017)
- Every 12th-day 24-hour canister VOC sampling at 6 sites
- Hydrogen sulfide (H_2S) and carbon disulfide (CS_2) sampling at 1 site

The Texas Commission on Environmental Quality (TCEQ) Monitoring Division and the South East Texas Regional Planning Commission (SETRPC) operated the monitoring sites and reported the data for all chemicals evaluated in this memorandum. Lists of all target analytes at these monitoring locations are included in Attachment A.

Chemicals were evaluated individually by comparing the reported concentrations to their respective AMCVs. All one-hour concentrations collected from the ambient air monitoring sites in Table 1 were evaluated for their potential to cause acute (short-term) adverse health and welfare (odor potential and vegetation) effects. The TD calculated the annual- and three-year averages of these one-hour data to determine their potential to cause chronic (long-term) adverse health and vegetation effects.

Data from 24-hour canister samples taken every 6th- (TCEQ) or 12th-day (SETRPC) were also evaluated. Because short-term or peak concentrations may be significantly different from 24-hour sample concentrations, daily concentrations have limited use in evaluating the potential for acute health effects, unlike the shorter-term data reviewed herein (e.g., one-hour autoGC data, one-hour H_2S data). In order to be able to evaluate 24-hour monitoring data more fully, TCEQ has developed 24-hour AMCVs for chemicals, including 1,3-butadiene, 2,2-dimethylbutane, 2,3-dimethylbutane, 2-methylpentane, 3-methylpentane, benzene, ethylene dibromide, ethylene dichloride, and n-hexane. As such, 24-hour samples were compared to the available TCEQ 24-hour AMCVs for these chemicals. When averaged over at least one year, these 24-hour air samples are representative of long-term average concentrations in air. Therefore, the TD compared annual and three-year average concentrations calculated from 24-hour samples for each target analyte to their respective long-term AMCVs to evaluate the potential for chronic health and vegetation concerns. More information about AMCVs is available online at the TCEQ Air Toxics webpage.

The majority of TCEQ and SETRPC monitoring data reviewed met or exceeded TCEQ's 75 percent data completeness objective. The following analytes did not meet this objective for the period under review:

- Beaumont Downtown: acetylene (2017), 1,2,3-trimethylbenzene (2017 – 2019), 2,4-dimethylpentane (2018 & 2019), 3-methylhexane (2019), isopentane (2017), methylcyclopentane (2018 & 2019) and n-pentane (2017)
- Nederland High School: acetylene (2017 - 2019), 1,3-butadiene (2018), 1,2,3-trimethylbenzene (2017 & 2019), 1,2,4-trimethylbenzene (2017 & 2019), 2,4-dimethylpentane (2018 & 2019), isoprene (2017), and methylcyclopentane (2018 & 2019)
- Jefferson Middle School: benzene (2018) and styrene (2017 & 2018)

Meeting the data completeness objective helps to ensure the representativeness of calculated annual and three-year average concentrations.

Table 1. Sites with Air Toxics Monitoring Data Evaluated in this Memorandum

Site Location	Type of Monitor	EPA Site Number	Network	Monitored Compounds
Beaumont Downtown 1086 Vermont Ave, Beaumont	24-hour every 6th- day canister & hourly autoGC	48-245-0009	TCEQ	84 VOCs (canister); 46 VOCs (autoGC)
Port Arthur West 623 Ellias St, Port Arthur	24-hour, every 6th- day canister	48-245-0011	TCEQ	84 VOCs (canister)
Groves 3355 Grandview Ave & 32nd St, Port Neches	24-hour, every 6th- day canister	48-245-0014	TCEQ	84 VOCs (canister)
Port Neches Avenue L 605 Avenue L, Port Neches	24-hour, every 6th- day canister	48-245-0017	TCEQ	84 VOCs (canister)
Jefferson County Airport End of 90th St, Port Arthur	24-hour, every 6th- day canister	48-245-0018	TCEQ	84 VOCs (canister)
Beaumont Mary [a], 598 Craig Street, Beaumont	24-hour, every 6th day canister	48-245-1050	TCEQ	84 VOCs (canister)
City Service Center/PA [b] 201 H.O. Mills Blvd, Port Arthur	24-hour, every 6th- day canister	48-245-0019	TCEQ	84 VOCs (canister)
Nederland High School 1800 N. 18th St, Nederland	hourly autoGC	48-245-1035	TCEQ	46 VOCs
SETRPC 41 West Orange, 2811 Austin Ave, Orange	24-hour, every 12th- day canister	--	SETRPC	53 VOCs
SETRPC 42 Mauriceville, 10691 TX-62, Orange	24-hour, every 12th- day canister	48-361-1100	SETRPC	53 VOCs
SETRPC 43 Jefferson Co Airport, West End of 90th St, Port Neches	24-hour, every 12th- day canister	48-245-0102	SETRPC	53 VOCs
SETRPC 44 Beaumont, 1149 Pearl St, Beaumont	24-hour, every 12th- day canister	--	SETRPC	53 VOCs

Site Location	Type of Monitor	EPA Site Number	Network	Monitored Compounds
SETRPC 45 Port Neches Fire Station, 1209 Merriman St, Port Neches	24-hour, every 12th-day canister	--	SETRPC	53 VOCs
SETRPC 48 Old Cove School, 1214 Dupont, Orange	24-hour, every 12th-day canister	--	SETRPC	53 VOCs
SETRPC 49 Port Arthur, 6956 James Gamble Dr, Port Arthur	24-hour, every 12th-day canister, hourly H_2S and carbon disulfide	48-245-0628	SETRPC	53 VOCs, H_2S, carbon disulfide
Port Arthur Memorial School, SETRPC 50, 2200 Jefferson Dr, Port Arthur	hourly autoGC	48-245-0021	SETRPC	benzene, 1,3-butadiene, styrene

[a] The Beaumont Mary monitor changed locations and was deactivated from September 24, 2015 to July 29, 2017.
[b] The City Service Center monitor was deactivated on April 29, 2017.

Evaluation

AutoGC Data

Except for one elevated hourly concentration of benzene (319 ppb) on August 4, 2017 at the Jefferson Middle School autoGC monitor, all other hourly-, annual- and 3-year average VOC concentrations from the Beaumont Downtown, Jefferson Middle School and Nederland High School autoGC monitors were below their respective short-term (including odor thresholds) and long-term AMCVs and would not be expected to cause adverse health or welfare effects. Please note that the one elevated 1-hour measurements of benzene occurred on August 4, 2017 at a time when there was a high chance that a barge or ship was in the area which could have contributed to the high VOC/benzene reading. Further evaluation was carried out for this one monitored benzene concentration which exceeded its current health-based 1-hour AMCV of 180 ppb. However, the magnitude of exceedance for this one hourly AMCV exceedance on August 4, 2017 is low (< 1.8-fold). Therefore, considering the inherent conservativeness and precautionary nature of the 1-hour AMCV along with the underlying toxicity data, no adverse health effects would be expected if exposure had occurred at this measured concentration.

Canister Data

All 24-hour concentrations were below their 24-hour AMCVs and would not be expected to cause adverse health effects.

Apart from acetaldehyde, all three-year average VOC concentrations from 24-hour canister samplers were below their respective long-term AMCVs at all sites and were below a level of potential long-term health or vegetation concern.

Acetaldehyde
Acetaldehyde was measured by the SETRPC in 24-hour canister samples above its odor AMCV (67 ppb), but not above its short-term health-based AMCV (250 ppb), at West Orange (two exceedances of 72 ppb and 73 ppb in 2017), Port Neches (two exceedances of 81 ppb and 100 ppb in 2017 and one exceedance of 70 ppb in 2018), and one exceedance of 81 ppb in 2017 at Cove School. These monitored concentrations would not be expected to cause direct acute health effects (e.g., eye irritation). Additionally, although the perception of sufficiently strong and persistent unpleasant odors has the potential to cause odor-related health effects (e.g., nausea, headache), these concentrations are not indicative of strong odors with the potential to cause odor-related health effects due to the likely conservative nature of the odor-based AMCVs, and low frequency and magnitude of the exceedances (all samples were <2 times the odor-based AMCVs).

Acetaldehyde monitored by the SETRPC exceeded its annual health-based AMCV of 25 ppb at West Orange (30.57 ppb in 2017), Mauriceville (26.17 ppb in 2017), Beaumont (25.86 ppb in 2017), Port Neches (37.42 ppb in 2017 and 31.16 ppb in 2018), and Cove School (25.72 ppb in 2017). The three-year average concentration of acetaldehyde exceeded its long-term AMCV at Port Neches (26.81 ppb in 2017-2019). TCEQ's comparison values are not threshold concentrations for health effects, and adverse health effects would not be expected to occur based on a thorough evaluation of the reported results and scientific toxicological data. Additionally, all 2018 and 2019 acetaldehyde data were jj-flagged, meaning that the flagged data were estimated and that measurements did not routinely meet quality specifications. Communication with SETRPC's contractor during this evaluation indicated that acetaldehyde is a "poor performer" in canister samples and often shows up in blanks due to its high solubility. They stated that the 2017 acetaldehyde data should probably be jj-flagged, in addition to the 2018 and 2019 data. Although acetaldehyde concentrations reported by the SETRPC are evaluated in this memorandum, there is uncertainty in those measurements.

Sulfur Compounds

Hydrogen Sulfide (H2S)
All reported one-hour rolling averages were below the level of the 30-minute state regulatory standard (80 ppb) for hydrogen sulfide (H2S) for industrial and non-industrial properties at the SETRPC Port Arthur site for the three years evaluated (2017 – 2019).

Carbon Disulfide (CS_2)
From 2017 – 2019, all hourly-, annual- and 3-year average carbon disulfide (CS2) concentrations at the SETRPC Port Arthur canister site were below their short- and long-term AMCVs and would not be expected to cause adverse health or welfare effects.

If you have any questions regarding the contents of this review, please do not hesitate to contact Stanley Aniagu (512-239-0558; Stanley.Aniagu@tceq.texas.gov) or Allison Jenkins (512-239-0656; Allison.Jenkins@tceq.texas.gov).

Attachment A

List 1 - Target VOC Analytes in TCEQ Canister Samples

1,1,2,2-Tetrachloroethane
1,1,2-Trichloroethane
1,1-Dichloroethane
1,1-Dichloroethylene
1,2,3-Trimethylbenzene
1,2,4-Trimethylbenzene
1,2-Dichloropropane
1,3,5-Trimethylbenzene
1,3-Butadiene
1-Butene
1-Hexene+2-Methyl-1-Pentene
1-Pentene
2,2,4-Trimethylpentane
2,2-Dimethylbutane (Neohexane)
2,3,4-Trimethylpentane
2,3-Dimethylbutane
2,3-Dimethylpentane
2,4-Dimethylpentane
2-Chloropentane
2-Methyl-2-Butene
2-Methylheptane
2-Methylhexane
2-Methylpentane (Isohexane)
3-Methyl-1-Butene
3-Methylheptane
3-Methylhexane
3-Methylpentane
4-Methyl-1-Pentene
Acetylene
Benzene
Bromomethane
Carbon Tetrachloride
Chlorobenzene
Chloroform
Chloromethane (Methyl Chloride)
cis-1,3-Dichloropropene
cis-2-Butene
cis-2-Hexene
cis-2-Pentene
Cyclohexane
Cyclopentane
Cyclopentene
Dichlorodifluoromethane
Dichloromethane (Methylene Chloride)
Ethane
Ethylbenzene
Ethylene
Ethylene Dibromide (1,2-Dibromoethane)
Ethylene Dichloride (1,2-Dichloroethane)
Isobutane
Isopentane (2-Methylbutane)
Isoprene
Isopropylbenzene (Cumene)
m-Diethylbenzene
m-Ethyltoluene
Methyl Chloroform (1,1,1-Trichloroethane)
Methylcyclohexane
Methylcyclopentane
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
Propane
Propylene
Styrene
Tetrachloroethylene
Toluene
trans-1-3-Dichloropropene
trans-2-Butene
trans-2-Hexene
trans-2-Pentene
Trichloroethylene
Trichlorofluoromethane
Vinyl Chloride

List 2 - Target VOC Analytes in AutoGC Samples

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

List 3 - Target VOC Analytes in SETRPC Canister Samples

1,1,1-Trichloroethane
1,2,4-Trimethylbenzene
1,2-Dichloroethane
1,3-Butadiene 1-Butanol
1-Hexene 1-Octene 1-Pentene
2,2,4-Trimethylpentane 2-Butanone
3-Methylpentane
Acetaldehyde
Acetone (+)
Acetonitrile
a-Pinene
Benzene
b-Pinene
Butyl acrylate
Carbon disulfide
Carbon tetrachloride
Chlorobenzene
Chloroform
Cumene
Cyclohexane
Ethane
Ethylbenzene
Ethylene
Hexanal
Isobutene + 1-Butene
Isohexane
Isopentane
Isoprene
Methanol (+)
Methyl-t-butylether
Methylcyclohexane
Methylene chloride
Naphthalene
n-Butane
n-Decane
n-Hexane
n-Octane
n-Pentane
o-Xylene
Propane
Propylene
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