TCEQ Interoffice Memorandum

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Date: September 9, 2014

Subject: Toxicological Evaluation of 2013 Ambient Air Network Monitoring Data in Region 4, Dallas/Fort Worth

Conclusions

- All hourly average and annual average concentrations of volatile organic compounds (VOCs) reported at Texas Commission on Environmental Quality (TCEQ) Region 4-Dallas/Fort Worth 1-hour automated gas chromatograph (autoGC) monitoring sites were below their respective short-term and long-term air monitoring comparison values (AMCVs), respectively, and would not be expected to cause acute or chronic adverse health effects, vegetation effects, or odor concerns.
- All 24-hour and annual average concentrations of VOCs and carbonyls from canister samples were below their respective TCEQ AMCVs and would not be expected to cause adverse health effects or vegetation effects.
- Annual average concentrations of all speciated metals were less than their respective TCEQ long-term AMCVs and would not be expected to cause chronic adverse health effects.
- At the Dallas-Morrell monitoring site, the annual average concentration of nickel, 0.03 µg/m^3, reported as total suspended particulate (TSP) was below the long-term AMCV of 0.059 µg/m^3 for respirable carcinogenic forms of nickel (i.e., PM_{10}) and would not be expected to cause chronic adverse health or vegetation effects. Additionally:
  - Although the Dallas-Morrell site currently remains on TCEQ's Air Pollutant Watch List (APWL0401) for nickel, the available data together with the above information support removing this site from the APWL. This is based on information regarding the type of nickel detected as well as other site-specific data detailed below.
- Air quality in the Barnett Shale area continues to be monitored. Detailed information is available on the TCEQ's Barnett Shale Web page at: http://www.tceq.state.tx.us/goto/barnettshale.

Background

The Toxicology Division (TD) has reviewed ambient air sampling data collected from 33 network monitoring sites in TCEQ Region 4, Dallas/Fort Worth. The TD reviewed air monitoring summary results for VOCs and carbonyls from 1-hour and 24-hour samples collected

continuously and every sixth-day, respectively. In addition, the TD evaluated the criteria pollutant lead from a health perspective in this memorandum. For complete lists of all chemicals evaluated, please see Lists 1 through 4 in Attachment A. Table 1 lists the monitoring sites and provides a link to more information about the sites. A brief summary of the monitoring sites is provided below:

- 1-hour autoGC VOC monitoring at 15 sites
- Every sixth-day 24-hour canister VOC sampling at 14 sites
- Every sixth-day 24-hour carbonyl sampling at 2 sites
- Metals sampling at 9 sites
  - Every sixth-day lead TSP sampling at 6 sites
  - Every sixth-day chromium and nickel PM_{10} or $PM_{2.5}$ sampling at 4 sites
  - Every third-day or sixth-day metals $PM_{2.5}$ sampling at 3 sites

Table 1. Monitoring Sites Located in TCEQ Region 4

Site Name and Location	County	EPA Site ID	Monitored Compounds
Frisco 5th Street, 7471 South 5th Street	Collin	48-085-0003	Lead (TSP)
Frisco 7, 6931 Ash Street	Collin	48-085-0007	Lead (TSP)
Frisco Eubanks, 6601 Eubanks Street	Collin	48-085-0009	Lead (TSP)
Frisco Stonebrook, 7202 Stonebrook Parkway	Collin	48-085-0029	Lead (TSP)
Dallas Convention Center, 717 South Akard Street	Dallas	48-113-0050	Metals ($PM_{2.5}$)
Dallas Elm Fork, 2171 Manana Drive	Dallas	48-113-1505 (Activation Date: November 18, 2013)	VOCs (autoGC)
Dallas Hinton, 1415 Hinton Street	Dallas	48-113-0069	VOCs (autoGC, 24-hour canister), Carbonyl, Metals ($PM_{2.5}$), Lead (TSP)
Dallas Morrell, 3049 Morrell Street	Dallas	48-113-0018	Metals (PM_{10})
Lancaster Cedardale, 1930 Cedardale Road	Dallas	48-113-1500 (Activation Date: September 1 , 2013)	VOCs (24-hour canister)
Denton Airport South, Denton Municipal Airport	Denton	48-121-0034	VOCs (24-hour canister)

Site Name and Location	County	EPA Site ID	Monitored Compounds
DISH Airfield, 9800 Clark Airport Road	Denton	48-121-1013	VOCs (autoGC)
Flower Mound Shiloh, 4401 Shiloh Road	Denton	48-121-1007	VOCs (autoGC)
Italy, 900 Farm to Market Road 667	Ellis	48-139-1044	VOCs (24-hour canister)
Midlothian OFW, 2725 Old Fort Worth Road	Ellis	48-139-0016	VOCs (24-hour canister), Metals ($PM_{2.5}$)
Greenville, 824 Sayle Street	Hunt	48-231-1006	VOCs (24-hour canister)
Johnson County Luisa, 2420 Luisa Lane	Johnson	48-251-1008	VOCs (24-hour canister)
Godley FM2331, 12404 FM2331	Johnson	48-251-1501 (Activation Date: July 13, 2013)	VOCs (autoGC)
Mansfield Flying L Lane, 1310 Flying L Lane	Johnson	48-251-1063	VOCs (autoGC)
Kaufman, 3790 South Houston Street	Kaufman	48-257-0005 (Deactivated September 2013)	VOCs (24-hour canister)
Terrell Temtex, 2988 Temtex Boulevard	Kaufman	48-257-0020	Lead (TSP)
Mineral Wells 23rd Street, 2000 NE 23rd Street	Palo Pinto	48-363-1502 (Activation Date: August 21, 2013)	VOCs (24-hour canister)
Weatherford Highway 180, 2253 Fort Worth Hwy	Parker	48-367-1506 (Activation Date: October 13, 2013)	VOCs (24-hour canister)
Arlington UT Campus, 1101 S. Pecan St.	Tarrant	48-439-1018	VOCs (AutoGC)
Eagle Mountain Lake, 14290 Morris Dido Newark Road	Tarrant	48-439-0075	VOCs (autoGC)
Everman Johnson Park, 633 Everman Parkway	Tarrant	48-439-1009	VOCs (autoGC)

Site Name and Location	County	EPA Site ID	Monitored Compounds
Fort Worth Northwest, 3317 Ross Avenue	Tarrant	48-439-1002	VOCs (autoGC, 24-hour canister), Carbonyls
Fort Worth Benbrook Lake, 7001 Lakeside Drive	Tarrant	48-439-1503 (Activation Date: October 1, 2013)	VOCs (autoGC)
Fort Worth Joe B. Rushing Road, Road 2525 Joe B. Rushing Road	Tarrant	48-439-1065 (Activation Date: September 17, 2013)	VOCs (autoGC)
Grapevine Fairway, 4100 Fairway Drive	Tarrant	48-439-3009	VOCs (24-hour canister)
Keller, FAA Site off Alta Vista Road	Tarrant	48-439-2003 (Activation Date: July 14, 2013)	VOCs (24-hour canister)
Kennedale Treepoint Drive, 5419 Treepoint Drive	Tarrant	48-439-1062	VOCs (autoGC)
Decatur Thompson, 301 E Thompson Street	Wise	48-497-0088	VOCs (autoGC)
Rhome Seven Hills Road, 639 CR 4651	Wise	48-497-1064	VOCs (autoGC)

The TCEQ Monitoring Division reported the data for all chemicals evaluated in this memorandum. All data (84 VOCs (canister), 46 VOCs (autoGC), 17 carbonyls, 15 metals ($PM_{2.5}$, PM_{10}, or TSP)) highlighted in this evaluation met TCEQ's data completeness objective of 75 percent data return except for the following:

- Dallas Hinton (methyl ethyl ketone and carbonyls for canister sampler and 1,2,3-trimethylbenzene for autoGC)
- DISH Airfield (1,2,3-trimethylbenzene)
- Eagle Mountain Lake (1-pentene, 1,2,3-trimethylbenzene, c-2 pentene)
- Everman Johnson Park (1,2,3-trimethylbenzene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, isopropylbenzene-cumene, n-decane, n-nonane, o-xylene, styrene, TNMHC, and TNMTC)
- Frisco 7 (Lead TSP)
- Frisco Eubanks (Lead TSP)
- Grapevine Fairway (Trichlorofluoromethane)
- Mansfield Flying L Lane (1,2,3-trimethylbenzene)
- Rhome 7 Hills Road (1,2,3-trimethylbenzene)

One-hour autoGC VOC samples were compared to TCEQ's short-term AMCVs. Twenty-four-hour air samples collected every third- or sixth-day for a year are designed to provide

representative long-term average concentrations. In order to be able to evaluate 24-hour monitoring data more fully, TCEQ has developed 24-hour AMCVs for specific chemicals. As such, 24-hour samples were compared to the available TCEQ 24-hour AMCVs (1,3-butadiene, benzene, and formaldehyde). However, because short-term or peak concentrations are not necessarily captured by 24-hour samples, daily concentrations have limited use in evaluating the potential for acute health effects. Therefore, the TD evaluated the reported annual average concentrations from 1-hour autoGC and 24-hour samples for each target analyte for potential chronic health and vegetation concerns by comparing measured chemical concentrations to their respective long-term AMCVs. More information about AMCVs is available online at: http://www.tceq.texas.gov/toxicology/AirToxics.html#amcv.

As lead is a criteria pollutant, applicable lead TSP levels (i.e., rolling three-month averages) were compared to the appropriate comparison value (i.e., 0.15 µg/m^3); however, annual average lead TSP concentrations were also evaluated since they are more representative of long-term lead exposure from a health perspective.

Evaluation

VOCs

Short-Term Data

All hourly average concentrations of the 46 VOCs reported at the 15 autoGC sites were either not detected or below their respective short-term and 24-hour AMCVs. Therefore, acute adverse health effects, odorous conditions, or vegetation effects would not be expected to occur as a result of exposure to the reported levels of VOCs at these 15 autoGC monitoring sites.

Long-Term Data

The 2013 annual average concentrations of the 46 VOCs evaluated at the 15 autoGC monitoring sites and the 84 VOCs reported at each of the 14 every sixth-day 24-hour canister monitoring sites were well below their respective long-term AMCVs. Exposure to the reported annual average concentrations would not be expected to cause chronic adverse health or vegetation effects.

Carbonyls

The 2013 annual average concentrations of the 17 carbonyls reported at the Fort Worth Northwest and Dallas-Hinton sites were below their respective long-term AMCVs. Exposure to the reported annual average concentrations would not be expected to cause chronic adverse health or vegetation effects.

Metals

At the three sites reporting $PM_{2.5}$ metals data, annual average concentrations of all 15 metals were well below their respective long-term AMCVs. Exposures to the reported levels of these metals would not be expected to cause chronic adverse health and vegetation effects.

At the Dallas-Morrell site, only nickel and chromium were reported. The annual average concentrations of both nickel and chromium were below their respective long-term health-based AMCVs. Exposure to the reported annual average concentrations of these two metals would not be expected to cause chronic, adverse health effects.

Nickel at Dallas-Morrell Site

The 2013 annual average nickel concentration of 0.02 µg/m^3 was below the long-term AMCV of 0.059 µg/m^3 for respirable nickel particles. Elevated annual nickel levels were detected at the Dallas-Morrell site from 1987-2011 (Figure 1). Beginning in 1995, the annual average nickel concentrations have decreased and appear to have stabilized in the range of 0.02 to 0.3 µg/m^3 from 1998 through 2013. The reductions in annual nickel levels first observed in 1995 are attributed to actions taken by Dal Chrome Co., Inc., an automotive chrome bumper recycling facility located predominantly upwind from the Dallas-Morrell site that operated until November 2013. The air monitoring data from the Dallas-Morrell site are representative of total nickel concentrations and do not specify the specific forms of nickel. However, based on the type of facility, Dal Chrome Co., Inc. is known to emit mainly metallic nickel and is expected to be the predominant nickel emissions source in the vicinity of the Dallas-Morrell site.

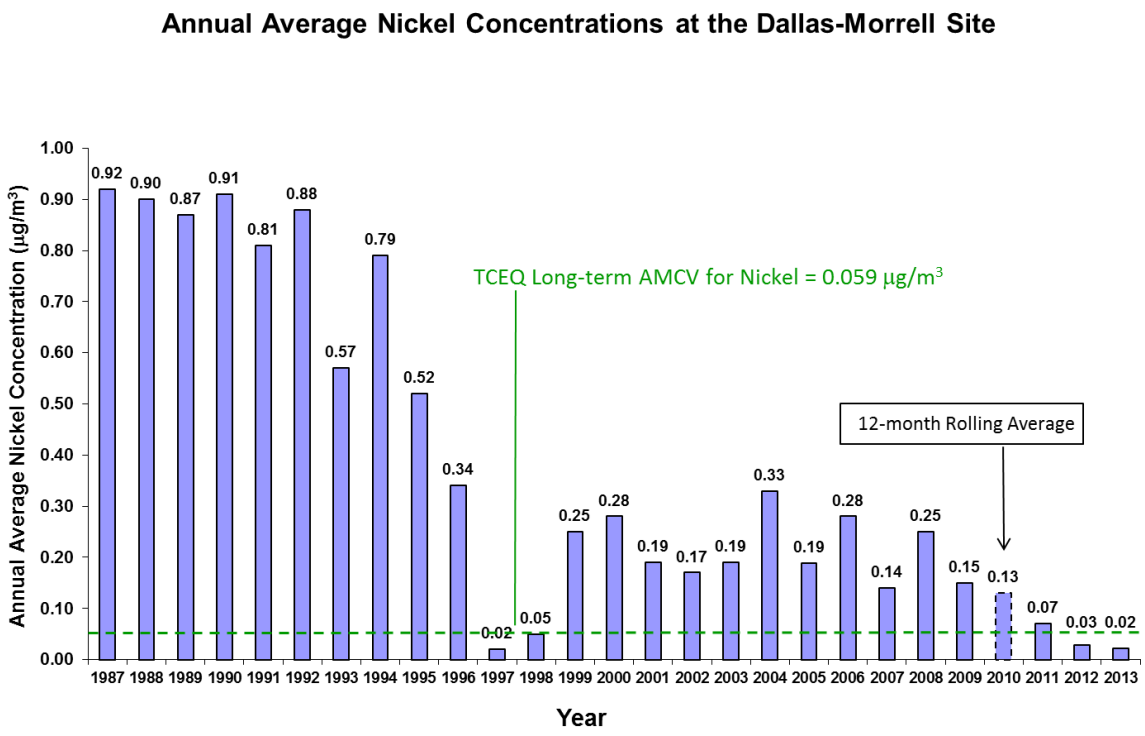

Figure 1. Annual Average Nickel Concentrations at the Dallas-Morrell Site from 1987 to 2013 (Note: a 12-month rolling average concentration from August 17, 2009 to August 12, 2010 was used for 2010)

The long-term AMCV of 0.059 µg/m^3 for respirable nickel particles was derived based on risk of developing lung cancer following exposure to carcinogenic forms of nickel in occupational

workers. Therefore, comparing nickel PM_{10} (post 2010) or TSP data (pre 2010) to the long-term AMCV for respirable nickel particles may be overly conservative for several reasons, including: differences in PM size fractions; differences in forms of nickel; and differences in health effects evaluated (i.e., non-carcinogenic and carcinogenic effects). Detailed information about the long-term AMCV and noncarcinogenic chronic AMCV for nickel is available in the nickel Development Support Document (DSD).

Summary of Nickel Concentrations at the Dallas-Morrell Site

The 2013 annual average nickel concentration was below the long-term AMCV for respirable nickel particles. The air monitoring data from the Dallas-Morrell site are representative of total nickel concentrations and do not specify the specific forms of nickel, however this approach is very conservative, as described above. The TD recommends removal of nickel at the Dallas-Morrell site from the TCEQ's Air Pollutant Watch List (APWL0401), because the available data together with the above information and the fact that the facility closed in November of 2013 indicate that removal from the APWL is appropriate.

Lead

On November 12, 2008, the U.S. Environmental Protection Agency (EPA) finalized the new 0.15 µg/m^3 NAAQS for lead based on a rolling three-month average concentration (73 Federal Register 66964). In general, the rule requires source-oriented ambient air lead monitoring at sites with actual annual lead emissions of one or more tons per year. Two lead-acid battery recycling facilities, namely Exide Technologies, Inc. and ECS Refining Texas LLC (hereafter called Exide and ECS, respectively), were identified as the facilities that are required to have source-oriented lead monitoring in TCEQ Region 4. In December of 2013, the rolling three-month average of lead TSP at the Eubanks monitor near Exide was reported as 0.03 µg/m^3, which is below the 0.15 µg/m^3 comparison value for lead. In December of 2013, the rolling 3-month average of lead TSP at the Terrell Temtex site near ECS was reported as 0.04 µg/m^3, and is below the 0.15 µg/m^3 comparison value for lead.

Lead TSP Monitors around Exide

The Exide facility, a secondary lead smelter, was active from 1964 through November 2012. Three lead TSP monitors (Frisco 7, Frisco Eubanks, and Frisco 5th St.) were established in mid-1990 or earlier and an additional monitor (Frisco Stonebrook) was activated on January 7, 2011. Additional details about the Exide facility and surrounding area are available through the TCEQ websites for the remediation of the Exide site and the latest lead-related planning activities in the Dallas Fort Worth area. On November 30, 2012, Exide closed its doors, and clean up and demolition began in December of the same year.

Reported Lead TSP Concentrations from Monitors around Exide

Annual average concentrations of lead TSP from Frisco 7, Frisco Eubanks, and Frisco 5th St. monitors have been fairly consistent since 1995, with some variations (annual average lead TSP for 2002-2013 can be found in Figure 2). Higher concentrations have been reported from the Frisco Eubanks monitor and lower lead TSP concentrations were reported from all other

monitors. While the NAAQS for lead was lowered ten-fold in 2008 from 1.5 to 0.15 µg/m^3, the ambient lead TSP concentrations around Exide did not change significantly at that time. However, since the closure of the facility in November of 2012, lead levels at the Eubanks monitor have fallen below the 0.15 µg/m^3 comparison value for lead. Lead concentrations, as measured by the three other ambient lead TSP monitors, have also continued to decline since that time.

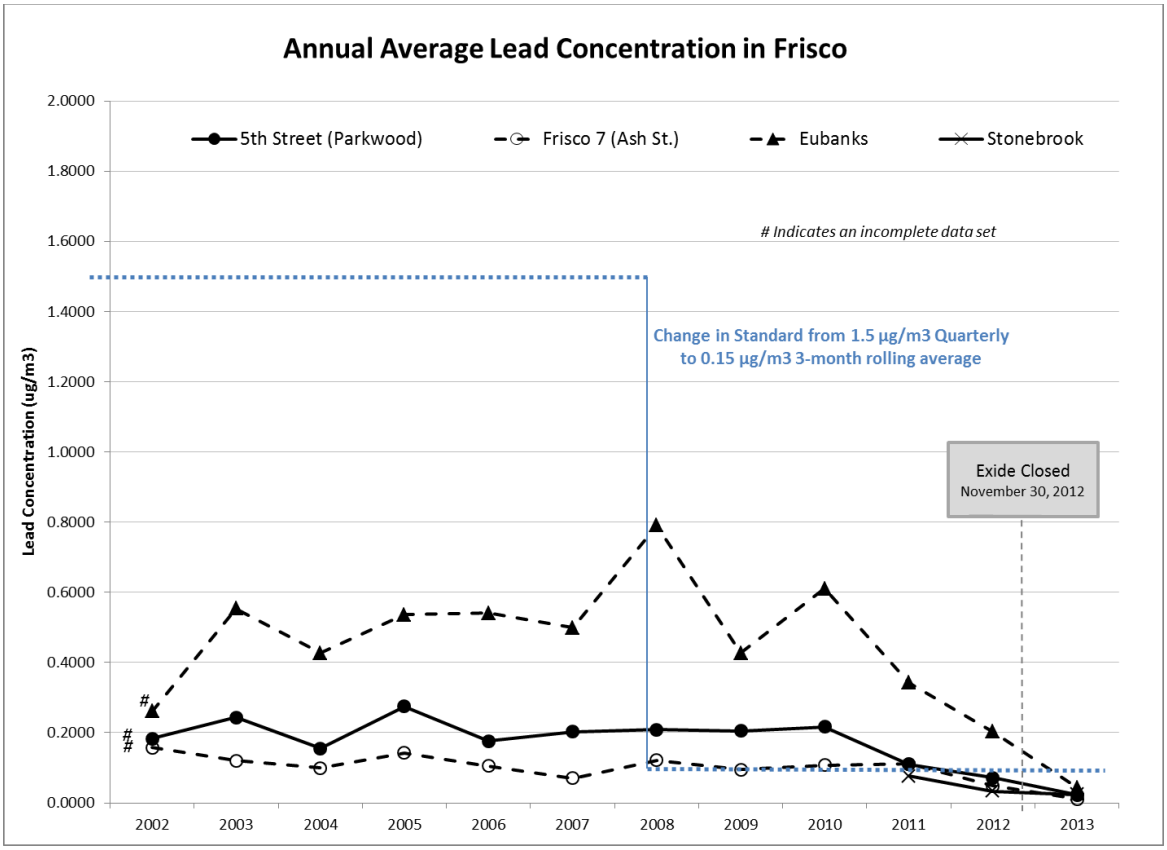

Figure 2. Annual Average Lead TSP Concentrations from Monitors around the Exide Facility from 1994 to 2013

Lead Summary

Although historical lead TSP concentrations at the Eubanks monitor near Exide exceeded the 0.15 µg/m^{3}comparison value, current air monitoring data indicate that lead concentrations are well below the NAAQS comparison level at all four monitor sites surrounding the facility and that the concentrations at the Eubanks monitor are now well below the 0.15 µg/m^{3}comparison value.

Investigations of Air Quality and Barnett Shale Activities

In response to concerns about air emissions from oil and gas operations in the Barnett Shale area, the TCEQ has performed extensive mobile monitoring and has significantly expanded the network of stationary samplers that measure VOCs. On February 27, 2012, the response process for complaints related to oil and gas operations in the Barnett Shale area was modified. Complaints concerning odor from an oil or natural gas site in the Barnett Shale area that is currently occurring and constitute an imminent threat to public health, safety, or the environment, or has substantiated odor nuisance conditions in the previous 12 months will be given an "Immediate Response" priority. An on-site investigation will be conducted by the Dallas/Fort Worth Region staff within 12 hours of receipt of the complaint by the regional office. All other oil and natural gas related complaints will be given priority in accordance with the Field Operations Standard Operating Procedures. In addition, the DFW regional staff conducts periodic reconnaissance investigations in selected areas and the regional office also conducts monitoring, as time and resources permit, at the request of the public and other interested parties. Scheduled compliance investigations are also conducted at natural gas sites to determine compliance with applicable rules and regulations. Detailed information is available on the TCEQ's Oil and Gas Activities Web page at: http://www.tceq.texas.gov/assistance/industry/oil-and-gas/oilgas.html. For specific information about the Barnett Shale Area, click on the link for Barnett Shale Geological Area under the Air Quality section or go to this link: https://www.tceq.texas.gov/airquality/barnettshale.

If you have any questions regarding the contents of this review, please do not hesitate to contact Shannon Ethridge by phone at (512) 239-1822 or via email at Shannon.Ethridge@tceq.texas.gov, Jessica Myers by phone at (512) 239-3444 or via email at Jessica.Myers@tceq.texas.gov, or Stephanie Shirley by phone at (512) 239-1808 or via email at Stephanie.Shirley@tceq.texas.gov.

Attachment A

List 1. Target VOC Analytes in 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
M/P Xylene
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-Dichloropropylene
Trans-2-Butene
Trans-2-Hexene
Trans-2-Pentene
Trichloroethylene
Trichlorofluoromethane
Vinyl Chloride

List 2. Target Carbonyl Analytes

2,5-Dimethylbenzaldehyde	Formaldehyde	o-Tolualdehyde
Acetaldehyde	Heptaldehyde	Propanal - Propionaldehyde
Acetone	Hexanaldehyde	p-Tolualdehyde
Acrolein	Isovaleraldehyde	Valeraldehyde
Benzaldehyde	Methyl Ethyl Ketone (MEK)/Methacrolein	
Butyraldehyde		
Crotonaldehyde - 2-Butenal	m-Tolualdehyde	

List 3. Target Metal Analytes

Aluminum ($PM_{2.5}$)	Chromium ($PM_{2.5}$, PM_{10} and TSP)	Molybdenum ($PM_{2.5}$)
Antimony ($PM_{2.5}$)	Cobalt ($PM_{2.5}$)	Nickel ($PM_{2.5}$, PM_{10} and TSP)
Arsenic ($PM_{2.5}$)	Copper ($PM_{2.5}$)	Selenium ($PM_{2.5}$)
Barium ($PM_{2.5}$)	Lead (TSP and $PM_{2.5}$)	Tin ($PM_{2.5}$)
Cadmium ($PM_{2.5}$)	Manganese($PM_{2.5}$)	Zinc ($PM_{2.5}$)

List 4. Target VOC Analytes in AutoGC

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