Corpus Christi Air Monitoring and Surveillance Camera Installation and Operation Project

Quarterly Report for the Period

January 1, 2009 through March 31, 2009

Submitted to

The Honorable Janis Graham Jack
US District Court for the Southern District of Texas
Corpus Christi, Texas

Ms. Kathleen Aisling
US Environmental Protection Agency, Region 6
Dallas, Texas

Ms. Susan Clewis
Texas Commission on Environmental Quality, Region 14
Corpus Christi, Texas

Submitted by

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May 29, 2009

I. Introduction

On October 1, 2003, the US District Court for the Southern District of Texas issued an order to the Clerk of the Court to distribute funds in the amount of $6,700,000, plus interest accrued, to The University of Texas at Austin (UT Austin) to implement the court ordered condition of probation (COCP) project *Corpus Christi Air Monitoring and Surveillance Camera Installation and Operation* (Project). This quarterly report has been prepared pursuant to the requirements of the project and is being submitted to the US District Court, the US Environmental Protection Agency (EPA), and the Texas Commission on Environmental Quality (TCEQ).

II. Project Progress Report

The focus of work during the quarter ending March 31, 2009 has been directed to the following activities.

A. Operations and Maintenance Phase of the Project

A detailed description of the data analyses for this quarter appears in Appendix A, pages 6 through 22, and a summary of these analyses appear in this section.

The Project consists of a network of seven (7) air monitoring stations with air monitoring instruments and surveillance camera equipment. A map showing locations of COCP Project monitoring sites along with TCEQ sites and sites operated by Texas A&M at Kingsville (TAMUK) appears in Figure 1, below. Table 1, page 3, identifies the location and instrumentation found at each of the COCP Project sites. TCEQ and TAMUK sites provide some additional data used in analyses.

Figure 1. Corpus Christi Monitoring Sites

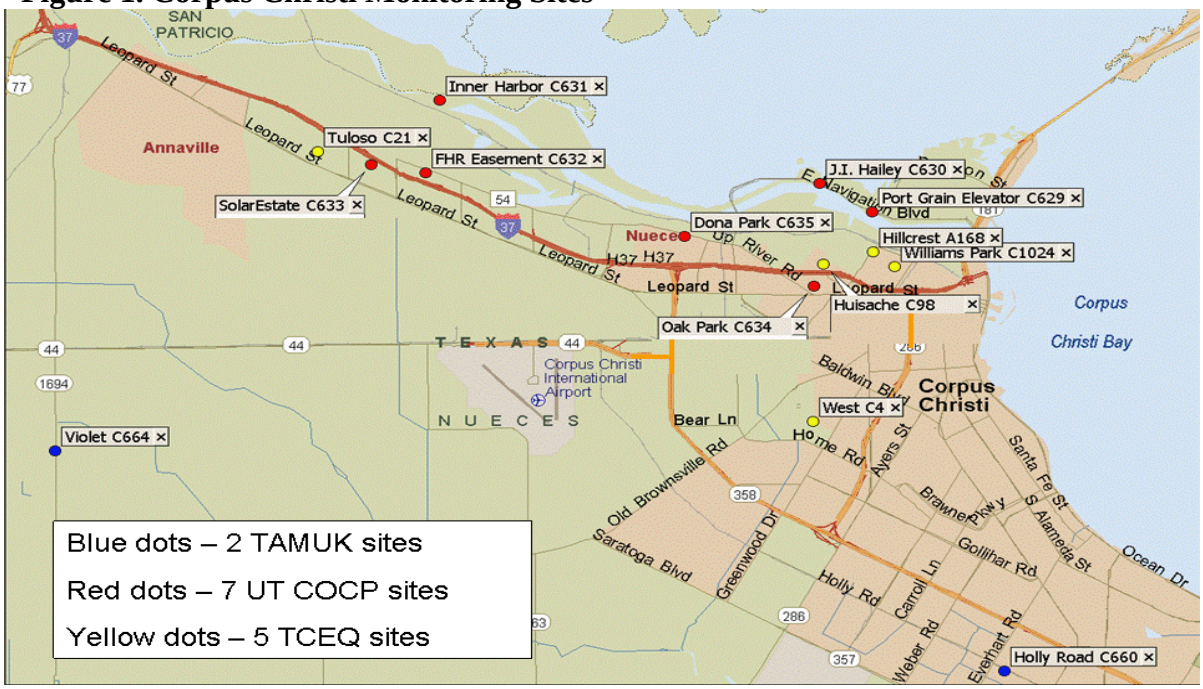

Table 1. Schedule of Air Monitoring Sites, Locations and Major Instrumentation

TCEQ CAMS Nos.	Description of Site Location	Monitoring Equipment				
		Auto GC	TNMHC(T) & Canister(C)	H2S & SO2	Met Station	Camera
634	Oak Park Recreation Center	Yes	T		Yes	
629	Grain Elevator @ Port of Corpus Christi		T&C	Yes	Yes	
630	J. I. Hailey Site @ Port of Corpus Christi		T&C	Yes	Yes	
635	TCEQ Monitoring Site C199 @ Dona Park		T&C	Yes	Yes	Yes
631	Port of Corpus Christi on West End of CC Inner Harbor		T&C	Yes	Yes	
632	Off Up River Road on Flint Hills Resources Easement		T&C	Yes	Yes	
633	Solar Estates Park at end of Sunshine Road	Yes	T	Yes	Yes	Yes

Legend

Auto GC	automated gas chromatograph
TNMHC	total non-methane hydrocarbon analyzer (all except 634 & 633 also have canister hydrocarbon samplers)
H_2S	hydrogen sulfide analyzer
SO_2	sulfur dioxide analyzer
Met Station	meteorology station consisting of measurement instruments for wind speed, wind direction, ambient air temperature and relative humidity
Camera	surveillance camera

A discussion of data findings for the quarter appears in Appendix A, pages 6 though 22. Specifically, the appendix contains the following elements:

- **Auto-GC Data Summary -** In examining the first quarter's hourly auto-GC data from Oak Park and Solar Estates, no measurements were found to have exceeded a short-term Reference Value or ESL. Also, the quarterly averages of all species were below the respective annual ESLs. A summary appears in Appendix A, pages 12 through 14.

- **Benzene and Pentane Trends at Auto-GC Sites:** As has been the case since early 2008, benzene concentrations were lower this quarter than the same quarter in each of the previous three years. Pentane, a common alkane species, has a relatively flat trend.

- **Update on White Point Emissions:** Last month's report described how examination of TNMHC concentrations and surface back-trajectories led to the conclusion that oil & gas extraction operations on the White Point peninsula on the north side of Nueces Bay were

affecting monitors on the south side. An update on this research appears in Appendix A pages 17 through 19.

- **Case Study of Event on February 24, 2009:** See pages 20 through 22 in Appendix A.

B. Scheduled Meetings of the Volunteer Advisory Board

Meeting notes from the March 25th Advisory Board Meeting are currently under review. The meeting notes, together with the status of the action items, will be circulated to all parties as a separate document

C. Project Management and Planning

Project Management and Planning during this period has focused on the following four (4) major activities.

1. **Air Monitoring Operations**
   Operations and maintenance of the seven monitoring sites reporting data via the TCEQ LEADS is on-going. The data can be accessed and reviewed at the project website (http://www.utexas.edu/research/ceer/ccaqp/).

2. **Communication and Reporting**
   The status of the Project has been communicated through the website, which is operational with portions under continual development, quarterly and annual reports, and at meetings of the Project's Advisory Board.

3. **Budget Monitoring**
   Budget monitoring during the period has focused on project costs for Phase II - Sites Operation and Maintenance costs. Financial reports for the quarter are included in Appendix B, pages 23 and 24.

4. **Other Contributions**
   In the Quarterly Report ending December 31, 2008, two new Supplemental Environmental Projects (SEP) were mentioned. Discussions about the two new SEP awards, which took place during the November 6, 2008 meeting of the Advisory Board, were detailed in the Advisory Board Meeting Notes found in the December 31, 2008 Quarterly Report.

   During this quarter the Texas Commission on Environmental Quality and UT Austin continued to work together to generate a statement of work and budget for approval for the following two previously mentioned SEP awards:

   Texas Molecular Corpus Christi Services Ltd. Partnership SEP under Agreed Order Docket Number D1-GV-07-001054 in the amount of $67,900. UT Austin will seek approval from TCEQ to purchase an additional surveillance camera and coordinate the installation of one or more cameras along the monitoring network; and

   Equistar Chemicals, LP, (A Lyondell Company) SEP under Agreed Order Docket No. D-1-GV-06-002509 in the amount of $400,000. UT Austin has submitted a proposal to

the TCEQ to purchase an Infra-Red Camera, provide training on the camera and to extend the life of the Corpus Christi Air Monitoring and Surveillance Camera Network.

During the next quarter it is anticipated that final approval to move forward with these SEPs will be issued by TCEQ.

III. Financial Report

As required, the following financial summary information is provided. Details supporting this financial summary are included in Appendix B, pages 23 and 24.

A. Total Amount of COCP Funds and Other Funds Received Under the Project
The COCP funds received through March 31, 2009 totals $7,450,565.19. This total includes interest earned through March 31, 2009.

B. Detailed List of the Actual Expenditures Paid from COCP Funds
Expenditures of COCP funds during this quarter totaled $226,856.75. The detailed breakdown of the actual expenditures is included in Appendix B, page 24. The activities for which these expenditures were used are detailed in Section II, on page 2 of this report.

C. Total Interest Earned on COCP Funds During the Quarter
The interest earned during this quarter totaled $18,004.73. A report providing detailed calculations of the interest earned on the COCP funds during each month of the quarter is included in Appendix B, pages 23 and 24.

D. Balance as of March 31, 2009, in the COCP Account
The balance in the COCP account, including interest earned totals $2,856,353.25.

E. Expected Expenditures for the Funds Remaining in the COCP Account
The projected expenditures for the funds remaining totals $2,856,353.25.

Quarterly Report Distribution List:
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Environmental Protection Agency
Ms. Kathleen Aisling, Environmental Engineer, Air Enforcement Section, Dallas Regional Office
Members of the Advisory Board

APPENDIX A

Data Analysis for Corpus Christi Quarterly Report

January 1, 2009 through March 31, 2009

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Data Analysis for Corpus Christi Quarterly Report

This technical report describes recent results of monitoring and analysis of data under the Corpus Christi Air Quality Project for the period January 1 through March 31, 2009. The monitoring network is shown in Figure 1, page 2, and is described in Table 1 below. This report contains the following elements:

- a summary of hourly speciated hydrocarbon concentrations measured by automated gas chromatographs (auto-GCs) in two residential areas;
- benzene and pentane trends at the two auto-GC sites;
- update on emissions from White Point oil & gas operations
- case study on an event on February 24, 2009.

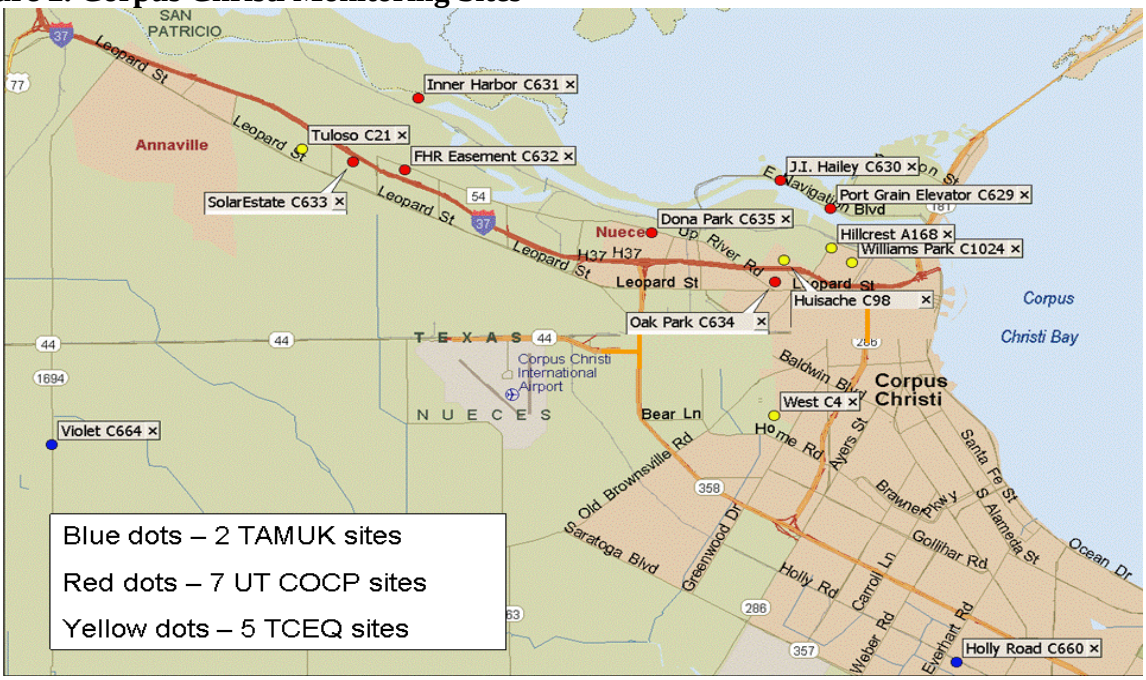
Table 1. Schedule of Air Monitoring Sites, Locations and Major Instrumentation

TCEQ CAMS#	Description of Site Location	Monitoring Equipment				
		Auto GC	TNMHC (T) / Canister (C)	H_2S & SO_2	Met Station	Camera
634	Oak Park Recreation Center (**OAK**)	Yes	T		Yes	
629	Grain Elevator @ Port of Corpus Christi (**CCG**)		T&C	Yes	Yes	
630	J. I. Hailey Site @ Port of Corpus Christi (**JIH**)		T&C	Yes	Yes	
635	TCEQ Monitoring Site C199 @ Dona Park (**DPK**)		T&C	Yes	Yes	Yes
631	Port of Corpus Christi on West End of CC Inner Harbor (**WEH**)		T&C	Yes	Yes	
632	Off Up River Road on Flint Hills Resources Easement (**FHR**)		T&C	Yes	Yes	
633	Solar Estates Park at end of Sunshine Road (**SOE**)	Yes	T	Yes	Yes	Yes

Legend

Auto GC	automated gas chromatograph
TNMHC	total non-methane hydrocarbon analyzer (all except 633 & 634 also have canister hydrocarbon samplers)
H_2S	hydrogen sulfide analyzer
SO_2	sulfur dioxide analyzer
Met Station	meteorology station consisting of measurement instruments for wind speed, wind direction, ambient air temperature and relative humidity
Camera	surveillance camera

Figure 2. Corpus Christi Monitoring Sites



Glossary of terms

- **Pollutant concentrations** – Concentrations of most gaseous pollutants are expressed in units denoting their "mixing ratio" in air; i.e., the ratio of the number molecules of the pollutant to the total number of molecules per unit volume of air. Because concentrations for all gases other than molecular oxygen, nitrogen, and argon are very low, the mixing ratios are usually scaled to express a concentration in terms of "parts per million" (ppm) or "parts per billion" (ppb). Sometimes the units are explicitly expressed as ppm-volume (ppmV) or ppb-volume (ppbV) where 1 ppmV indicates that one molecule in one million molecules of ambient air is the compound of interest and 1 ppbV indicates that one molecule in one billion molecules of ambient air is the compound of interest. In general, air pollution standards and health effects screening levels are expressed in ppmV or ppbV units. Because hydrocarbon species may have a chemical reactivity related to the number of carbon atoms in the molecule, mixing ratios for these species are often expressed in ppb-carbon (ppbV times the number of carbon atoms in the molecule), to reflect the ratio of carbon atoms in that species to the total number of molecules in the volume. This is

relevant to our measurement of auto-GC species and TNMHC, which are reported in ppbC units. For the purpose of relating hydrocarbons to health effects, this report notes hydrocarbon concentrations in converted ppbV units. However, because TNMHC is a composite of all species with different numbers of carbons, it cannot be converted to ppbV. Pollutant concentration measurements are time-stamped based on the start time of the sample, in Central Standard Time (CST), with sample duration noted.

- **Auto-GC** - The automated gas chromatograph collects a sample for 40 minutes, and then automatically analyzes it for some 47 hydrocarbon species. These include benzene and 1,3-butadiene, which are air toxics, various butene species that have relatively low odor thresholds, and a range of gasoline and vehicle exhaust components. Auto-GCs operate at Solar Estates CAMS 633 and Oak Park CAMS 634.

- **Total non-methane hydrocarbons** (TNMHC) – TNMHC represent a large fraction of the total volatile organic compounds released into the air by human and natural processes. TNMHC is an unspeciated total of all hydrocarbons, and individual species must be resolved by other means, such as with canisters or auto-GCs. However, the time resolution of the TNMHC instrument is much shorter than the auto-GC, and results are available much faster than with canisters. TNMHC analyzers operate at all seven UT/CEER sites.

- **Canister** – Stainless steel canisters are filled with air samples when an independent sensor detects that elevated (see below) levels of hydrocarbons (TNMHC) are present. Samples are taken for various lengths of time (generally 20 minutes) to try to capture the chemical make-up of the air. In most cases, the first time on any day that the monitored TNMHC concentration exceeds 2000 ppbC at a site for a continuous period of 15 minutes or more, the system will trigger and a sample will be collected. Samples are sent to UT Austin and are analyzed in a lab to resolve some 60 hydrocarbon and12 chlorinated species. Canister samplers have operated at all seven UT/CEER sites, but currently only at five (CAMS 629,630,631,632, and 635).

- **Effects Screening Levels (ESLs) and Reference Values (ReVs) –** The definitions and details about the use of ESLs and ReVs appear in the "RG-442" regulations guidance document *Guidelines to Develop Effects Screening Levels, Reference Values, and Unit Risk Factors,* found at http://www.tceq.state.tx.us/comm_exec/forms_pubs/pubs/rg/rg-442.html (Accessed April, 2009). Extracts from this document appear below:

  > *1.1 Legal Authority and Regulatory Use:* The Texas Clean Air Act (Chapter 382 of the Texas Health and Safety Code (THSC)) authorizes the TCEQ to prevent and remedy conditions of air pollution. Section 382.003 of the THSC defines air pollution as
  >
  > *the presence in the atmosphere of one or more air contaminants or combination of air contaminants in such concentration and of such duration that:*
  >
  > - *are or may tend to be injurious to or to adversely affect human health or welfare, animal life, vegetation, or property; or*
  > - *interfere with the normal use and enjoyment of animal life, vegetation, or property.*

Sections 382.0518 and 382.085 of the THSC specifically mandate the TCEQ to conduct air permit reviews of all new and modified facilities to ensure that the operation of a proposed facility will not cause or contribute to a condition of air pollution. Air permit reviews typically involve evaluations of best available control technology and predicted air concentrations related to proposed emissions from the new or modified facility. In the review of proposed emissions, federal/state standards and chemical-specific **Effects Screening Levels** (ESLs) are used, respectively, for criteria and non-criteria pollutants. Because of the comprehensiveness of the language in the THSC, ESLs are developed for as many air contaminants as possible, even for chemicals with limited toxicity data.

Air contaminants may cause both direct and indirect effects. Direct effects are those that result from direct inhalation and dermal exposures to chemicals in air. Deposition of contaminants on soil and water—and subsequent uptake by plants and animals—may cause indirect effects in humans who consume those plants and animals. However, the THSC authorizes the prevention and remedy of air pollution based on effects and interference from contaminants *present in the atmosphere*, i.e., direct effects. Therefore, during the air permitting process, the TCEQ does not set air emission limits to restrict, or perform analysis to determine, the impacts emissions may have, by themselves or in combination with other contaminants or pathways, after being deposited on land or water or incorporated into the food chain. However, indirect effects are assessed during cleanup efforts under the Risk Reduction and Texas Risk Reduction Program Rules, described below.

The TCEQ also relies upon this authority to evaluate air monitoring data. Texas has the largest ambient air toxics monitoring network in the country, receiving monitoring data for up to 186 air toxics at approximately 57 different locations throughout the state. **Reference Values** (ReVs) and **Unit Risk Factors** (URFs) are used to evaluate measured air toxics concentrations for their potential to cause health and welfare effects, as well as to help the agency prioritize its resources in the areas of permitting, compliance, and enforcement.

Sec. 1.7 Use of ESLs, ReVs, and URFs in TCEQ Program Areas: The TS [Toxicology Section] develops ESLs, ReVs, and URFs to provide toxicological support to multiple program areas within the TCEQ… In the air permit review process, the TS utilize short- and long-term ESLs to evaluate proposed emissions for their potential to adversely affect human health and welfare. For evaluation of ambient air monitoring results, acute and chronic ReVs and URFs are used to assess the potential for exposure to the measured concentrations to cause human health effects. To assess potential welfare effects for monitoring results, the TS uses odor- and vegetation-based ESLs.

The TCEQ Toxicology Section is continuing long-term analysis of these thresholds and persons may subscribe to an e-mail listserv for updates at the Web site http://www.tceq.state.tx.us/implementation/tox/esl/ESLMain.html (accessed April 2009).

The current ESLs for benzene are 55.5 ppbV for short term and 1.4 ppbV for long term exposure. TCEQ has recommended using the ReV for short term assessments of benzene concentrations. This number is 180 ppbV. Thus, only when individual auto-GC one-hour values or canister 20-minute values for benzene exceed 180 ppbV will a short-term "exceedance" for benzene be noted.

- **Elevated Concentrations –** In the event that measured pollutant concentrations are above a set threshold they are referred to as "elevated concentrations." The values for these thresholds are summarized by pollutant below. As a precursor to reviewing the data, the reader should understand the term "*statistical significance*". In the event that a concentration is higher than one would typically measure over, say, the course of a week, then one might conclude that a specific transient assignable cause may have been the pollution source, because experience shows the probability of such a measurement occurring under normal operating conditions is small. Such an event may be labeled "statistically significant" at level 0.01, meaning the observed event is rare enough that it is not expected to happen more often than once in 100 trials. This does not necessarily imply the occurrence of a violation of a health-based standard. A discussion of "elevated concentrations" and "statistical significance by pollutant type follows:

    - For H_2S or SO_2, any measured concentration greater than the level of the state residential standards, which are 80 ppb for H_2S and 400 ppb for SO_2, is considered "elevated." Note that the concentrations need not persist long enough to constitute an exceedance of the standard to be so regarded. In addition, any closely spaced values that are statistically significantly (at 0.01 level) greater than the long-run average concentration for a period of one hour or more will be considered "elevated" because of their unusual appearance, as opposed to possible health consequence. The rationale for doing so is that unusually high concentrations at a monitor may suggest the existence of unmonitored concentrations closer to the source area that are potentially above the state's standards.
    - For TNMHC, any measured concentration greater then the canister triggering threshold of 2000 ppbC is considered "elevated." Note that the concentrations need not persist long enough to trigger a canister (900 seconds).
    - For benzene and other air toxics in canister samples or auto-GC measurements, any concentration above the ReV is considered "elevated." Note that 20-minute canister samples and 40-minute auto-GC measurements are both compared with the ReV or ESL, whichever is deemed appropriate by the TCEQ.
    - Some hydrocarbon species measured in canister samples or by the auto-GC generally appear in the air in very low concentrations close to the method detection level. Similar to the case above with H_2S and SO_2, any values that are statistically significantly (at 0.01 level) greater than the long-run average concentration will be considered "elevated" because of their unusual appearance, as opposed to possible health consequence. The rationale for doing so is that unusually high concentrations at a monitor may suggest an unusual emission event in the area upwind of the monitoring site.

1. Auto-GC Data Summaries in Residential Areas

In this section the results of semi-continuous sampling for hydrocarbons at the two auto-GC sites – Solar Estates C633 and Oak Park C634 – are presented. These two sites are located in residential areas generally downwind of industrial emissions under northerly winds. In examining aggregated data one observes similar patterns of hydrocarbons at the two sites, with concentrations averaging higher at Oak Park than at Solar Estates.

Tables 2 and 3, pages 13 and 14, summarize data from the first quarter of 2009. These tables are available to TCEQ staff at http://rhone.tceq.state.tx.us/cgi-bin/agc_summary.pl (accessed April 2009). The tables show the average concentrations over the quarter, and the maximum one-hour and 24-hour average concentrations for 27 hydrocarbon species of interest for the period of interest. Note that not all data have been validated and are thus subject to change. All concentration values in the tables are in ppbV units. No concentrations or averages of concentrations were greater than effects screening levels or reference values during the first quarter of 2009.

In each table, the "Num Ambient Samples" column includes all ambient samples, including those that are not flagged as validated. The "Mean" is calculated as a weighted average of daily averages and takes into account the number of samples flagged ambient for each day.

The current benzene Reference Value used in toxicological evaluations to screen for areas of concern is 180 ppbV. The current short-term benzene ESL, which is only used for permitting purposes, is 55 ppbV. The annual ESL for benzene, which is used in toxicological evaluations to screen for areas of concern, is 1.4 ppbV.

Table 2. Oak Park 1st quarter 2009 Auto-GC species of interest, ppbV units

Species	Num Ambient Samples	Mean	Peak 1-Hour Value	Peak 24-Hour Value
Ethane	1,951	8.78	192.52	25.65
Ethylene	1,951	0.75	51.61	6.03
Propane	1,951	5.66	206.86	18.44
Propylene	1,951	0.41	69.80	3.88
Isobutane	1,951	1.99	65.46	7.83
n-Butane	1,951	3.46	127.01	12.66
t-2-Butene	1,951	0.07	1.92	0.25
1-Butene	1,951	0.05	2.05	0.21
c-2-Butene	1,951	0.04	2.22	0.20
Isopentane	1,951	2.33	123.12	9.81
n-Pentane	1,951	1.48	72.28	8.21
1,3-Butadiene	1,951	0.02	0.62	0.08
t-2-Pentene	1,951	0.02	0.78	0.14
1-Pentene	1,951	0.02	1.24	0.15
c-2-Pentene	1,951	0.01	0.35	0.07
n-Hexane	1,951	0.51	25.71	2.77
Benzene	**1,951**	**0.43**	**7.13**	**1.69**
Cyclohexane	1,951	0.18	5.90	0.79
Toluene	1,951	0.76	30.12	4.46
Ethyl Benzene	1,951	0.05	2.33	0.32
p-Xylene + m-Xylene	1,951	0.18	7.50	1.15
o-Xylene	1,951	0.06	2.05	0.34
Isopropyl Benzene - Cumene	1,951	0.02	1.33	0.22
1,3,5-Trimethylbenzene	1,951	0.01	0.50	0.10
1,2,4-Trimethylbenzene	1,951	0.04	1.00	0.20
n-Decane	1,951	0.02	1.09	0.17
1,2,3-Trimethylbenzene	1,951	0.01	0.49	0.09

Table 3. Solar Estates 1st quarter 2009 Auto-GC species of interest, ppbV units

Species	Num Ambient Samples	Mean	Peak 1-Hour Value	Peak 24-Hour Value
Ethane	1,926	8.03	168.56	24.42
Ethylene	1,926	0.40	8.77	1.62
Propane	1,926	4.76	182.65	22.14
Propylene	1,926	0.20	42.22	2.95
Isobutane	1,926	1.61	76.15	7.61
n-Butane	1,926	2.59	102.78	11.00
t-2-Butene	1,926	0.06	1.74	0.40
1-Butene	1,926	0.05	2.47	0.41
c-2-Butene	1,926	0.04	1.25	0.28
Isopentane	1,926	1.32	44.76	4.49
n-Pentane	1,926	0.84	33.68	2.89
1,3-Butadiene	1,926	0.03	0.84	0.13
t-2-Pentene	1,926	0.03	0.86	0.11
1-Pentene	1,926	0.02	0.39	0.07
c-2-Pentene	1,926	0.01	0.43	0.06
n-Hexane	1,926	0.29	10.85	0.88
Benzene	**1,926**	**0.25**	**4.02**	**0.65**
Cyclohexane	1,926	0.17	5.12	0.61
Toluene	1,926	0.32	7.72	1.37
Ethyl Benzene	1,926	0.03	0.71	0.09
p-Xylene + m-Xylene	1,926	0.23	7.60	1.39
o-Xylene	1,926	0.05	1.50	0.22
Isopropyl Benzene - Cumene	1,926	0.01	0.96	0.18
1,3,5-Trimethylbenzene	1,926	0.01	0.29	0.03
1,2,4-Trimethylbenzene	1,926	0.03	0.57	0.10
n-Decane	1,926	0.02	0.86	0.11
1,2,3-Trimethylbenzene	1,926	0.01	0.28	0.04

2. Benzene and Pentane Trends at Auto-GC Sites

A notable finding throughout 2008 has been that benzene concentrations continue to be practically and statistically significantly lower at both auto-GC sites compared with past years. Tables 4 and 5, below, show comparisons between first quarter 2009 averages for benzene at Oak Park CAMS 634 and Solar Estates CAMS 633, from 2006 to 2009. The two tables show the number of samples, the mean concentration for the quarter, and the annual maximum one-hour and midnight-to-midnight 24-hour average concentrations in ppbV units for the period. The one-hour maximum value for early 2009 Oak Park is in red because it is significantly lower than in the past.

Table 4. Summary of 1st Q benzene at Oak Park 2006-2009, ppbV units

Year	Num Samples	Mean ppbV	Peak 1-hour value	Peak 24-hour value
1Q06	1,795	0.81	46.03	6.92
1Q07	1,954	1.04	120.16	8.95
1Q08	1,895	0.49	35.17	2.86
1Q09	**1,951**	**0.43**	**7.13**	**1.69**

Table 5. Summary of 1st Q benzene at Solar Estates 2006-2009, ppbV units

Year	Num Samples	Mean ppbV	Peak 1-hour value	Peak 24-hour value
1Q06	1,534	0.34	5.43	1.07
1Q07	1,847	0.43	6.29	1.80
1Q08	1,939	0.27	3.80	0.66
1Q09	**1,926**	**0.25**	**4.02**	**0.65**

For comparison purposes, another common hydrocarbon species, pentane, is shown in a similar summary format in Tables 6 and 7, below. ***Pentane*** has been chosen because it is one of the six most common species measured, it is an important component of gasoline, and it is present in vehicle exhaust.

Table 6. Summary of 1st Q pentane at Oak Park 2006-2009, ppbV units

Year	Num Samples	Mean ppbV	Peak 1-hour value	Peak 24-hour value
1Q06	1795	1.46	44.81	6.38
1Q07	1954	2.04	142.94	11.83
1Q08	1895	1.59	64.65	12.59
1Q09	1951	1.48	72.28	8.21

Table 7. Summary of 1st Q pentane at Solar Estates 2006-2009, ppbV units

Year	Num Samples	Mean ppbV	Peak 1-hour value	Peak 24-hour value
1Q06	1706	1.18	24.07	3.85
1Q07	1855	1.13	23.15	3.80
1Q08	1939	0.82	80.16	4.20
1Q09	1926	0.84	33.68	2.89

Benzene concentrations have declined by about half at Oak Park in the past two first quarters compared to the earlier years, but the trend in pentane is relatively flat by comparison. This may suggest that there have been specific efforts to control benzene emissions.

The graphs in Figures 3 – 6, below, show the Oak Park mean concentration by hour (often referred to as the diurnal pattern) for the first quarters of 2006 through 2009. Lines are drawn at 1.4 ppbV, representing the long-term ESL and at 0.5 ppbV for reference purposes. In examining the diurnal patterns relative to the 1.4 ppbV line, early morning concentrations peaked above this level in 2006 and 2007 and below it in 2008 and 2009. The 0.5 ppbV value was arbitrarily chosen as the level that daytime concentrations were above in 2006 and 2007 and below in 2008 and 2009.

Figure 3. Mean benzene concentration at Oak Park, 1Q 2006, ref. lines at 1.4 ppbV and 0.5 ppbV

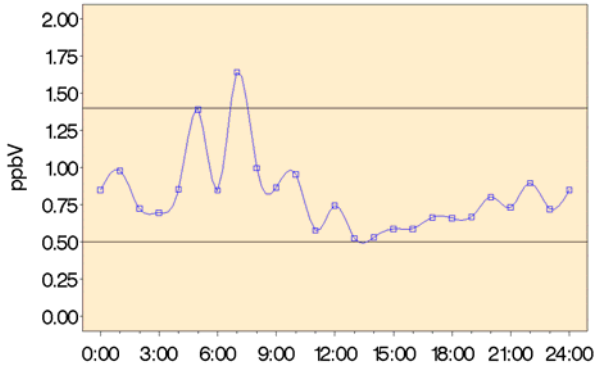


Figure 4. Mean benzene concentration at Oak Park, 1Q 2007, ref. lines at 1.4 ppbV and 0.5 ppbV

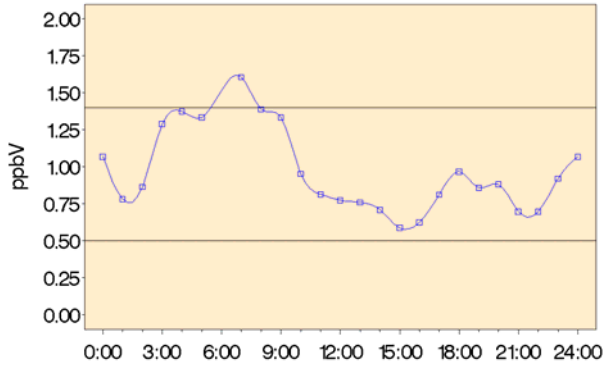


Figure 5. Mean benzene concentration at Oak Park, 1Q 2008, ref. lines at 1.4 ppbV and 0.5 ppbV

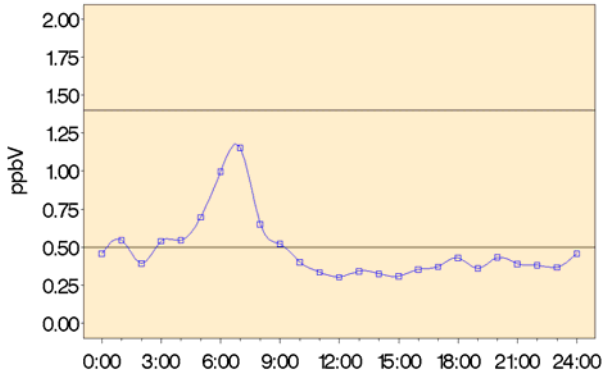
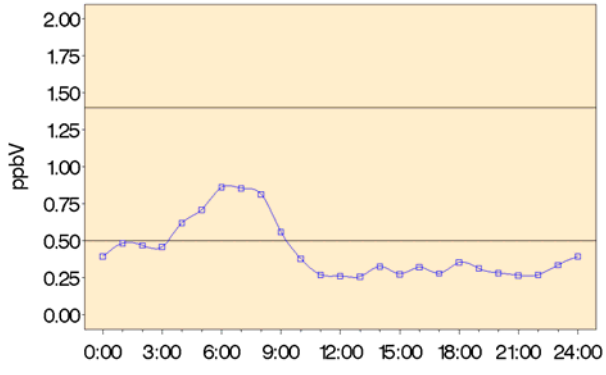


Figure 6. Mean benzene concentration at Oak Park, 1Q 2009, ref. lines at 1.4 ppbV and 0.5 ppbV

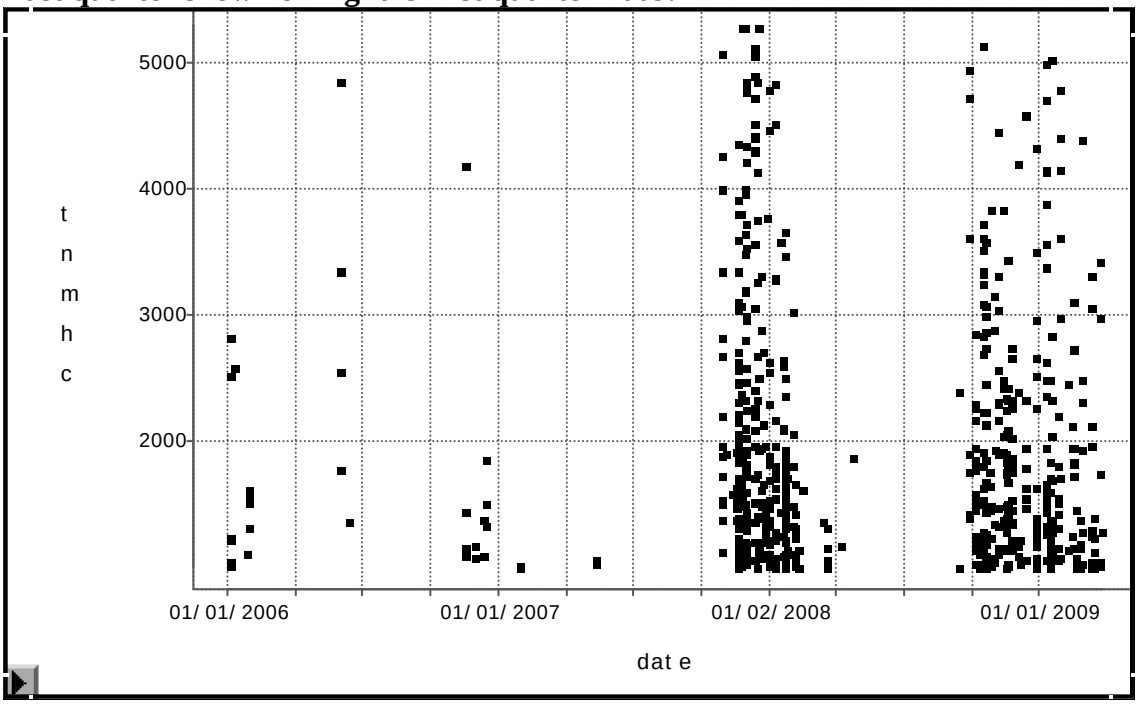


The decline in benzene concentrations at Oak Park was shown in an earlier report to be largely associated with a decline in concentrations coincident with northeasterly and northwesterly winds. This analysis shows the decline is not related to a particular time of day, but is relatively similar across all hours.

3. Update on White Point Emissions

As was reported in the previous quarterly report, in late 2007 the Corpus Christi automated alert system began to receive more frequent alerts under northerly winds. Figure 7 below is an updated and modified version of a graph from the previous report showing the time series of 5-minute TNMHC measurements at Dona Park CAMS 635 filtered for values over 1000 ppbC and for coincident wind directions between 340 degrees (north-northwest) and 360 degrees (due north). This is the direction from Dona Park to the White Point area on the north side of Nueces Bay, as shown on page 18 in Figure 8. From within this relatively narrow direction cone, only a handful of elevated concentrations were measured from 2005 when monitoring began up until sometime around November 1, 2007. From that point in time, many "hits" were recorded up until February 2008, commencing again in October 2008 and continuing through the first quarter of 2009.

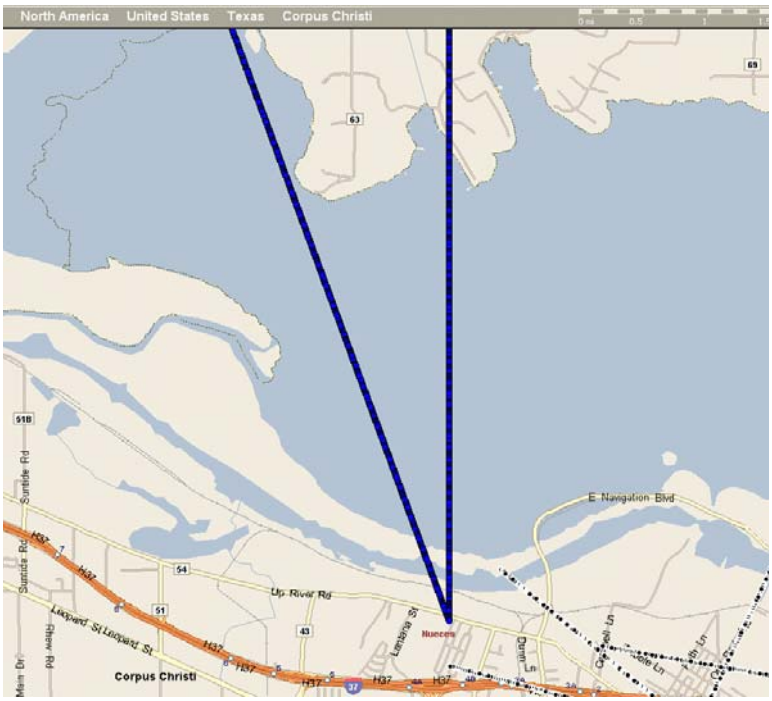
Figure 7. Time series of Dona Park CAMS 635 TNMHC measurements at 5-minute time resolution filtered on concentration >= 1000 ppbC and wind direction between 340 and 360 degrees. Each vertical line represents the start of a quarter; first vertical line is 1/1/06. Last quarter shown on right is first quarter 2009.



An examination of Texas Railroad Commission (RRC) records on the agency's website[1] shows there are a large number of permitted oil and natural gas facilities in the Corpus Christi area. Several Web pages exist on the RRC Website that allow one to learn more about specific wells and pipelines. A geographic information system (GIS) application[2] allows one to generate maps of counties featuring icons for different types of permitted entities (pipelines, surveys, wells, etc.).

[1] http://www.rrc.state.tx.us/ accessed April 2009
[2] http://www.rrc.state.tx.us/data/online/gis/ accessed April 2009

Figure 8. Map of direction "cone" from Dona Park CAMS 635 within which elevated concentrations arrived, 2007-2009. Land at the top of the figure within the cone is the "White Point area".



For example, in Figure 9 on page 19, the many RRC permitted entities around the Nueces Bay area are shown. An online legend is available to help decipher the icons on the map[3]. In general, red icons indicate oil and gas wells, while green icons indicate oil wells. Many wells are plugged. Open circle icons are dry holes. A yellow background for an icon indicates that online well logs are available.

Figure 10 on page 19 shows a close-up on White Point revealing pipelines and horizontal wells. The numbers shown by the icons in this figure correspond to RRC GIS identification numbers. Horizontal wells are important in allowing the extraction of natural gas in geological layers that have lateral orientation.

[3] http://gis2.rrc.state.tx.us/public/help/legend.html accessed April 2009.

Figure 9. Map of wells, active and historical, from Railroad Commission Website

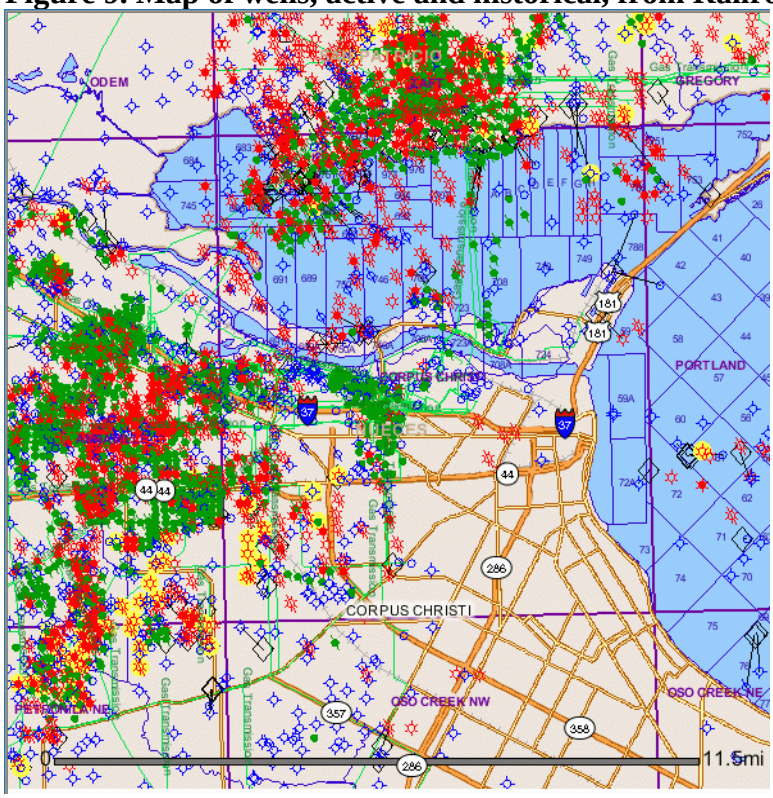
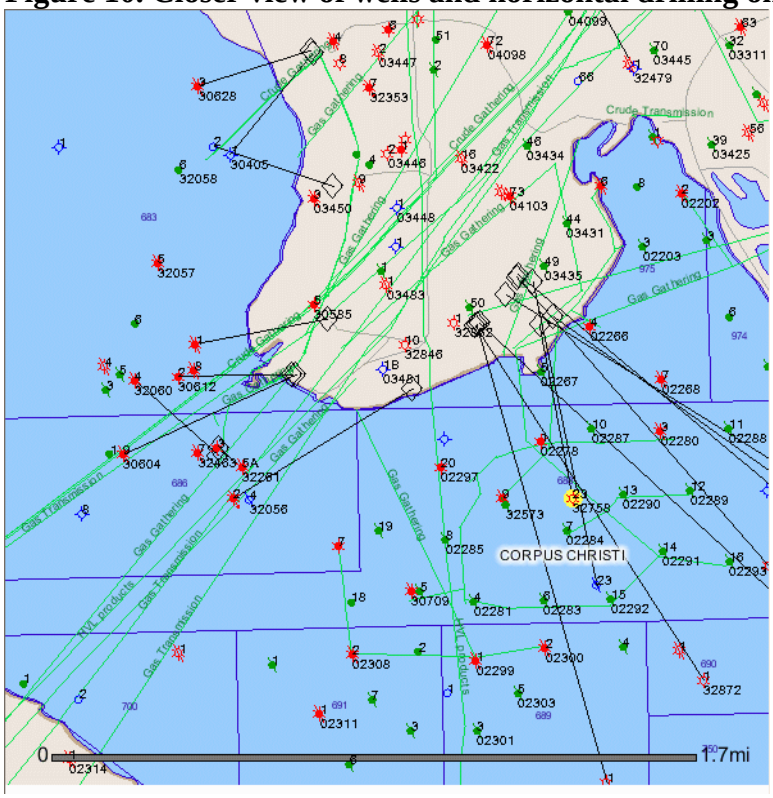


Figure 10. Closer view of wells and horizontal drilling on White Point



4. Case Study of Event on February 24, 2009

On the evening of Tuesday February 24, 2009, the following alert from the West End Harbor site was received:

> emrs_medium_alert_48355003843102_20090224_1835.txt
> TNMOC MEDIUM trigger at site Inner Harbor C631
> 30,444.47 >= 2000.00 ppbC (trigger 2 of 3)
> WD = 162 degrees
> WS = 16.2 mph
> time of trigger 18:35 (CST) 2009.02.24

The TNMHC value triggering the alert was one of the highest measured in the network, and concentrations at the site remained high enough over a long enough period to trigger a canister sample. The time series for the 5-minute resolution TNMHC and wind direction values over the February 24 – 25 period appears in Figure 11, below. The data from the canister are shown on page 21 in Figure 12. The vast majority of mass in this sample was *isobutane*, at a concentration (7,123 ppbV) higher than the short term odor ESL (2,040 ppbV). A surface back-trajectory started at 6:45 p.m. CST at the time of maximum TNMHC concentration appears on page 21 in Figure 13. Wind speeds were between 13 and 16 miles per hour during the event, showing little variation in speed or direction.

Figure 11. Time series of TNMHC and wind direction on February 24 – 25, 2009 showing spike in concentrations evening of the 24th under southeast winds, 13-19 mph speed.

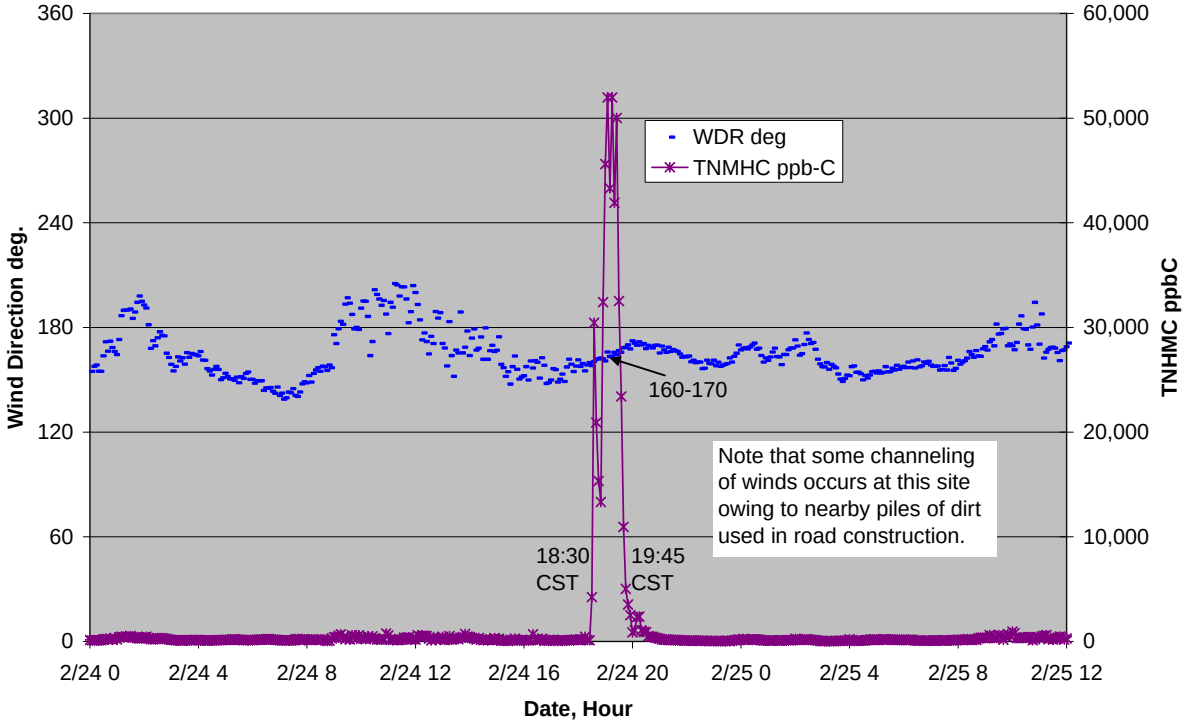


Figure 12. Canister sample from West End Harbor, 6:47 p.m. CST on February 24, 2009, with isobutane as the primary species present.

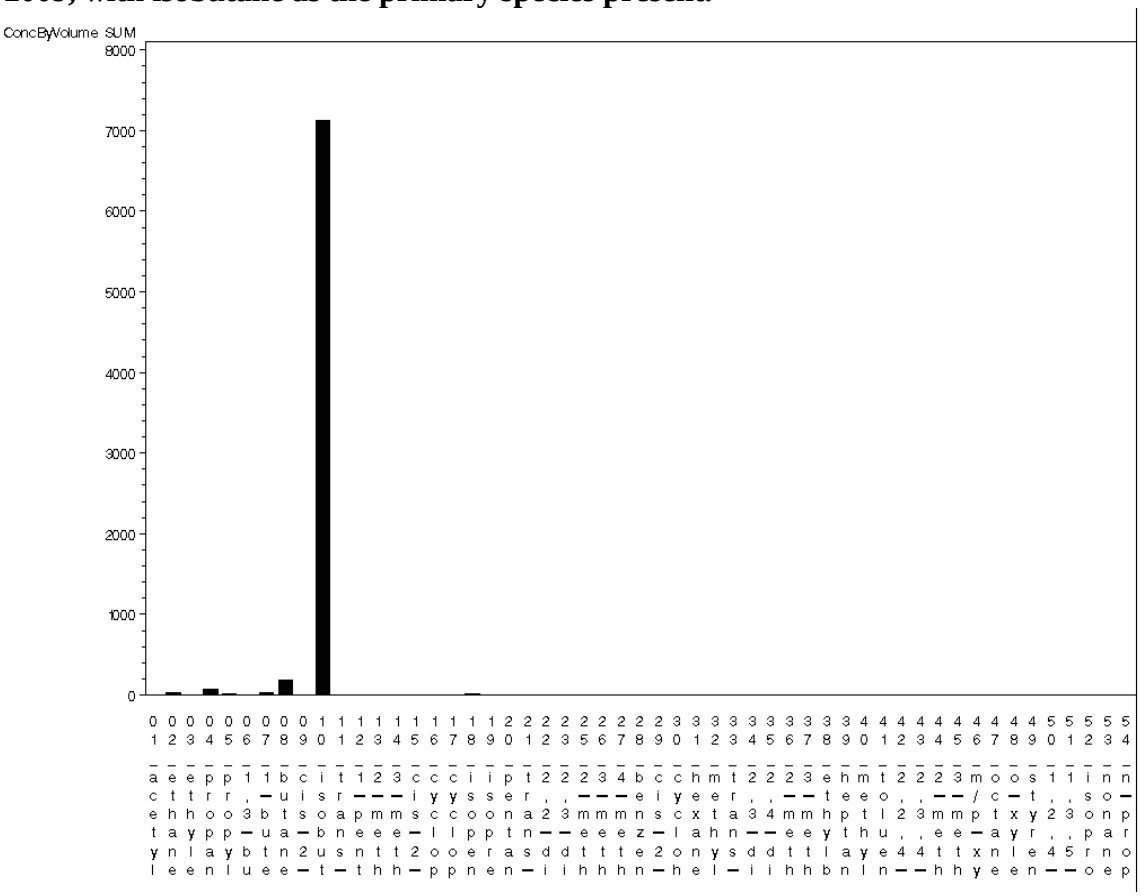


Figure 13 Surface back-trajectory associated with the time of maximum TNMHC concentration at West End Harbor on February 24, 2009. Note high wind speeds.

One phone call was made on April 7 and emails were sent on April 8 and April 28 to staff at the Port of Corpus Christi to ask about dockside activity at the Port's facilities near the West End harbor site, but no response has been received by UT Project Personnel as of May 22, 2009. However, this event was investigated by TCEQ Region staff. The Flint Hills West Refinery (FHR) reported on loading activities that occurred at the railcar loading rack. The FHR representative told the TCEQ investigator that "there had been a small hole, ¼ inch, found in a hose used to load isobutane at approximately 7:30 pm. Previous to the discovery of the leaking hose there had been loading activities. Upon discovery, the loading operations were stopped and the hose replaced."[4]

The FHR representative estimated that approximately 12 pounds of material leaked from the hose from 6 pm to 7:30 pm CST. Note how closely this time period compares to the period of elevated TNMHC in Figure 11 on page 20 (6:30 – 7:45 pm CST). While follow-up investigations continue, the emissions from this event appear to have been below the threshold required for TCEQ event reporting at this time.

Conclusions from the First Quarter 2009 Data

In this quarter's report, several findings have been made:

- Periodic air pollution events continue to be measured on a routine basis, but values of hydrocarbons above the reference values and effects screening levels are rarely observed. No measurements exceeded ESLs or Reference Values this quarter in the auto-GC data. One measurement exceeded an odor ESL in a canister sample.
- Benzene concentrations in residential areas were statistically significantly lower this quarter compared to the same quarter in past years of monitoring. The highest one hour value at Oak Park was remarkably lower than in the past.
- Emissions from oil and gas explorations and extraction in the White Point area began to affect the monitoring network in late 2007 and ended in early 2008, began again in late 2008 and have continued past the end of the first quarter of 2009.

Further analyses will be provided upon request.

[4] Email correspondence from David Turner, May 22, 2009.

APPENDIX B

Financial Report of Expenditures
Financial Report of Interest Earned

Corpus Christi Air Monitoring and Surveillance Camera Installation and Operation Project

Accounting Report for the Quarter
01/01/09 - 03/31/09

A. Total Amount of COCP Funds and Other Funds Received Under This Proposal

Total Grant Amount:	$6,761,718.02
Total Interest Earned:	**$688,847.17**
Total Funds Received:	**$7,450,565.19**

B. Summary of Expenditures Paid by COCP Funds

		Year 3 Budget	Year 4 Budget	Year 5 Adjustments	Year 6 Budget	Yrs 1-6 Adjusted Budget	Prior Activity	Current Activity 01/01/09-03/31/09	Encumbrances	Remaining Balance 3/31/2009
Salaries-Prof	12	$216,128.63	$160,652.00	286,279.40	299,633.00	$962,693.03	($725,086.63)	($71,641.39)	($94,679.18)	$71,285.83
Salaries-CEER	15	$19,606.37	$15,636.00	33,123.00	30,948.00	$99,313.37	($73,309.71)	($2,849.62)	($5,701.24)	$17,452.80
Fringe	14	$47,984.00	$38,783.00	58,333.00	72,728.00	$217,828.00	($159,265.22)	($16,281.62)	($19,946.26)	$22,334.90
Other/C-Analysis	47/68	$60,474.00	$73,500.00	(8,656.40)	73,500.00	$198,817.60	($34,610.00)	($15,600.00)	$0.00	$148,607.60
Supplies	50	$86,844.00	$33,500.00	68,676.00	122,682.00	$314,719.73	($239,123.85)	($18,660.16)	($7,190.60)	$49,745.12
	51		$20,300.00	8,000.00		$22,822.27	($15,800.00)	($457.76)	($493.30)	$6,071.21
Subcontract	62-64	$1,965,693.00	$314,022.00	296,734.00	346,289.00	$2,922,738.00	($2,565,183.33)	($70,234.58)	$0.00	$287,320.09
Travel	75	$2,300.00	$2,000.00	7,719.00	9,000.00	$23,479.00	($16,628.15)	($1,541.61)	($0.06)	$5,309.18
Equipment	80	$0.00	$0.00	0.00		$0.00	$0.00		$0.00	$0.00
Indirect Costs	90	$359,855.00	$98,759.00	112,531.00	143,217.00	$714,362.00	($538,348.30)	($29,590.01)	$0.00	$146,423.69
TOTALS		**$2,758,885.00**	**757,152.00**	**862,739.00**	**1,037,501.00**	**$5,476,773.00**	**($4,367,355.19)**	**($226,856.75)**	**($128,010.64)**	**$754,550.42**

C. Interest Earned by COCP Funds as of 03/31/09

Prior Interest Earned:	**$670,842.44**
Interest Earned This Quarter:	$18,004.73
Total Interest Earned to Date:	**$688,847.17**

D. Balance of COCP Funds as of 03/31/09

Total Grant Amount:	$6,761,718.02
Total Interest Earned:	$688,847.17
Current Q. Expenses	($226,856.75)
Total Expenditures:	($4,367,355.19)
Remaining Balance:	**$2,856,353.25**

I certify that the numbers are accurate
and reflect acutal expenditures
for the quarter

Metaxcourt

Accounting Certification