Corpus Christi Air Monitoring and Surveillance Camera Installation and Operation Project

Quarterly Report for the Period

January 1, 2011 through March 31, 2011

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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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, 2011 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 appears 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 the COCP Project monitoring sites along with TCEQ sites appears in Figure 1, below. Table 1, page 3, identifies the location and instrumentation found at each of the COCP Project sites. TCEQ sites provide additional data used in these analyses.

Figure 1. Corpus Christi Monitoring Sites

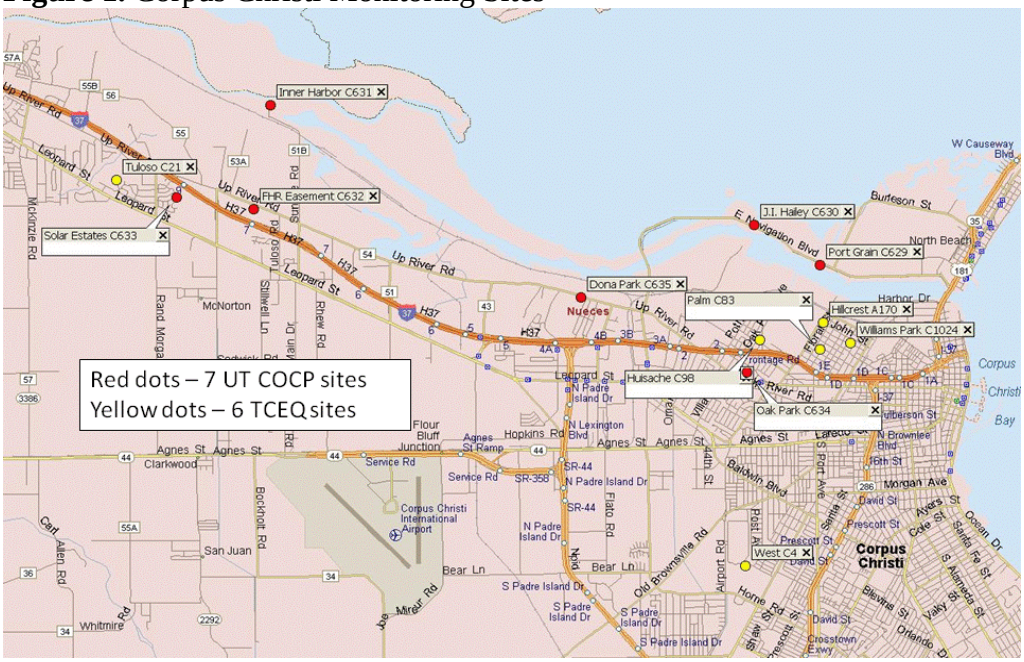

Table 1. Schedule of Air Monitoring Sites, Locations and Major Instrumentation

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 CAMS 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:

- **Cold Weather and Data Collection –** During February, a period of protracted cold weather and power interruptions led to a decision to suspend operations for a few days. Details appear in Appendix A, page 11.

- **Auto-GC Data Summary –** In examining the first quarter of 2011 hourly auto-GC data from Oak Park, Solar Estates, and TCEQ's Palm sites, no measurements were found to have exceeded a short-term air monitoring comparison value (AMCV). Also, the quarterly averages of all species were below their respective long-term AMCVs. A summary appears in Appendix A, pages 11 through 15.

- **Benzene Summary** – Average benzene concentrations have been relatively constant in recent years. The first quarter means from 2006 through 2011 are presented in Appendix A, pages 15 through 17.

- **SO_2 and H_2S** – No exceedances of the State's standards for sulfur species were measured this quarter. However, one exceedance day of the SO_2 National Ambient Air Quality Standards (NAAQS) was measured on February 24 at JIH CAMS 630. Work was done this quarter at the JIH CAMS 630 site to allow a canister to collect a sample when concentrations of SO_2 are measured above one half the levels of the NAAQS. TCEQ staff members have performed research into the relationship of ships at nearby docks during periods of elevated SO_2 at JIH. A summary appears in Appendix A, pages 18 through 20.

- **TNMHC at Dona Park** – As has been reported since the 4th quarter 2008 report in early 2009, elevated concentrations at Dona Park from emissions on the north side of Nueces Bay have been measured in recent winters. Elevated concentrations were measured more frequently this past season than in earlier seasons. Details are provided in Appendix A, pages 20 through 22.

B. Scheduled Meetings of the Volunteer Advisory Board

The Corpus Christi Project Advisory Board met on March 1, 2011. The meeting notes from that Advisory Board Meeting are found in Appendix B, pages 23 through 25.

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 updating, quarterly and annual reports.

3. **Budget Monitoring**
   Budget monitoring during the period has focused on projects costs for Phase II – Sites Operation and Maintenance costs. Financial reports for the quarter are included in Appendix C, pages 26 and 27.

4. **Other Contributions**
   Project staff was notified on February 7, 2011, that the project will receive $150,000 from the Equistar Supplemental Environmental Project funds that had been frozen until bankruptcy proceedings were completed. A proposal for use of these funds was presented to and approved by the Court on March 29, 2011.

III. Financial Report

As required, the following financial summary information is provided. Details supporting this financial summary are included in Appendix C, pages 26 and 27.

A. Total Amount of COCP Funds and Other Funds Received Under the Project
The COCP funds received through March 31, 2011 totals $7,556,424.92. This total includes estimated interest earned through March 31, 2011.

B. Detailed List of the Actual Expenditures Paid from COCP Funds
Expenditures of COCP funds during this quarter totaled $171,981.38. The detailed breakdown of the actual expenditures is included in Appendix C, page 27. 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 $7,715.26. A report providing detailed calculations of the interest earned on the COCP funds during each month of the quarter is included in Appendix C, pages 26 and 27.

D. Balance as of March 31, 2011, in the COCP Account
The balance in the COCP account, including estimated interest earned totals $1,235,329.48.

E. Expected Expenditures for the Funds Remaining in the COCP Account
The projected expenditures for the funds remaining totals $1,235,329.48

Quarterly Report Distribution List:
U.S. District Court
- Mr. Joseph Jasek, Assistant Deputy Chief USPO
- Mr. James Martinez, Supervising USPO

Texas Commission on Environmental Quality
- Ms. Sharon Blue, Litigation Division – Headquarters
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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, 2011 through March 31, 2011

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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 Monitoring and Surveillance Camera Installation and Operation Project for the period January 1 through March 31, 2011. The monitoring network is shown in Figure 1, page 2, and is described in Table 2, below. This report contains the following elements:

- An explanation for data loss during February owing to cold weather and power interruptions;
- A summary of Oak Park, Solar Estates, and Palm (TCEQ) auto-GC data for the 1st quarter of 2011;
- Information on the trends for benzene concentrations at two auto-GCs in residential areas;
- Data analysis performed by TCEQ staff on the relationship of ships at docks to SO_2 concentrations at JIH CAMS 630.
- A preliminary analysis of the higher than usual number of elevated TNMHC concentrations at Dona Park CAMS 635.

Table 2. 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 CAMS 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

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 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. In June 2010 TCEQ began operating an auto-GC at Palm CAMS 83 at 1511 Palm Drive in the Hillcrest neighborhood.

- **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** – Electro-polished 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 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 operate at the five sites that do not take continuous hydrocarbon measurements with auto-GCs (CAMS 629, 630, 631, 632, and 635).

- **Air Monitoring Comparison Values (AMCV) –** The TCEQ uses AMCVs in assessing ambient data. Two valuable online documents ("fact sheet" and "AMCV document") that explain AMCVs are at http://www.tceq.state.tx.us/implementation/tox/regmemo/AirMain.html#compare (accessed May, 2011). The following text is an excerpt from the TCEQ "fact sheet":

  > Effects Screening Levels are chemical-specific air concentrations set to protect human health and welfare. Short-term ESLs are based on data concerning acute health effects, the potential for odors to be a nuisance, and effects on vegetation, while long-term ESLs are based on data concerning chronic health and vegetation effects. Health-based ESLs are set below levels where health effects would occur whereas welfare-based ESLs (odor and vegetation) are set based on effect threshold concentrations. The ESLs are screening levels, not ambient air standards. Originally, the same long- and short-term ESLs were used for both air permitting and air monitoring.
  >
  > There are significant differences between performing health effect reviews of air permits using ESLs, and the various forms of ambient air monitoring data. The Toxicology Division is using the term "air monitoring comparison values" (AMCVs) in evaluations of air monitoring data in order to make more meaningful comparisons. "AMCVs" is a collective term and refers to all odor-, vegetative-, and health-based values used in reviewing air monitoring data. Similar to ESLs, AMCVs are chemical-specific air concentrations set to protect human health and welfare. Different terminology is appropriate because air permitting and air monitoring programs are different.

  A very specific difference between the permitting program and monitoring program is that permits are applied to one company or facility at a time, whereas monitors may collect data on emissions from several companies or facilities or other source types (e.g, motor vehicles). Thus, the protective ESL for permitting is set lower than the AMCV in anticipation that more than one source may contribute to monitored values.

- **National Ambient Air Quality Standards (NAAQS) –** U.S. Environmental Protection Agency (EPA) has established a set of standards for several air pollutions described in the Federal Clean Air Act[1]. NAAQS are defined in terms of *levels* of concentrations and particular *forms*. For example, the NAAQS for particulate matter with size at or less than 2.5 microns ($PM_{2.5}$) has a *level* of 15 micrograms per cubic meter averaged over 24-hours, and a *form* of the annual average based on four quarterly averages, averaged over three years. Individual concentrations measured above the level of the NAAQS are called *exceedances*. The number calculated from a monitoring site's data to compare to the level of the standard is called the site's *design value*, and the highest design value in the area for a year is the regional design value used to assess overall NAAQS compliance. A monitor or a region that does not comply with a NAAQS is said to be *noncompliant*. At some point after a monitor or region has been in noncompliance, the U.S. EPA may choose to label the region as *nonattainment*. A nonattainment designation triggers requirements under the Federal Clean Air Act for the development of a plan to bring the region back into compliance.

  One species measured by this project and regulated by a NAAQS is sulfur dioxide (SO_2). Effective June 2, 2010, EPA modified the SO_2 NAAQS to include a level of 0.075 ppm,

[1] See http://epa.gov/air/criteria.html accessed April 2011

or 75 ppb averaged over one hour, with a form of the three-year average of the annual 99th percentiles of the daily maximum one-hour averages. The other two existing NAAQS for SO_2 are 0.03 ppm averaged over one year and 0.14 ppm averaged over 24 hours, not to be exceeded in any one year. There is also a secondary SO_2 standard of 0.500 ppm over three hours, not to be exceeded in any one year. The reason that there has been little attention to the SO_2 NAAQS on this project until now is that the State of Texas's standard of 0.400 ppm or 400 ppb over 30 minutes for SO_2 was much more likely to be exceeded than the older NAAQS. With the addition of a new NAAQS for SO_2 in June 2010, however, the situation has changed.

- **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:

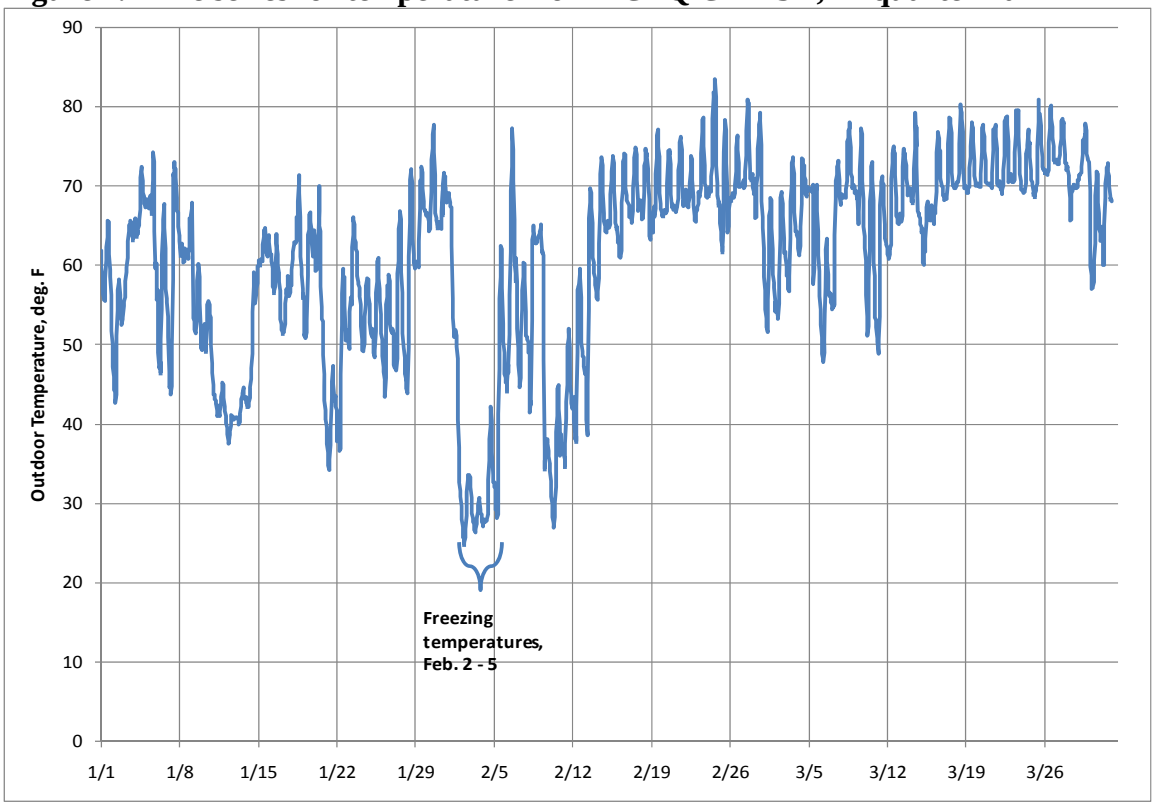
    - For H_2S, any measured concentration greater than the level of the state residential standards, which is 80 ppb over 30 minutes, is considered "elevated." For SO_2, any measured concentration greater than the level of the NAAQS, which is 75 ppb over one hour, is considered "elevated." Note that the concentrations of SO_2 and H_2S need not persist long enough to constitute an exceedance of the standard to be regarded as elevated. 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 than 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) to be considered elevated.
    - For benzene and other air toxics in canister samples or auto-GC measurements, any concentration above the AMCV is considered "elevated." Note that 20-minute canister samples and 40-minute auto-GC measurements are both compared with the short-term AMCV.
    - 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 at a given time or annual quarter 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. Cold Weather and Data Collection

During the first week in February 2011, there were a number of disruptions in power and black-outs in Texas owing to freezing air covering much of the state. Figure 2, below, shows a time series for hourly temperature readings at the TCEQ West CAMS 4 monitoring station. UT took the preventative step of shutting down all seven sites from February 2 through February 8. This represents a data loss of five out of 90 days in the quarter, or about 6 percent. Nevertheless, data return at COCP sites was still over 90 percent for the quarter at all sites but one. JIH CAMS 630 had 86 percent data completion owing to three factors: it was the last site restarted on February 8; it underwent minor maintenance on March 1 to March 3; it underwent system changes March 21 and 22 so that canisters may be triggered by SO_2 concentrations above a trigger level. The March 1 to March 3 maintenance at JIH CAMS 630 was for a lower than expected flow rate, which was still within specifications, and which did not have any effect on data quality.

Figure 2. Time series for temperature from TCEQ CAMS 4, 1st quarter 2011



2. Auto-GC Data Summaries in Residential Areas

In this section the results of semi-continuous sampling for hydrocarbons at the three Corpus Christi auto-GC sites – Solar Estates C633, Oak Park C634, and TCEQ's Palm C83 – are presented. These three sites are located in residential areas. Solar Estates and Oak Park are generally downwind of industrial emissions under northerly winds. Palm, located between the

TCEQ's Hillcrest and Williams Park sites in Figure 1, page 2, is generally downwind under northerly and westerly winds. In examining aggregated data one observes similar patterns of hydrocarbons at all three sites. Palm has operated for ten months, so one can begin to draw conclusions from comparisons to the other two sites' data, and at this point its concentration statistics are similar to those at Oak Park and Solar Estates.

Table 3, page 13, summarizes data from the first quarter of 2011. Data in this table are available to TCEQ staff at http://rhone.tceq.state.tx.us/cgi-bin/agc_summary.pl (accessed April 2011). The data summarized in Table 3 have not completed the standard data validation process. Generally, very few changes occur during the standard validation process. The summary of the validated 2010 data appears in Table 4, on page 14. There have been some changes in the highest one-hour and highest 24-hour values that had been reported earlier using non-validated data. Specifically, an erroneous t-2-butene pre-validation 1-hour maximum concentration measurement of 110 ppbV on 8/28/2010 hour 16:00 CST was related to the change-out of a hydrogen gas cylinder that caused a shift in the auto-GC baseline. The meta- and para-xylene lower 1-hour maximum concentration after validation was also the result of hydrogen gas cylinder changed on October 7, 2010 hour 18:00. The 1,2,4-trimethylbenzene (TMB) lower 1-hour maximum concentration after validation was a result of a compressor failure that affected data from 8/16/2010 21:00 to 8/17/2010 19:00 CST. Isopentane and n-pentane showed higher 1-hour maximum concentrations after validation as a result of over-range measurements for these species on September 15, 2010 hour 15:00 CST. An over-ranged value is automatically flagged until marked valid by a validator thus not showing any concentration until after validation. In most if not all cases in which a 1-hour maximum changed, the corresponding pre-validation 24-hour maximum had been recorded the same day and its value was changed also.

Tables 3 and 4 show the average (arithmetic mean of measured values), the maximum one-hour value, and the maximum 24-hour average concentrations for 27 hydrocarbon species for the period of interest. All concentration values in the tables are in ppbV units. No concentrations or averages of concentrations from the 27 species were greater than the TCEQ's air monitoring comparison values (AMCV) during 2010 or 2011 to date. Note that values in the 1st quarter are generally higher than in the 2nd or 3rd quarter, which owes in large part to the higher frequency of northerly winds in the winter. The mean data columns in Table 3 for the 1st quarter data are shown graphically in Figure 3, page 15.

The rows for ***benzene*** are bold-faced in Tables 3 and 4 owing to the concern that the concentrations for this species tend to be closer to the AMCV than are concentrations of other species. The benzene short-term AMCV is 180 ppbV and the benzene long-term AMCV is 1.4 ppbV.

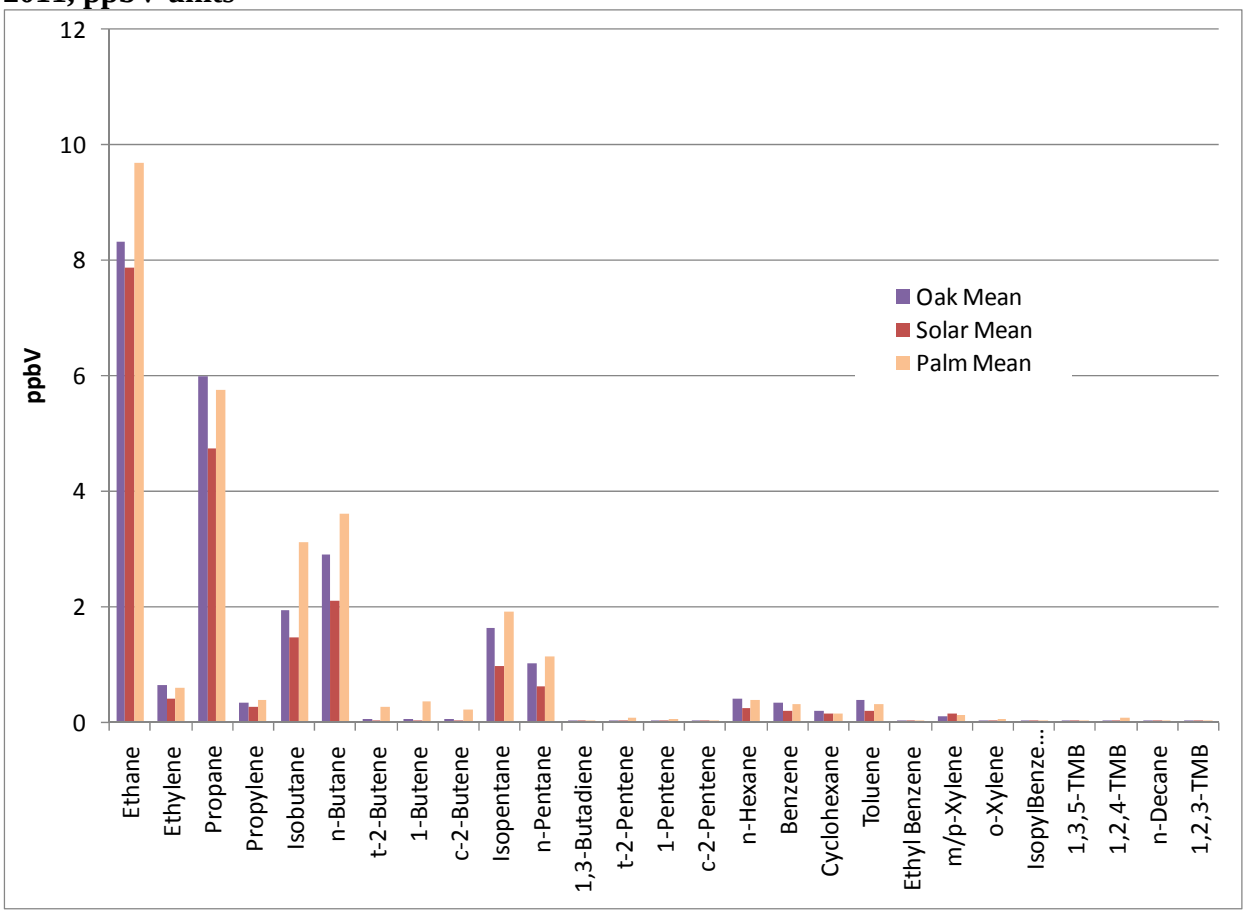
Table 3. Auto-GC statistics 1st quarter 2011

Units ppbV	Oak 1Q11			Solar 1Q11			Palm 1Q11		
Species	**Peak 1hr**	**Peak 24hr**	**Mean**	**Peak 1hr**	**Peak 24hr**	**Mean**	**Peak 1hr**	**Peak 24hr**	**Mean**
Ethane	288.06	39.896	8.33	80.197	24.673	7.878	263.21	31.603	9.695
Ethylene	57.113	4.915	0.643	4.606	1.908	0.403	15.561	2.743	0.590
Propane	497.94	55.879	5.985	63.706	13.05	4.744	196.14	21.115	5.761
Propylene	42.04	2.815	0.348	46.77	2.182	0.270	28.397	3.987	0.374
Isobutane	208.26	22.339	1.949	22.731	4.417	1.464	162.38	32.623	3.109
n-Butane	243.29	27.062	2.908	37.556	8.255	2.111	88.878	15.548	3.605
t-2-Butene	3.579	0.388	0.053	0.879	0.190	0.030	49.790	3.155	0.267
1-Butene	3.968	0.436	0.055	2.002	0.227	0.034	46.208	5.455	0.363
c-2-Butene	2.657	0.326	0.061	0.655	0.155	0.020	34.625	3.869	0.217
Isopentane	95.047	11.223	1.632	39.163	3.249	0.977	84.189	9.408	1.923
n-Pentane	71.844	8.589	1.032	29.69	1.855	0.625	74.715	6.856	1.148
1,3-Butadiene	3.244	0.177	0.032	5.149	0.281	0.020	2.267	0.409	0.035
t-2-Pentene	2.004	0.150	0.031	0.615	0.063	0.008	5.888	0.493	0.075
1-Pentene	0.765	0.091	0.018	0.229	0.046	0.005	5.569	0.411	0.05
c-2-Pentene	0.988	0.073	0.015	0.255	0.036	0.003	7.621	0.482	0.043
n-Hexane	34.245	2.857	0.416	4.14	0.774	0.251	31.181	2.914	0.386
Benzene	**10.338**	**1.541**	**0.345**	**10.084**	**0.616**	**0.193**	**10.41**	**1.519**	**0.311**
Cyclohexane	10.159	1.310	0.187	6.506	0.535	0.143	8.488	0.891	0.153
Toluene	11.567	1.741	0.374	4.853	0.638	0.208	5.773	1.075	0.316
Ethyl Benzene	0.656	0.117	0.028	0.696	0.114	0.024	2.876	0.172	0.029
m/p-Xylene	2.531	0.372	0.098	7.431	1.268	0.148	4.385	0.496	0.132
o-Xylene	1.123	0.120	0.029	0.707	0.128	0.03	5.100	0.400	0.045
IsopylBenzeneCumene	1.660	0.326	0.026	0.718	0.130	0.009	3.998	0.232	0.011
1,3,5-TMB	0.297	0.050	0.009	0.445	0.085	0.011	2.47	0.147	0.018
1,2,4-TMB	0.807	0.115	0.029	1.453	0.348	0.029	3.821	0.253	0.072
n-Decane	0.924	0.123	0.023	0.671	0.194	0.025	2.656	0.160	0.021
1,2,3-TMB	0.323	0.048	0.007	0.340	0.100	0.010	2.382	0.140	0.019

Table 4. Validated Auto-GC statistics 2010

Units ppbV	Oak 2010			Solar 2010			Palm Jun.-Dec. 2010		
Species	**Peak 1hr**	**Peak 24hr**	**Mean**	**Peak 1hr**	**Peak 24hr**	**Mean**	**Peak 1hr**	**Peak 24hr**	**Mean**
Ethane	265.73	35.315	6.32	143.36	25.04	6.69	322.65	45.23	7.79
Ethylene	66.802	6.593	0.66	199.89	11.27	0.43	47.935	4.256	0.58
Propane	436.6	37.899	4.47	115.1	18.13	4.24	233.2	28.97	4.05
Propylene	38.444	3.393	0.34	70.306	4.895	0.26	29.71	8.901	0.31
Isobutane	176.28	14.635	1.51	49.405	7.307	1.43	89.82	14.04	2.19
n-Butane	410.92	25.77	2.41	47.877	8.81	1.97	82.277	22.99	2.53
t-2-Butene	4.883	0.465	0.06	2.434	0.294	0.04	6.742	1.342	0.14
1-Butene	9.423	0.577	0.06	3.788	0.398	0.04	6.905	1.29	0.13
c-2-Butene	6.407	0.374	0.06	1.905	0.225	0.03	4.757	1.146	0.09
Isopentane	402.74	25.318	1.72	37.351	5.873	1.06	68.068	15.22	1.76
n-Pentane	435.96	27.3	1.11	26.699	3.812	0.67	31.638	6.192	0.91
1,3-Butadiene	15.609	0.858	0.04	9.181	0.558	0.03	0.909	0.087	0.02
t-2-Pentene	2.893	0.346	0.05	0.99	0.137	0.02	2.852	0.738	0.09
1-Pentene	1.387	0.16	0.03	0.519	0.07	0.02	7.086	0.811	0.05
c-2-Pentene	0.905	0.147	0.02	0.477	0.07	0.01	1.513	0.393	0.05
n-Hexane	196.29	13.119	0.42	10.073	1.456	0.26	10.741	1.72	0.32
Benzene	**38.847**	**3.492**	**0.35**	**9.774**	**0.915**	**0.21**	**15.194**	**1.763**	**0.29**
Cyclohexane	87.371	6.107	0.18	19.252	1.09	0.16	5.17	0.699	0.12
Toluene	62.623	4.267	0.49	9.314	1.083	0.24	8.56	1.567	0.37
Ethyl Benzene	2.56	0.276	0.03	1.44	0.188	0.03	3.322	0.3	0.04
m/p-Xylene	13.218	1.095	0.13	8.527	1.337	0.17	11.947	1.054	0.14
o-Xylene	3.139	0.293	0.04	1.535	0.223	0.04	3.39	0.32	0.05
IsopylBenzeneCumene	2.062	0.43	0.02	2.831	0.27	0.02	0.75	0.132	0.01
1,3,5-TMB	0.984	0.126	0.02	2.318	0.337	0.02	0.619	0.096	0.02
1,2,4-TMB	1.6	0.308	0.04	6.43	0.443	0.04	1.453	0.23	0.06
n-Decane	2.425	0.266	0.03	4.497	0.686	0.04	0.913	0.117	0.03
1,2,3-TMB	0.879	0.088	0.01	0.752	0.146	0.02	0.606	0.104	0.03

Figure 3. Mean concentrations for 27 hydrocarbon species at three auto-GCs, 1st quarter 2011, ppbV units



3. Benzene Concentrations in Residential Areas

As has been discussed in past reports, benzene concentrations have been declining at the two auto-GCs operated at Oak Park CAMS 634 and Solar Estates CAMS 633. No benzene values have been measured above the AMCV. A time series with some points annotated by date appears in Figure 4 for Oak Park and Figure 5 for Solar Estates, on page 16. Note the different y-axis scales for the two sites, as Oak Park does tend to see higher concentrations than Solar Estates. The highest values measured at each site are noted in Figures 4 and 5. The second highest benzene value to date at Solar Estates was measured on February 22 at 8 a.m. CST. Winds were from the east during that observation, and no emission upset events were reported on that day. Figure 6, on page 16, shows the surface back-trajectory from 8:30 CST on 2/22/2011 from Solar Estates. Note that the data from the first quarter 2011 have not been validated yet.

Figure 4. Oak Park hourly benzene 2005 – 2011, ppbV units, individual elevated values noted, no observations greater than the TCEQ's AMCV

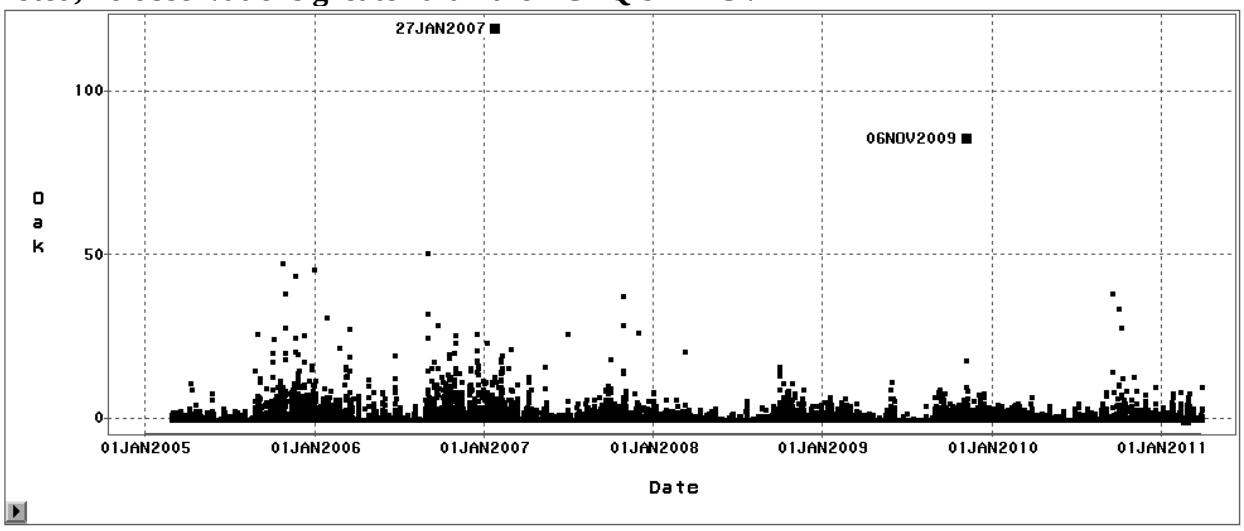


Figure 5. Solar Estates hourly benzene 2005 – 2011, ppbV units, no observations greater than the TCEQ's AMCV

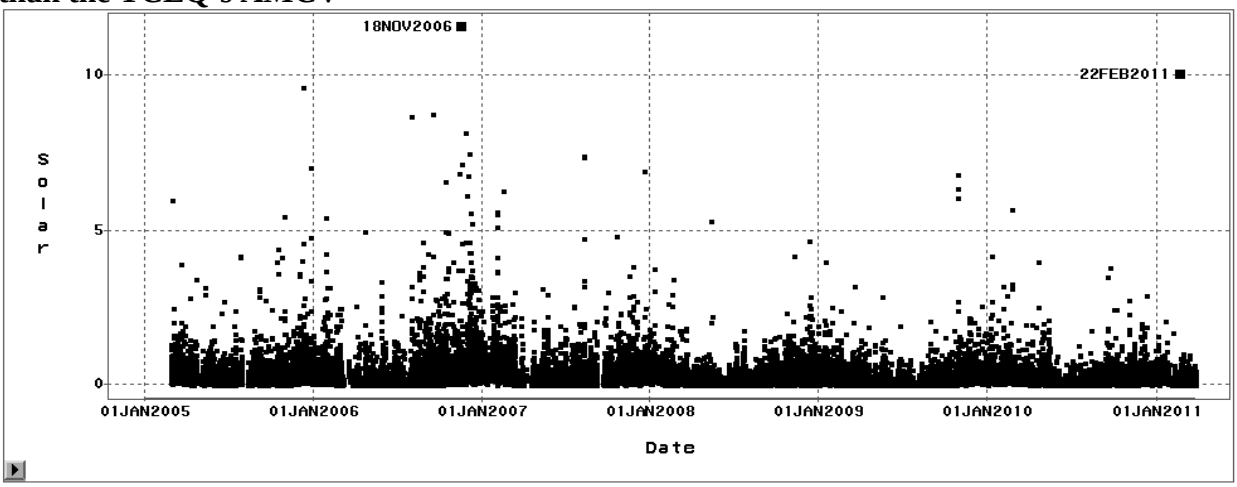


Figure 6. Surface back-trajectory from Solar Estates CAMS 633 February 22, 2011, 8:30 CST

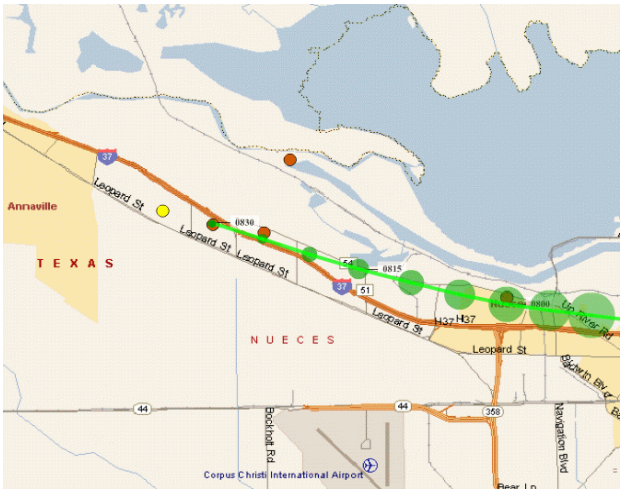
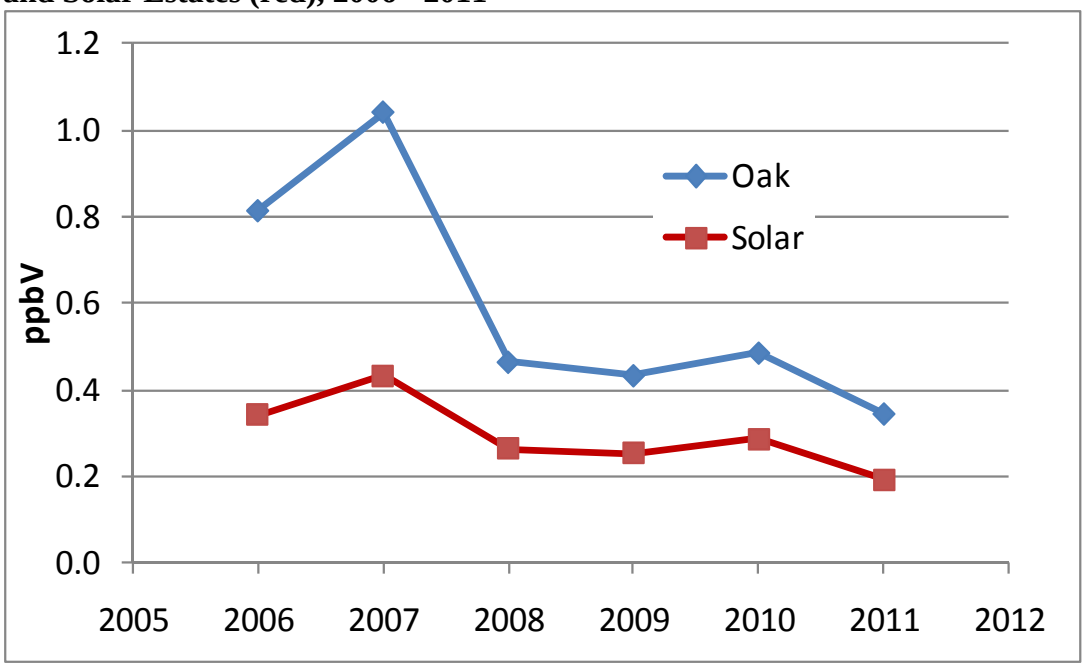


Table 5, below, shows the 1st quarter summary statistics from the auto-GCs for benzene from 2006 – 2011[2]. The annual means are shown graphically in Figure 7, below. Annual average benzene concentrations have been relatively constant in recent years. The annual means from 2008 through 2011 are statistically significantly lower than in the preceding two years.

Table 5. Summary Statistics for Benzene at Oak Park and Solar Estates, 2006 – 2010, ppbV units

Oak	Year	Num. Obs.	Peak 1-hr	Peak 24-hr	Mean
	2006	1,795	46.032	6.921	0.813
	2007	1,954	120.158	8.950	1.040
	2008	1,878	20.932	1.861	0.464
	2009	1,950	7.128	1.687	0.433
	2010	1,888	7.021	1.597	0.485
	2011	1,851	10.338	1.541	0.345
Solar	Year	Num. Obs.	Peak 1-hr	Peak 24-hr	Mean
	2006	1,534	5.426	1.066	0.342
	2007	1,847	6.290	1.799	0.432
	2008	1,937	3.798	0.655	0.264
	2009	1,912	4.019	0.653	0.253
	2010	1,923	5.701	0.915	0.287
	2011	1,780	10.084	0.616	0.193

Figure 7. Mean concentrations of benzene during 1st quarters by year at Oak Park (blue) and Solar Estates (red), 2006 - 2011



[2] Data collection began in March 2005, so that year's first quarter data are not considered.

5. JIH CAMS 630 SO_2 Concentrations and Ships

One SO_2 NAAQS exceedance day occurred on February 24 at JIH CAMS 630. On that day, four consecutive hours were measured above the 75 ppb level of the NAAQS, peaking at 149 ppb during the hour starting at 11 a.m. CST. TCEQ staff noted the nearby presence of an idling freight train, heavy-duty construction equipment doing road work, and a large ship docked in the ship channel. All three sources may have contributed to this event.

On January 18, 2011 the TCEQ Regional Office asked the Port of Corpus Christi (POCC) for records of ship arrivals and departures from docks near the JIH CAMS 630 site corresponding to a list of 41 dates on which JIH SO_2 concentrations were significantly higher than the JIH annual mean value. The POCC responded on February 2 with a data file containing tables of the ship name, dock name, arrival and departure date/times for 32 of the 41 dates. The docks for which ship data were provided are shown in Table 6, below, and mapped in Figure 8, on page 19. An example for the data table for one date appears in Table 7, below.

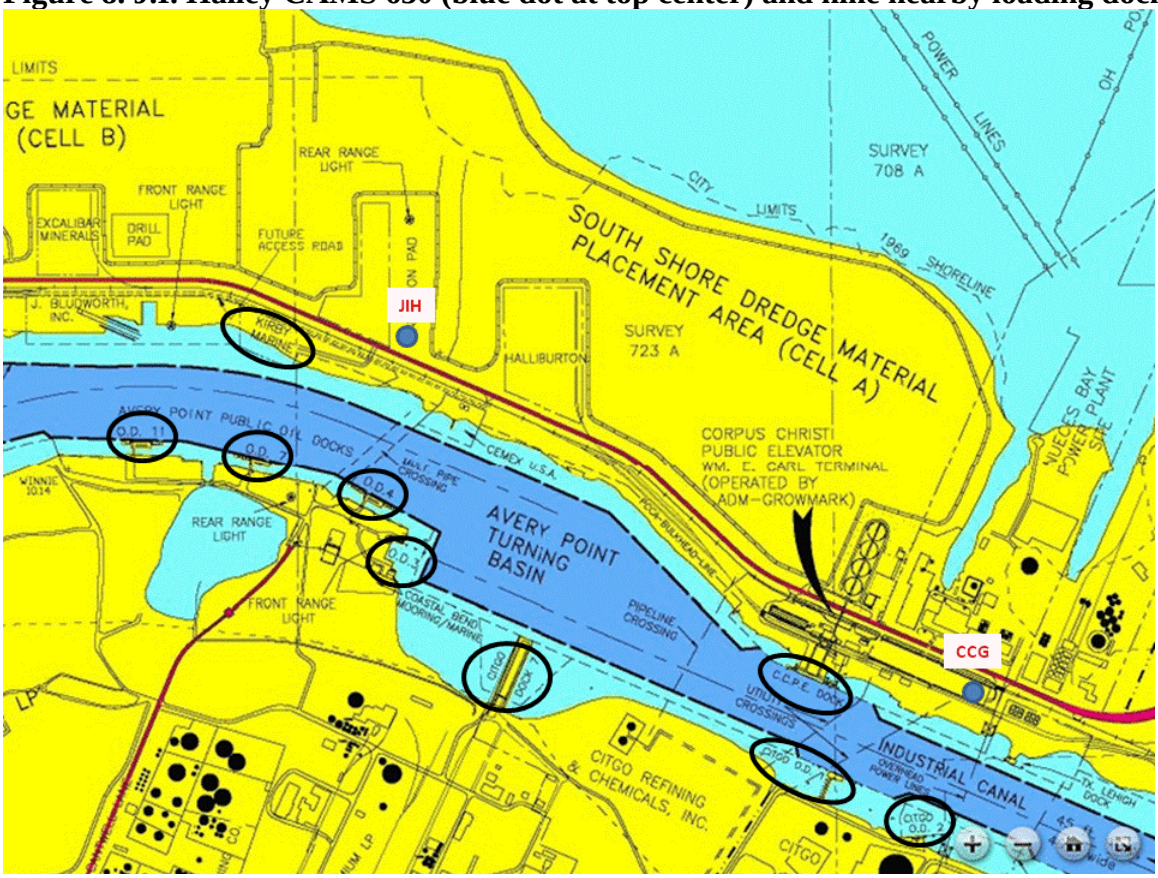
Table 6. Six docks closest to JIH CAMS 630 with angle of direction range from JIH to dock

Owner	Dock	Angle from JIH
Kirby Marine	Terminal	261 – 275°
POCC	Oil dock 11	245 – 259°
POCC	Oil dock 7	215 – 246°
POCC	Oil dock 4	170 – 209°
POCC	Oil dock 3	172 – 185°
Citgo	Dock 7	153 – 169°

Table 7. Example of one of 31 dates with ship records provided by POCC to TCEQ

Dock	Date Arrived	Date Departed	Vessel Name	Function	Product
2400 hours 7-31 2009 to 2400 hours 8-1-2009					
Kirby Terminal	8-1 0025	8-1 0525	Kirby 22300	standby	no product
	8-1 1500	8-2 0845	Kirby 9800	standby	no product
Oil dock 11	8-1 1500	8-3 1110	B 215	load	Asphalt
Oil dock 7	8-1 0825	8-3 0825	VALBRUNA	unload	Crude
	8-1 1400	8-1 1950	MOC 10	unload	Bunkers
Oil dock 4	7-31 2235	8-2 0535	CHEMTRANS STAR	unload	Gas Oil
Oil dock 3	8-1 0310	8-2 2315	WEB 321	load	gasoline
	8-1 0310	8-2 0320	WEB 320	load	gasoline
Citgo 7 east	8-1 0100	8-1 0810	Kirby 29700	load	cokerfeed
	8-1 1745	8-2 0550	Kirby 29700	load	cokerfeed

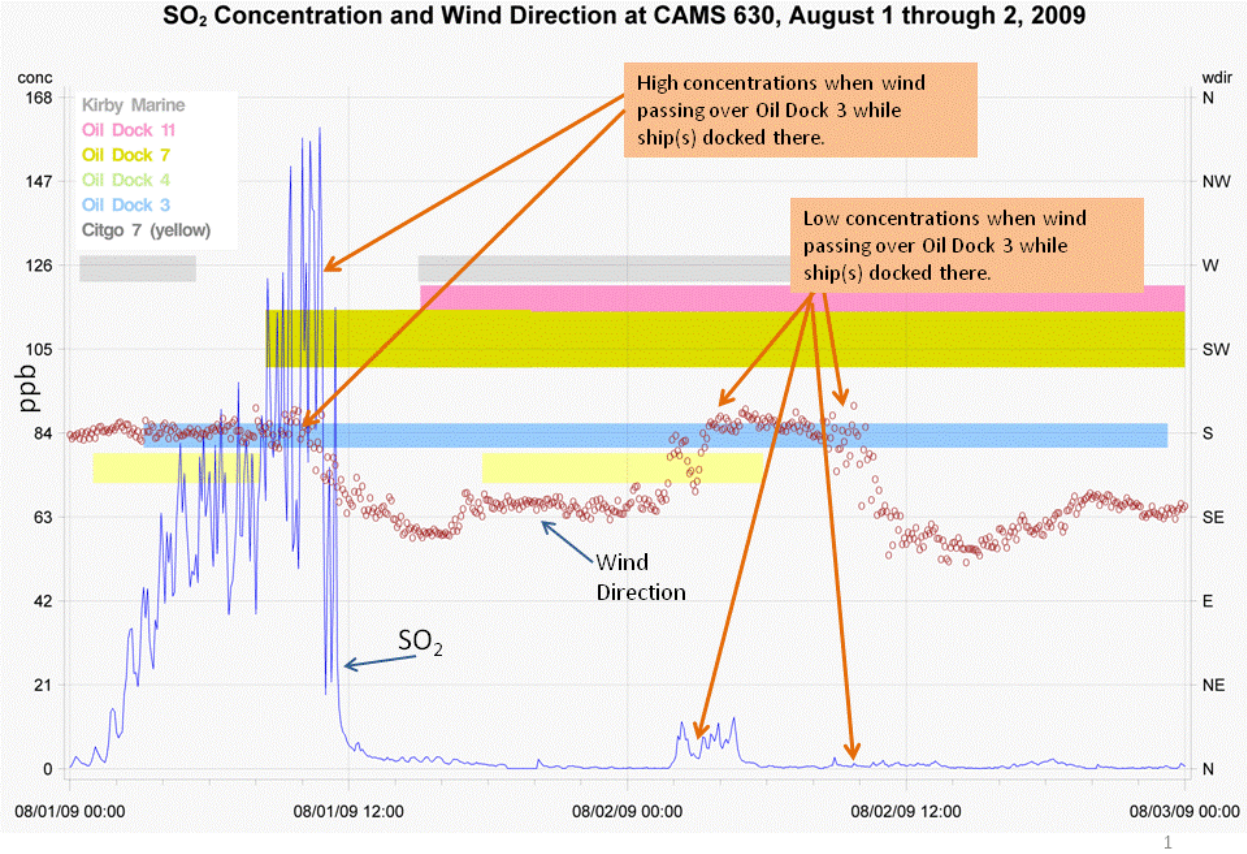
Figure 8. J.I. Hailey CAMS 630 (blue dot at top center) and nine nearby loading docks.



TCEQ staff researcher John Jolly conducted case studies on four dates, three in 2010 and one in 2009. He found time periods with SO_2 concentrations significantly higher than mean daily maximum concentrations and high enough in many cases to cause NAAQS exceedances at times when docked ships were upwind of JIH CAMS 630. He also found that when concentrations changed rapidly from one five-minute value to the next, there were generally coinciding small changes in wind direction.

However, Jolly observed that there are instances of high concentrations also seen at times when no docked ships were listed as having been upwind of the JIH site. Also, there are many instances of ships being docked upwind, but no elevated concentrations detected. An example of the type of depiction in Jolly's work appears in Figure 9, on page 20. Figure 9 is based on the geometry shown in Figure 8 and the timetable shown in Table 7, on page 18. Note that the colored horizontal bars in Figure 9 have heights that are based on the angles in Table 6, on page 18, the thickness of each bar is the range between the pairs of angles in that table. The length of each bar corresponds to the arrival and departure time of a ship at that dock from Table 7. Figure 9, shows that SO_2 concentrations rose around the time a ship docked at Oil Dock 3, which was steadily upwind for several hours, and SO_2 concentrations dropped when the winds shifted. Later, even though the winds again passed over Oil Dock 3 and Citgo 7 with docked ships, concentrations only raised a fraction of the earlier magnitude.

Figure 9. Image developed by John Jolly at TCEQ showing relationships among ship location and duration at dock, SO_2 concentrations and wind direction at 5-minute time resolution.



6. Dona Park TNMHC

As has been reported since the 4th quarter 2008 report in early 2009, elevated concentrations at Dona Park CAMS 635 from emissions on north side of Nueces Bay have been measured in recent winters. TCEQ Regional staff members attribute this to natural gas extraction activities on the White Point peninsula and other locations nearby, and data from the Texas Railroad Commission confirms the presence of many wells in that area. Elevated concentrations were measured more frequently this past winter season than in earlier seasons. Figure 10, on page 21, shows the time series for TNMHC hourly concentrations at Dona Park CAMS 635 for coincident hourly average wind direction between 340 and 360 (0) degrees, or the general north/northwest direction. Figure 11, on page 21, shows the time series for methane hourly concentrations under the same filtering. Methane is the largest component of natural gas. As has been shown in earlier reports, the prevailing wind direction in the Corpus Christi area is south/southeast, and southerly winds represent the overall majority of wind directions, but northerly winds comprise a larger fraction of winds each year in the month of October through March.

Figure 10. Hourly Dona Park CAMS 655 TNMHC with north/northwest wind direction (340 – 360 degrees)

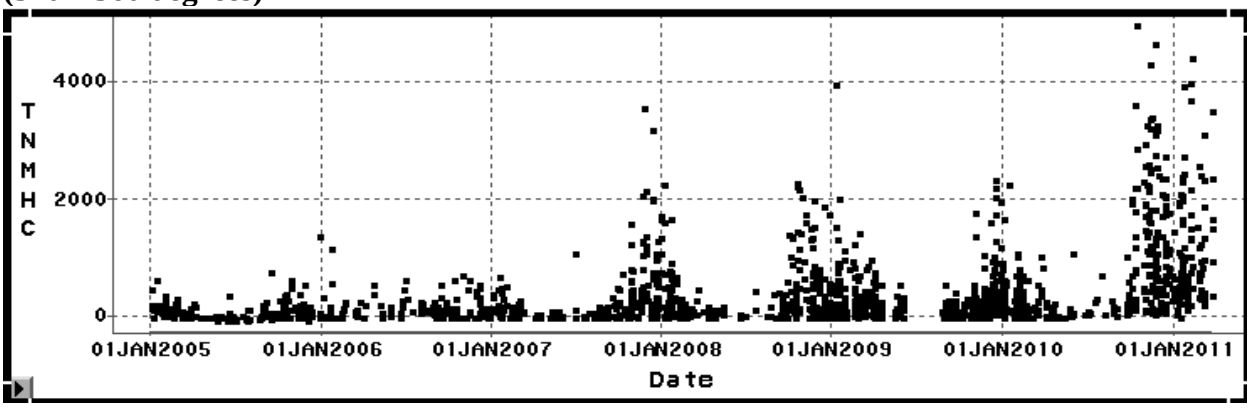
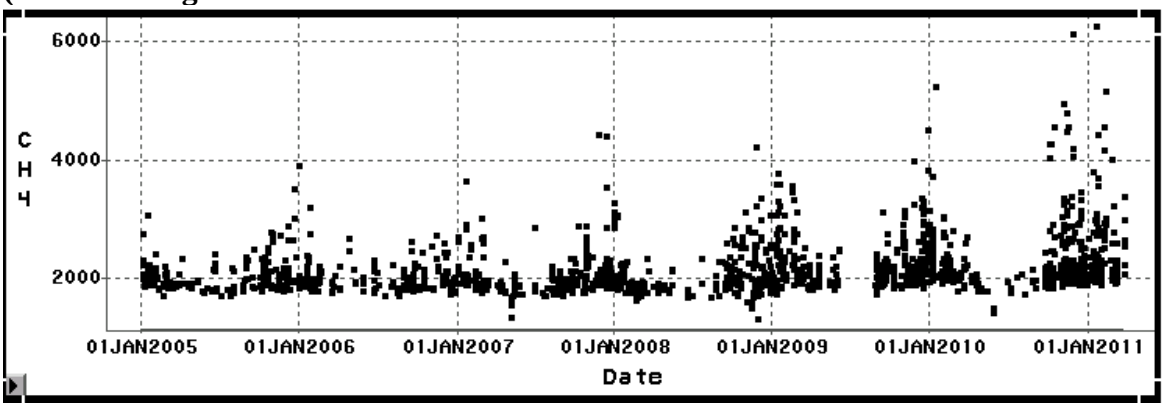


Figure 11. Hourly Dona Park CAMS 655 methane with north/northwest wind direction (340 – 360 degrees



To test the hypothesis that there were unusual weather conditions that could explain the higher TNMHC concentrations in the most recent winter, the wind speed, direction, and temperatures for the "winter" periods (November, December, January, February) from 2005 through 2011 were examined. In this analysis, "winter _05_06" is defined as the months November 2005, December 2005, January 2006 and February 2006, with other "winters" defined similarly. The summary data for each "winter" season are in Table 8, on page 22. The most recent winter does not appear to be unusual in terms of frequency of north/northwest (NNW) winds, the mean wind speed for those winds, or the hourly mean temperature. No statistical significance tests have been applied at this point.

Several canister samples were triggered over the 2010 – 2011 "winter" season. An examination of the data showed very little variation in terms of the relative mix of the species measured: primarily ethane, propane, butane isomers, pentane isomers, and hexane. As a result, UT will be more selective in analyzing canister samples from Dona Park taken under conditions with coincident methane concentration above 3,000 ppbC and back-trajectories that go back to the White Point area.

Table 8. Statistical summary of "winter" weather and NNW winds at Dona Park CAMS 635

winter	Number of NNW wind hours	Percent all winds from NNW	Mean NNW wind speed (mph)	Mean outdoor temperature
_05_06	219	8.2%	6.39	53.37
_06_07	192	7.2%	6.94	47.52
_07_08	199	7.4%	6.57	56.36
_08_09	241	9.1%	6.20	50.09
_09_10	270	10.3%	6.34	46.55
_10_11	246	9.4%	6.68	50.21

A brief look at the Texas Railroad Commission Website shows that natural gas and condensate production in San Patricio County was lower in the 2010 – 2011 "winter" than in earlier years. A closer look at the activity in the fields on White Point may yield additional information, but have not been examined at this point.

Conclusions from the First Quarter 2011 Data

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

- First quarter benzene concentrations at the auto-GCs and all other auto-GC species of interest remain well below the TCEQ's AMCVs. This quarter had the lowest first quarter means for benzene at both auto-GCs since monitoring began.
- Under the new NAAQS for SO_2, the JIH C630 site remains noncompliant but is not a regulatory site. The current hypothesis is that ship emissions play a significant role in elevated SO_2 concentrations at this site. TCEQ staff members are conducting active research and have been able to relate SO_2 concentrations to nearby ships.
- TNMHC and methane concentrations associated with natural gas extraction activity on the north side of Nueces Bay increased in the winter of 2010 – 2011.
- Periodic air pollution events continue to be measured on a routine basis, but values of species above the AMCV levels were not observed this quarter.

Further analyses will be provided upon request.

APPENDIX B

March 1, 2011
Advisory Board Meeting Notes

ADVISORY BOARD MEETING

Corpus Christi Air Monitoring and Surveillance Camera Installation and Operation Project

Texas A&M University - Corpus Christi

Room 1009, NRC Building

11:30 pm – 1:30 pm

March 1, 2011

Advisory Board Members Present:

Ms. Gretchen Arnold	Corpus Christi Pollution Prevention Partnership TAMUCC
Ms. Joyce Jarmon	Corpus Christi Community Council
Dr. Glen Kost	Public Health Awareness
Ms. Pat Suter	Coastal Bend Sierra Club

Ex-Officio Members of the Board

Ms. Rosario Torres	TCEQ – Region 14
Ms. Susan Clewis	TCEQ – Region 14
Mr. David Kennebeck	TCEQ – Region 14

Project Personnel Present:

Dr. David Allen	The University of Texas at Austin
Mr. Vince Torres	The University of Texas at Austin
Dr. Dave Sullivan	The University of Texas at Austin
Ms. Terri Mulvey	The University of Texas at Austin

I. Call to Order and Welcome

Mr. Vince Torres called the meeting to order at 11:35 pm.

II. Discussion of Development of Plan for Continued Operation of Monitoring Network

Mr. Torres gave the Advisory Board a summary of the projected funding available at the end of year 8. He reported the following:

- Neighborhood Air Toxics - $2,330,889
- Sherwin Alumina SEP _ $10,800
- Equistar SEP (Estimated) - $150,00
- Free Balance in the CCAM & SC Project Funds (Estimated) $141,413
- Total (Estimated) - $2,705,354
- Stage 2 Settlement Funds - $5,057,120*

  *Disposition still uncertain

He went on to explain the 3 year budgetary estimates for major equipment expenses. They include:

- Miscellaneous expenses through the end of the current year will be $20,000.
- Waiting for detailed equipment replacement costs for the auto-GC systems.
- For other monitors, replacement of equipment (plus spares) and installation: hydrogen sulfide (7), sulfur dioxide (7), total non-methane hydrocarbon (8) analyzers, and multi-gas calibrators (10) will cost $400,000.

Mr. Torres also explained the budgetary estimates for selected expenses include:

Item	Equipment & Installation	Annual Operating Cost
1) Network Operations & Maintenance (As is)		$1,200,000
2) NOx Analyzer (each*)	$25,000	$12,000
3) PM (Continuous)	$35,000	$12,000
4) PM (Non continuous)	$16,000	$24,000
5) Relocate a site	Up to $60,000	

*For this equipment, it is recommended that a spare unit also be purchased.

III. Preplanning for the Annual report to the Honorable Judge Jack

The following plan was recommended by UT Austin for continuation of the network and presentation to The Honorable Judge Jack at the Annual Presentation on March 29, 2011.

- Largely preserve the existing network.
- Add NOx monitors to the Oak Park and Dona Park sites.
- Move the Flint Hills Reserve site to a location north of the ship channel.
    1. Plan A. - West of Valerjo West on Port of Corpus Christi property.
    2. Plan B. - South of Dona Park.
- Add measurements for PM2.5 and PM 10 to the network as needed.
- Continue to examine the effectiveness of the network.

Ms. Pat Suter made a motion to approve the plan as recommended by UT. Dr. Glen Kost seconded the motion. The motion was unanimously approved by all Advisory Board Members present.

IV. Adjourn

The meeting was adjourned at 1:45 pm.

APPENDIX C

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
01/01/2011 - 03/31/2011

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

Total Grant Amount:	$6,761,718.02
Total Interest Earned:	$794,706.90
Total Funds Received:	$7,556,424.92

B. Summary of Expenditures Paid by COCP Funds

		Year 3 Budget	Year 4 Budget	Year 5 Budget	Year 6 Budget	Year 7 Budget	Yrs 1-7 Adjusted Budget	Prior Activity	Current Activity 01/01/11 - 03/31/11	Encumbrances	Remaining Balance 3/31/2011
Salaries-Prof	12	$216,128.63	$160,652.00	$286,279.40	$299,833.00	$318,499.03	$1,282,386.03	($1,142,488.52)	($20,877.57)	($5,747.26)	$33,272.68
Salaries-CEER	15	$19,566.37	$15,036.00	$33,123.00	$30,846.00	$29,880.03	$144,193.37	($135,000.62)	($6,106.69)	($5,000.36)	-$3,916.30
Fringe	14	$47,984.00	$38,783.00	$56,333.00	$72,728.00	$76,643.03	$290,643.03	($258,377.06)	($6,885.02)	($3,198.92)	$22,201.10
Communication	42	$0.00	$0.00	$0.00	$0.00	$0.00	$1,400.00	($1,080.00)	($135.00)	$0.00	$185.00
Other/D-Analysis	47/69	$60,474.00	$73,500.00	-$6,656.40	$73,500.00	$14,219.00	$122,849.60	($102,710.00)	($15,405.00)	$0.00	$4,771.60
Supplies	60	$66,844.00	$33,903.00	$66,676.00	$122,682.00	$72,797.32	$512,268.05	($459,352.13)	($29,982.81)	($32,961.14)	-$3,076.03
	61	$0.00	$20,303.00	$6,900.00	$0.00	$7,070.00	$25,640.27	($16,640.00)	$0.00	$0.00	$9,000.27
Subcontract	62-65	$1,866,693.00	$314,022.00	$295,734.00	$345,285.00	$501,523.00	$3,550,053.00	($3,241,885.12)	($66,513.09)	$0.00	$241,653.99
Program Income	66	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	($41,460.00)	-$41,460.00
Travel	75	$2,300.00	$2,000.00	$7,718.00	$9,000.00	$6,712.00	$30,191.00	($26,626.06)	($1,918.25)	($0.10)	$1,444.57
Equipment	80	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Indirect Costs	90	$356,855.00	$88,799.00	$112,531.00	$143,217.00	$167,601.70	$881,903.70	($770,751.63)	($22,452.35)	$0.00	$88,779.72
TOTALS		$2,788,885.00	$757,102.00	$862,739.00	$1,097,997.00	$1,284,945.02	$6,761,718.02	($6,149,114.06)	($171,991.36)	($97,767.78)	$352,854.82

C. Interest Earned by COCP Funds as of 03/31/11

Prior Interest Earned:	$786,991.64
Interest Earned This Quarter:	$7,715.26
Total Interest Earned to Date:	$794,706.90

D. Balance of COCP Funds as of 03/31/11

Total Grant Amount:	$6,761,718.02
Total Interest Earned:	$794,706.90
Current Q. Expenses	($171,991.36)
Total Expenditures:	($6,149,114.06)
Remaining Balance:	$1,235,329.48

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

Accounting Certification