# Neighborhood Air Toxics Modeling Project For Houston and Corpus Christi – Stage 1

## **Quarterly Report for the Period**

## January 1, 2009 through March 31, 2009

Submitted to

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

Submitted by

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## I. Introduction

On February 1, 2008, the Court entered an Order (D.E. 981, Order (pp.1, 7-11)) regarding unclaimed settlement funds in Lease Oil Antitrust Litigation (No.11) Docket No. MDL No.1206. The Court requested a detailed project proposal from Dr. David Allen, the Gertz Regents Professor in Chemical Engineering and the Director of the Center for Energy and Environmental Resources at The University of Texas at Austin (UT Austin), regarding the use of \$9,643,134.80 in the Settlement Fund. The proposal was for a project titled "Neighborhood Air Toxics Modeling Project for Houston and Corpus Christi" (hereinafter "Air Toxics Project"). The Air Toxics Project was proposed in two stages. In Stage 1, UT Austin will develop, apply, demonstrate and make publicly available, neighborhood-scale air quality modeling tools for toxic air pollutants in the Corpus Christi, Texas and will extend the operation of the air quality monitoring network in Corpus Christi, Texas. In Stage 2, subject to the availability of funds, UT Austin will extend the modeling to the Houston, Texas ship channel region, develop a mobile monitoring station that can be deployed in Corpus Christi and in other regions of Texas and/or further extend the operating life of the existing stationary network in the same or modified spatial configuration. If a mobile monitoring station is deployed, it will be used to map the spatial distributions of air pollutant concentrations and to inform the public. All ambient monitoring results will be used in synergy with the neighborhood-scale models to improve the understanding of emissions and the spatial distribution of air toxics in the region.

On February 21, 2008, 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 \$4,586,014.92, plus accrued interest, to UT Austin for the purposes of implementing Stage 1 of the Air Toxics Project as described in the detailed proposal submitted to the Court by UT Austin on February 15, 2008 (D.E. 998).

Under the Order to Distribute Funds in MDL No. 1206, on March 3, 2008, at the direction of the Settlement Administrator, \$4,602,598.66 was disbursed to UT Austin for Stage 1 of the Project. This amount includes the interest accrued prior to distribution from the MDL No. 1206 Settlement Fund. Stage 2 funding has not been awarded by the US District Court.

This Stage 1 quarterly report has been prepared pursuant to the requirements of the Air Toxics Project and is being submitted to the US District Court.

### II. Air Toxics Project – Stage 1 - Phase 1A Overview

A. Scope and Objectives

The objective of Stage I - Phase 1A of The Air Toxics Project for UT Austin and its subcontractors is to develop, apply, and make publicly available, neighborhood-scale air quality modeling tools for toxic air pollutants in the Corpus Christi area. Stage 1 – Phase 1A of the Air Toxics Project will provide significant and discernible environmental benefits to the Corpus Christi area by providing analyses of air pollutant concentrations experienced by the community, and providing post-event evaluation of pollutants emitted during a release. UT Austin is performing this work in collaboration with subcontractors at Texas A&M University and ENVIRON International Corporation.

### **B.** Major Tasks

The major tasks for Stage I, Phase IA include:

- Development of a conceptual model of meteorological conditions likely to lead to high concentrations of air toxics in the Corpus Christi area.
  This task will identify meteorological conditions (seasons, temperatures, wind speeds, wind directions, frontal passages and other parameters) and air quality conditions that are most likely to lead to high concentrations of air toxics in populated regions of Corpus Christi. The conceptual model will be used to identify historical periods that can be used to develop and test air toxics modeling systems for Corpus Christi.
- 2. Development of emissions inventory and land cover input information. These data will be developed at a spatial resolution that will allow the neighborhood scale air quality models to operate with a resolution of a few hundred meters.
- 3. Application of dispersion models to estimate the neighborhood-scale concentrations of air toxics in Corpus Christi. Dispersion models represent the current best practice for estimating air toxics concentrations in urban areas. Using emissions, land cover, and meteorological data, a dispersion model will be used to estimate concentrations of air toxics in plumes from sources identified in the emissions inventory and during historical meteorological conditions identified during the conceptual model development
- 4. Development of improved meteorological models of air pollutant dispersion in the Corpus Christi area.

A more rigorous combined plume and gridded model able to characterize the complex coastal meteorology in the region will also be developed and applied in order to address uncertainties in predicted concentrations obtained from the dispersion model. A state-of-the-science meteorological model will be used to simulate the three-dimensional weather conditions in the Corpus Christi area, with a focus on the replication of historical weather patterns identified in the conceptual model. Simulation of local circulation features will be carefully assessed, and additional analyses will customize the model for best performance in the Corpus Christi area.

- 5. Development of combined gridded and plume models to estimate neighborhood-scale concentrations of air toxics in Corpus Christi: The combined gridded and plume model will predict three-dimensional concentrations of selected air toxic pollutants throughout the Corpus Christi area using the meteorological modeling, emission inventory and land cover data described above. An evaluation framework will be developed to compare predicted and observed concentrations during specific historical episodes and to refine the modeling approach and performance.
- 6. Application of the combined dispersion and gridded modeling tools to estimate concentrations of air toxics in Corpus Christi. The combined dispersion and gridded modeling tools will be applied to estimate

concentrations of air toxics in Corpus Christi under a variety of meteorological conditions for routine emissions and when monitoring data has indicated higher concentrations of air toxics than would be expected under routine emission conditions; make spatial mappings of the estimated air toxics concentrations available on a Project website.

### C. Project Milestone Schedule

UT Austin and its subcontractors had four primary objectives for the first year of the Stage 1-Phase 1A of the Air Toxics Project: (1) to develop a conceptual model of air toxics events in the Corpus Christi area; (2) to assess and compare existing point source emission inventories for Nueces and San Patricio Counties; (3) to begin dispersion modeling simulations for the region using AERMOD and CALPUFF; and (4) to initiate meteorological modeling for the region. The first three objectives have been accomplished. Dr. John Nielsen-Gammon's group at Texas A&M University has initiated development of the WRF meteorological modeling methodology for the region.

UT Austin and its subcontractors are currently completing internal review of the documentation of the first year results with an expected release for review by the TCEQ during the next quarter. The groups are also working on defining the major project objectives for the second year.

UT Austin presented its annual report to the Court on February 24, 2009.

### D. Scheduled Project Presentations and Meetings

On February 24, 2009, the annual air toxics project report was presented to the Honorable Janis Graham Jack, US District Court, in Corpus Christi, Texas. The annual report focused on the results of the conceptual model of air toxics events in the region, on trends in the relationship between ambient measurements and reported point source emission inventories, and on differences between existing point source emission inventories for the region. The presentation also included preliminary results of the dispersion modeling simulations using AERMOD and CALPUFF and intercomparison of modeled and measured benzene concentrations.

The Corpus Christi Air Monitoring and Surveillance Camera Project Advisory Board met on March 25, 2009 on the campus of Texas A&M University in Corpus Christi Texas. Attendees of the Advisory Board meeting were briefed on the status and findings of the Air Toxics Project by Elena McDonald-Buller, Modeling Team Lead and Gary McGaughey, Meteorological Team Lead. In addition to presenting the major elements of the annual report to the Court described above, the UT Austin team also discussed potential modeling simulations that could be conducted to respond to community concerns about the air quality impacts of the planned Las Brisas Energy Center, LLC facility.

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.

### III. Air Toxics Project - Stage 1 - Phase 1B Overview

### A. Scope and Objectives

The initial workplan for the Stage I funding called for application of the modeling tools to the Houston Ship Channel region after their demonstration in Corpus Christi with the goal of demonstrating that the neighborhood-scale air toxics modeling

framework is applicable to other urban areas. The area surrounding the Ship Channel in east Harris County, Texas was to be used for this demonstration, and the period to be modeled will be August 15-September 15, 2006, which corresponds to the period of the Second Texas Air Quality Study (TexAQS II).

The initial workplan for Stage I has been restructured and Phase 1B of the project reserves approximately 50% of Stage 1 project funds, approximately \$2.3 million, to extend the operation of the Corpus Christi ambient monitoring network. As a result the modeling of the Houston Ship Channel region will be deferred pending availability of Stage 2 funds.

#### **B.** Goals

Under Phase 1B the project team will use the air quality modeling results in synergy with the data collected from the ambient network to help develop recommendations for future changes in the geographic configuration and/or instrumentation for the network that might facilitate better characterization of the air toxics exposure patterns.

#### IV. Stage 1 – Phase 1A Project Progress Report

#### A. Meteorological Team

Mr. Gary McGaughey completed the development of a conceptual model that describes meteorological conditions associated with higher measured concentrations of total nonmethane hydrocarbons (TNMHCs) and benzene in the Corpus Christi area. The report for the conceptual model development has been completed and is undergoing internal review. It is expected to be released for review to the TCEQ during the next quarter.

During the spring and early summer of 2009, Dr. Sullivan will be incorporating specific case study analyses of short term air toxics events in the Corpus Christi area into the conceptual model.

Dr. Nielsen-Gammon continues to provide input to the UT Austin team for conceptual model development and air toxics transport model validation in the Corpus Christi area. Dr. Wenfang Lei, a post-doctoral fellow working with Dr. Nielsen-Gammon, has conducted a literature survey on high-resolution urban-scale modeling and is making plans for the initial WRF runs on or about May 1, 2009. As noted earlier, Dr. Nielsen-Gammon's team plans to perform most meteorological model runs on a platform called "brazos". They have since learned that a second, similarly-powerful cluster is coming on-line at TAMU and that the execution of the WRF model will be one of the first priorities for the system managers after installation. This should provide the TAMU team with two robust platforms for WRF modeling in support of this project.

#### B. Modeling Team

Dr. Elena McDonald-Buller and Dr. Greg Yarwood and their teams at UT and ENVIRON, respectively, completed an analysis of existing emission inventories for point sources in the Corpus Christi area. A total of ten emission inventories were examined including the U.S. EPA's Toxic Release Inventories for 2002 through 2006, the U.S. EPA's 2002 National Emissions Inventory for Hazardous Air Pollutants, the Texas Commission on Environmental Quality (TCEQ) 2002 and 2005 submittals to the

U.S. EPA National Emissions Inventory for Hazardous Air Pollutants, and the TCEQ 2000 and 2005 Photochemical Modeling Inventories. A report has been completed that describes the origins and objectives of each inventory, the methodology used to investigate and compare the inventories, the results of the study including annual trends in total air emissions and individual air toxics, and inter-comparisons of emissions of selected air toxics from the inventories. The report is currently undergoing internal review. It is expected to be released for review to the TCEQ during the next quarter.

ENVIRON is developing inventories for area and mobile sources in the Corpus Christi area to be used in future dispersion and photochemical modeling efforts.

Mr. Ron Barnard, Environmental Programs Specialist, at the City of Corpus Christi, provided the UT Austin team with a CD of their emissions inventory for the region. UT Austin has reviewed this information and will issue a summary of findings.

The UT team has been working with ENVIRON on the development and evaluation of a 2002 seasonal modeling episode for the City of Victoria. Because the modeling domain for this episode includes the Corpus Christi area and the time period includes an entire ozone season, it was recommended by the Project's Advisory Board that the UT Austin team evaluate the performance of this model in the Corpus Christi area and use it to conduct a study of the predicted air quality impacts of the Las Brisas facility. The UT Austin team has initiated this work, which is expected to be a focal point of the modeling efforts during the next quarter.

ENVIRON developed a CAMx dispersion model for benzene from point sources for a modeling period of October 1 – November 30, 2006. The input meteorological data were developed from local observations using the CALMET diagnostic wind model. These are the same data that were used previously with CALPUFF. An interface program was written to prepare the CALMET meteorological data for CAMx including calculating parameters that are required by CAMx and not output by CALMET (i.e. vertical mixing coefficients and 3-D water vapor). A series of CAMx simulations was performed with grid resolutions of 1-km and 200 m. The CAMx predictions of benzene concentrations were compared to CALPUFF predictions and observed values. The results were summarized in a Power Point presentation and discussed with other project team members. The next steps identified were (1) to test and evaluate the CAMx plume-in-grid option and (2) to include other sources of benzene, starting with mobile sources.

### V. Collaborative Relationships and Leveraging of the Air Toxics Project

No new collaborative relationships were established during this reporting period.

### VI. Financial Summary

### A. Financial Report

Details of the following financial summary information are included in Appendix A, pages 8 and 9.

### 1. <u>Detailed List of the Actual Expenditures Paid from Air Toxics Project Funds</u> through March 31, 2009

Expenditures of Air Toxics Project funds during this quarter totaled \$243,809.20. The breakdown of expenditures can be found in Appendix A. The activities for which these expenditures were used are detailed in this report.

2. <u>Total Interest Earned on Air Toxics Project Funds through March 31, 2009</u> The interest earned during this quarter totaled \$24,900.84. A report providing detailed calculations of the interest earned on the Air Toxics Project funds is included in Appendix A, pages 8 and 9.

3. <u>Balance as of March 31, 2009, in the Air Toxics Project Account</u> The balance in the Air Toxics Project account, including interest earned totals \$3,999,265.00.

4. <u>Anticipated Expenditures for the Funds Remaining in the Air Toxics Project</u> <u>Account</u>

The anticipated expenditures for the remaining funds will total \$3,999,265.00.

### **Quarterly Report Distribution List:**

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### Neighborhood Air Toxics Modeling Project for Houston and Corpus Christi - Stage 1 Phase 1A

#### Accounting Report for the Quarter 01/01/2009 - 03/31/2009

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

Total Grant Amount:	\$4,602,598.66
Total Interest Earned:	\$130,328.69
Total Funds Received:	\$4,732,927.35

B. Summary of Expenditures Paid by Air Toxics Funds

		First Year	Second Year	Total Year 1 & 2	Prior Activity	Current Activity	Encumbrances	Remaining Balance
		Budget Increment	Budget Increment	Budget		01/01/09-03/31/09		3/31/2009
Salaries-Prof	12	\$395,025.00	245,892.00	\$640,917.00	(\$288,264.02)	(\$56,125.29)	(\$49,355.16)	\$247,172.53
Salaries-CEER	15	\$42,745.00	0.00	\$42,745.00	(\$31,871.99)	(\$10,876.69)		-\$3.68
Fringe	14	\$96,309.00	52,876.00	\$149,185.00	(\$68,674.24)	(\$15,002.44)	(\$11,547.74)	\$53,960.58
Supplies	50	\$43,583.83	19,657.00	\$61,991.00	(\$18,256.26)	(\$19.97)	\$0.00	\$43,714.77
Contingency	51	\$1,246.00	5,500.00	\$6,746.00	\$0.00	\$0.00	\$0.00	\$6,746.00
Consultants	60	\$20,000.00	2,500.00	\$22,500.00	\$0.00	\$0.00	\$0.00	\$22,500.00
Subcontracts	61-63	\$300,000.00	300,000.00	\$600,000.00	(\$7,777.75)	(\$126,021.84)	\$0.00	\$466,200.41
Modeling/Computer Sv	: 67	\$34,000.00	12,500.00	\$46,500.00	\$0.00	\$0.00	\$0.00	\$46,500.00
Tultion	71	\$9,582.00	8,145.00	\$17,727.00	(\$3,870.00)	(\$3,870.00)		\$9,987.00
Travel	75	\$10,000.00	5,000.00	\$15,000.00	\$0.00	(\$91.77)	(\$0.05)	\$14,908.18
Equipment	80	\$10,000.00	7,500.00	\$17,500.00	(\$7,245.00)	\$0.00	\$0.00	\$10,255.00
Indirect Costs	90	\$142,936.17	98,936.00	\$243,122.00	(\$63,893.89)	(\$31,801.20)	\$0.00	\$147,426,91
TOTALS		\$1,105,427.00	758,506.00	\$1,863,933.00	(\$489,853.15)	(\$243,809.20)	(\$60,902.95)	\$1,069,367.70

C. Interest Earned by COCP Funds as of 03/31/2009

Prior Interest Earned:	\$105,427.85
Interest Earned This Quarter:	\$24,900.84
Total Interest Earned to Date:	\$130,328.69

D. Balance of COCP Funds as of 03/31/2009

Total Grant Amount:	\$4,602,598.66	
Total Interest Earned:	\$130,328.69	
Total Expenditures:	(\$733,662.35)	
Remaining Balance:	\$3,999,265.00	*includes interest

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