AGENDA

Presentation to the Honorable Janis Graham Jack
United States District Court
Corpus Christi, Texas

February 24, 2009 10:00 am to 11:00 am

Topics and Presenters

Introduction and Overview
Presenter: Dr. David T. Allen, P.E., Principal Investigator
The University of Texas at Austin's Center for Energy and Environmental Resources

Project Financial Report and Stage 1-B Scenarios
Presenter: Mr. Vincent M. Torres, P.E., Ambient Monitoring Team Lead
The University of Texas at Austin's Center for Energy and Environmental Resources

Modeling and Measurements
Presenter: Dr. Elena McDonald-Buller, P.E., Air Quality Modeling Team Lead
The University of Texas at Austin's Center for Energy and Environmental Resources

The following project representatives will be in attendance but not presenting:

Dr. David Sullivan, Quality Assurance Officer
The University of Texas at Austin's Center for Energy and Environmental Resources

Mr. Gary McGaughey, Meteorological Modeling Team Lead
The University of Texas at Austin's Center for Energy and Environmental Resources

Ms. MaryAnn Foran, Contract Specialist
The University of Texas at Austin's Center for Energy and Environmental Resources

Mr. David Turner, Manager, Air Section
The Texas Commission on Environmental Quality-Region 14
Corpus Christi, Texas

Neighborhood Air Toxics Modeling For Houston and Corpus Christi

The University of Texas at Austin
Center for Energy and Environmental Resources

Annual Report to
The Honorable Janis Graham Jack
US District Court, Southern District
Corpus Christi, Texas

Overview of Presentation

Goals for the project
Progress during first year
Financial status

Project Goals

- **Extend the lifetime of the Corpus Christi air toxics monitoring network**

  Factors to consider:
  - **Current monitoring network has 3-4 additional years of operation with original funding**
  - **Expected lifetime of original monitoring equipment is on the order of 3-4 more years (obsolescence and failure)**
  - **New monitoring sites are being added (e.g., Hillcrest Auto-GC)**
  - **Current monitoring is providing insights into improved sampling strategies**

  Synthesis: Set aside a majority of project funding for continued operation of network, but use modeling and data analysis to develop a revised monitoring strategy

Project Goals

- **Improve data analysis and modeling capabilities for the network**

  Factors to consider:

  - **Need to identify whether monitor siting is optimized**
  - **Need to identify whether monitor analysis capabilities are optimized**
  - **Need to determine what response times are needed**
  - **Need to answer new types of questions being raised by the community through the advisory panel**

  Synthesis: Use a portion of the funds for modeling activities to address these needs; develop new modeling capabilities that provide information desired by the community; develop proposed second generation of the modeling network over the next year

Project Budget

Total Settlement Fund Allocation
$9,643,134.80

- **Stage 1 -$4,586,014.92 + $16,583.74* = $4,602,598.66****
  - ➢**Phase 1A - $2,277,562.66** (Modeling)**
  - ➢**Phase 1B - $2,325,036.00** (Monitoring Extension)**
- **Stage 2 - $5,057,119.88 (Undistributed pending appeal)**

* Interest earned by the US District Court prior to the distribution of funds.

** Includes interest earned by the US District Court prior to the distribution of funds.

Project Financial Status

Expenditures

Current year ending December 31, 2008*	**$489,853.15**

**Does not include encumbrances for expenditures as of December 31, 2008 in the amount of $109,449.85.*

Funds Remaining

Initial deposit on March 3, 2008	**$4,602,598.66**
Less expenditures through December 31, 2008	**($489,853.15)**
Plus interest earned by UT Austin through December 31, 2008	**$105,427.85**
Less Project Allocation reserved for extending the life of the Corpus Christi Monitoring Network (Stage 1 - Phase 1B)	**($2,325,036.00)**
Stage 1 - Phase 1A Project Funds Remaining	**$1,893,137.36**

How many years will the Stage 1 - Phase 1B funds extend* the life of the Monitoring Network?

- **SCENARIO 1 - Current configuration: ≈ 1.75 Years**
- **SCENARIO 2 - Current configuration with updated equipment replacement: ≈ 1.25 Years**
- **SCENARIO 3 - At two sites, Auto GC, TNMHC and Met equipment only: ≈ 3.75 Years**
- **SCENARIO 4 - Two or more Auto GC sites plus other TBS equipment: Number of years to be determined.**

***after July 2011**

Modeling Activities

The University of Texas at Austin team leads:

–David Allen (Principal Investigator)

–Elena McDonald-Buller (Air Quality Modeling)

–Gary McGaughey (Meteorological Modeling)

Collaborators from Environ International Corporation in Novato, California and Texas A&M University share expertise in meteorological and air quality modeling.

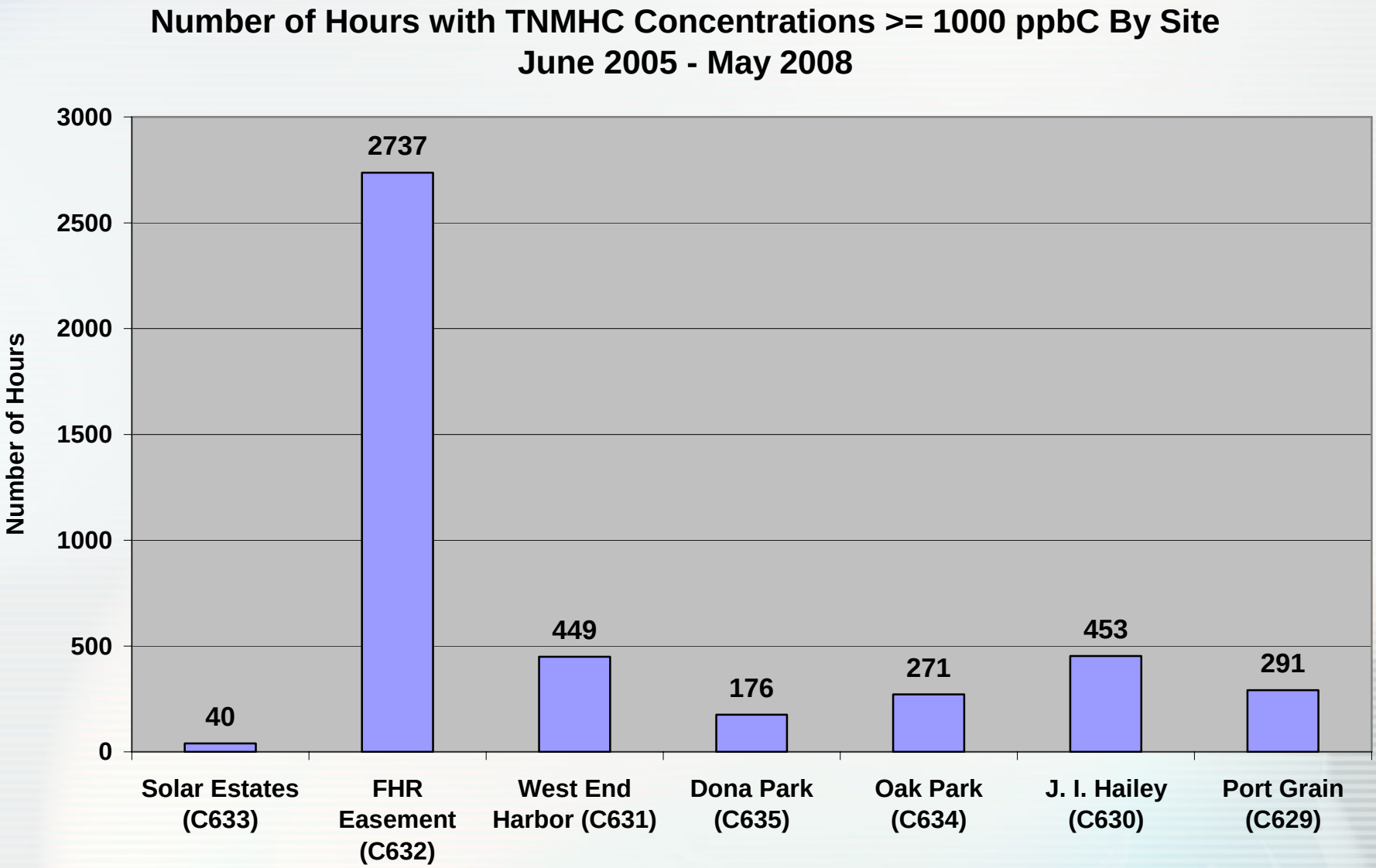
Key Questions

1. **Utilizing the extensive datasets of the Corpus Christi ambient monitoring network, what are the key characteristics of air toxic pollutant events in the Corpus Christi area? Should a second generation of monitors and monitoring locations be different than the current system design?**

What are key characteristics of high air toxics events in the Corpus Christi Area?

- Three years of data are now available from the CC network.
- Data for total non-methane hydrocarbons and benzene have been used to investigate seasonal and diurnal trends and emission source regions during high concentrations.
- We will continue this analysis during the lifetime of the network.

What is the frequency of occurrence of high TNMHC concentrations?



When does high TNMHC occur?

- Nighttime hours at all stations
- Seasonality:
  - Winter/fall at Solar Estates, Dona Park, and Oak Park
  - Winter/fall/summer at Port Grain and J. I. Hailey
  - Summer relatively more important than fall/winter at FHR Easement and West End Harbor
  - Spring frequency of occurrence low at all 7 stations

What geographic areas are upwind during high TNMHC events?

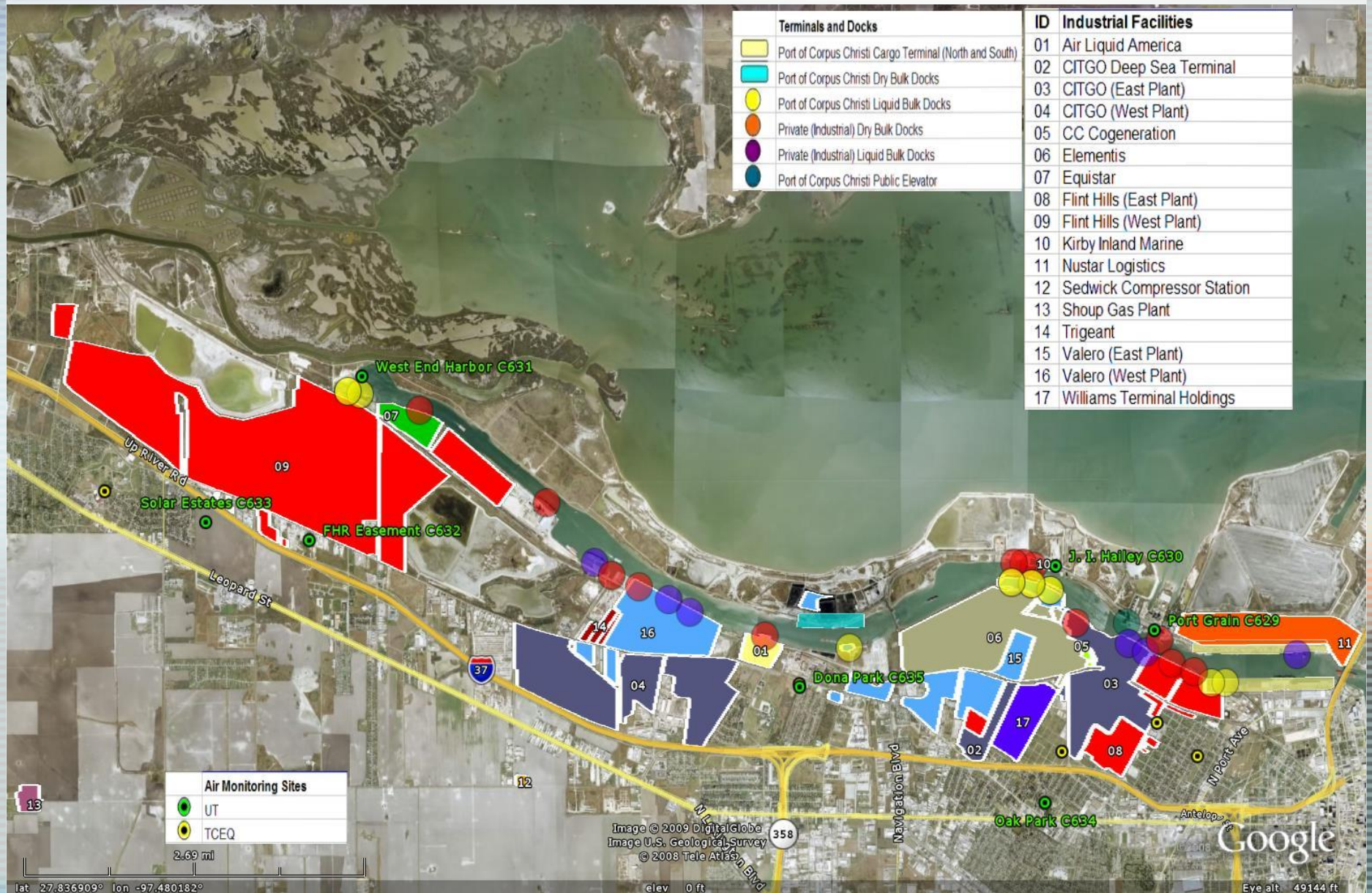
- Use the Trajectory Analysis Tool (funded through a TCEQ SEP) to calculate one-hour back-trajectories for high (i.e., 1000 ppbC) TNMHC hours at each of the 7 CC stations.

- The back-trajectory results identify the industrial facilities that are often in the upwind area prior to high TNMHC events.

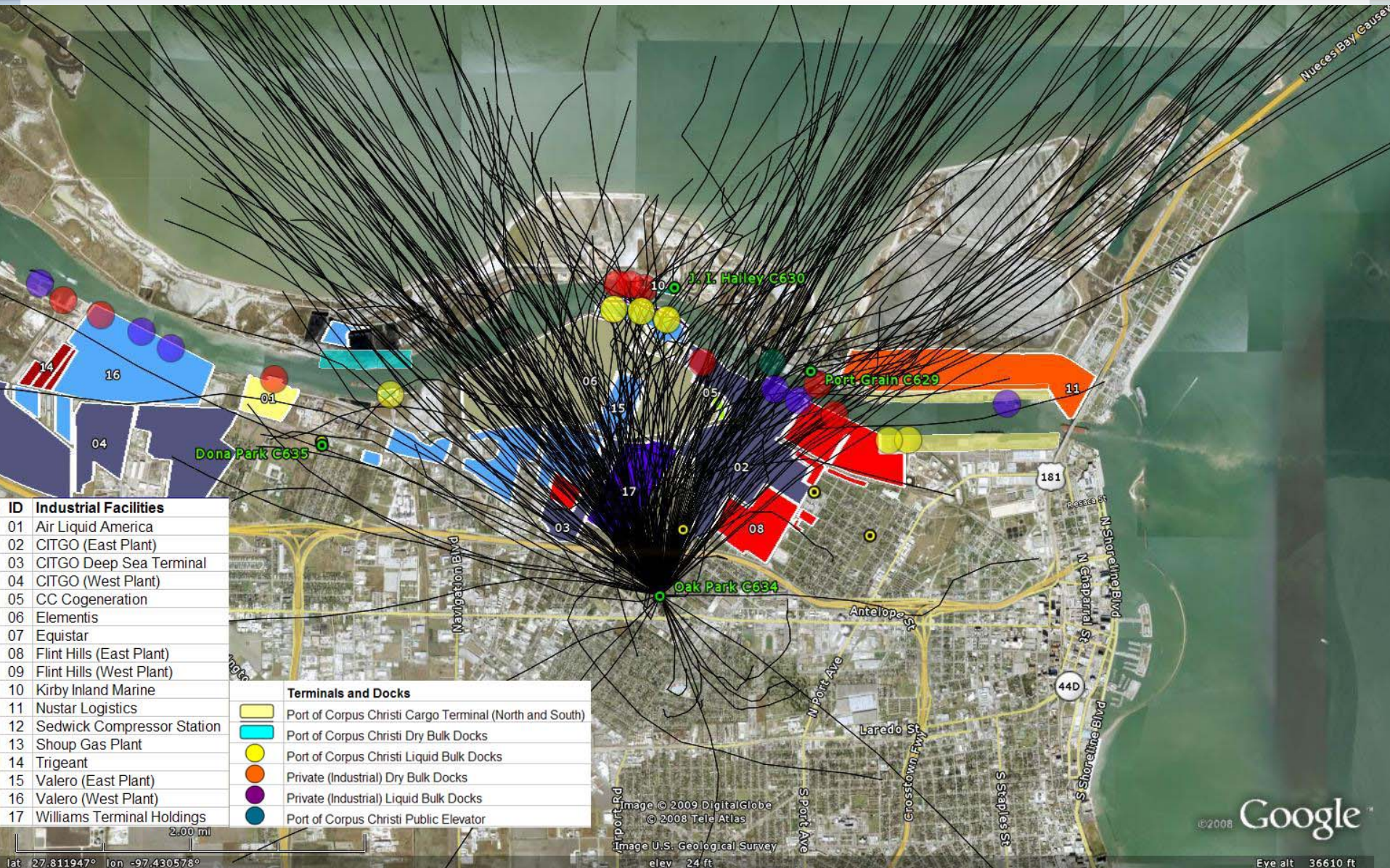
- There can be uncertainties in the calculation of a single back-trajectory. The generation of multiple back-trajectories during a number of high pollutant events increases confidence in results.

Facilities with VOC emissions

(2005 TCEQ Modeling Inventory)



Back-trajectories for high TNMHC hours at Oak Park

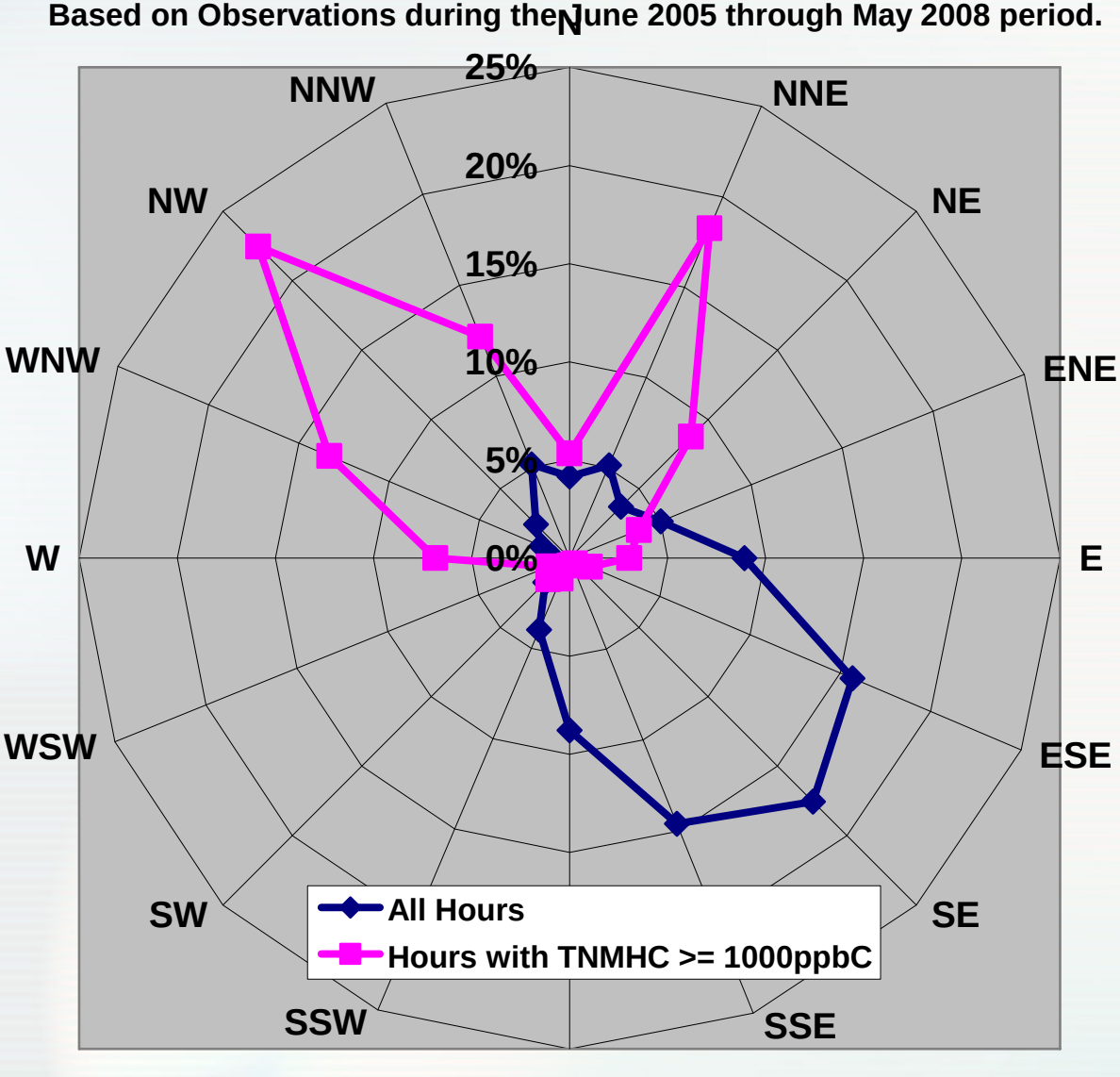


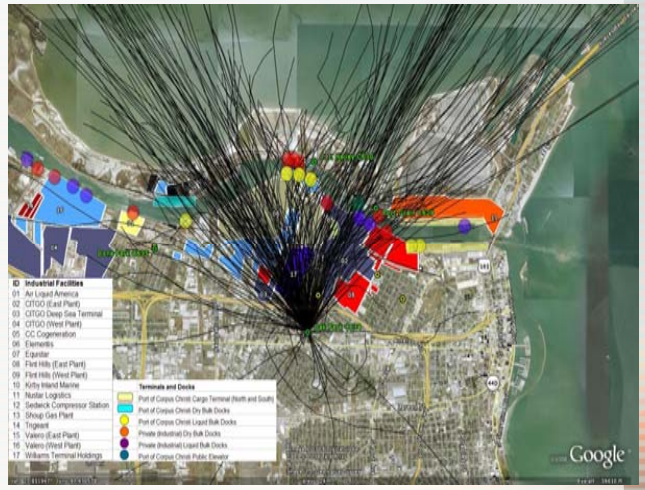
ID	Industrial Facilities
01	Air Liquid America
02	CITGO (East Plant)
03	CITGO Deep Sea Terminal
04	CITGO (West Plant)
05	CC Cogeneration
06	Elementis
07	Equistar
08	Flint Hills (East Plant)
09	Flint Hills (West Plant)
10	Kirby Inland Marine
11	Nustar Logistics
12	Sedwick Compressor Station
13	Shoup Gas Plant
14	Trigeant
15	Valero (East Plant)
16	Valero (West Plant)
17	Williams Terminal Holdings

Terminals and Docks
Port of Corpus Christi Cargo Terminal (North and South)
Port of Corpus Christi Dry Bulk Docks
Port of Corpus Christi Liquid Bulk Docks
Private (Industrial) Dry Bulk Docks
Private (Industrial) Liquid Bulk Docks
Port of Corpus Christi Public Elevator

Wind rose for all hours and high TNMHC hours at Oak Park

Oak Park Hourly TNMHC Concentrations Frequency of Occurrence by Wind Direction
Based on Observations during the June 2005 through May 2008 period.





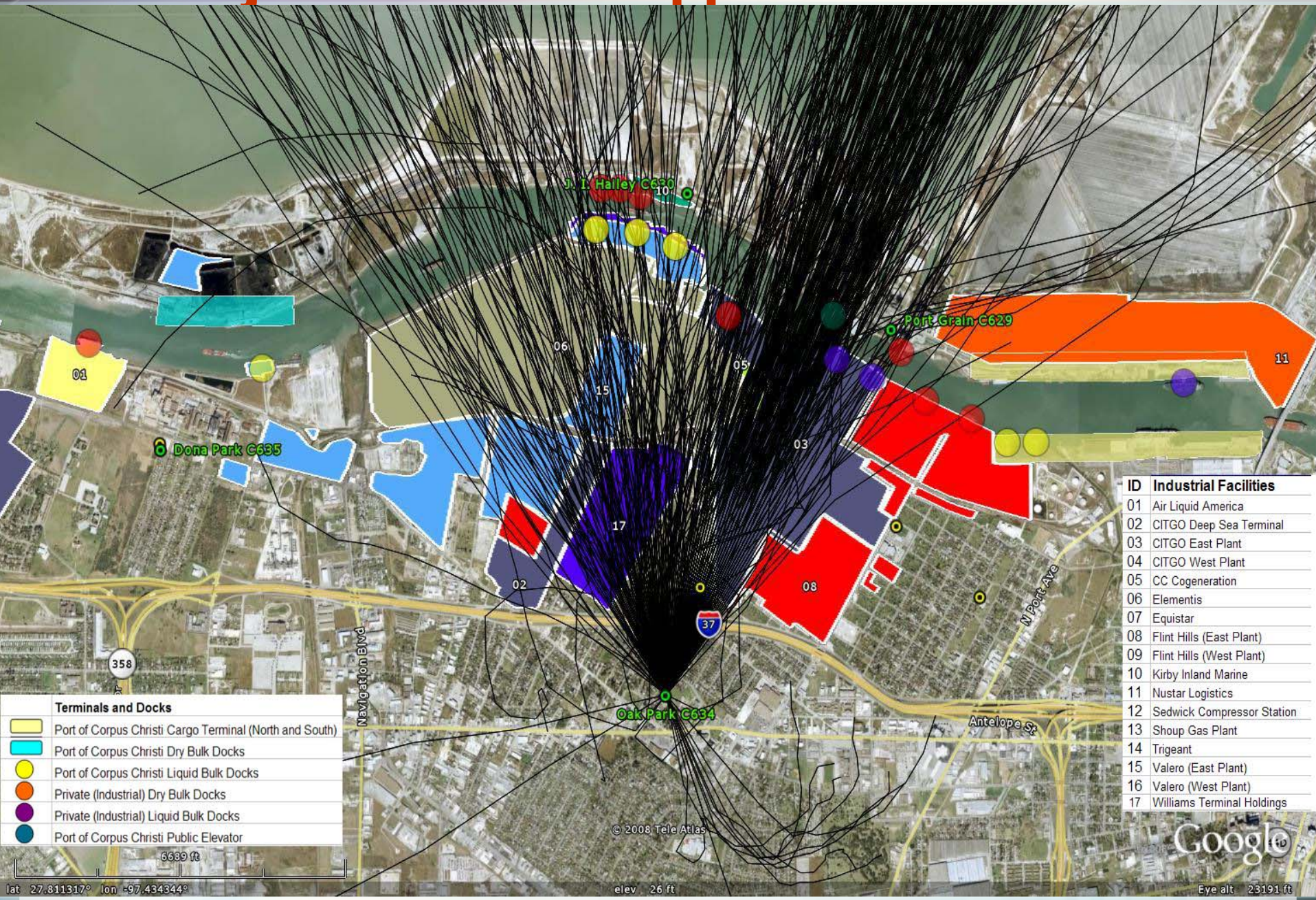
Key Findings for TNMHC Concentrations

- The limited spatial scale, duration, and strong wind directionality during high TNMHC events suggests the importance of site-specific emissions sources.
- All stations are characterized by a high frequency of occurrence of high TNMHC concentrations during fall/winter nighttime hours.
- The lack of day-of-week trends suggests high TNMHC is associated with source emissions that are essentially the same throughout week.

When does high benzene occur (based on auto-GC measurements at Oak Park and Solar Estates)?

- High benzene is more common at Oak Park than Solar Estates
- Fall/winter seasonality
- Early morning (4 a.m. – 9 a.m.) peak
- Weak trend for lower concentrations on Sunday compared to other weekdays

Back-trajectories for 30 ppbC hours at Oak Park



	Terminals and Docks
	Port of Corpus Christi Cargo Terminal (North and South)
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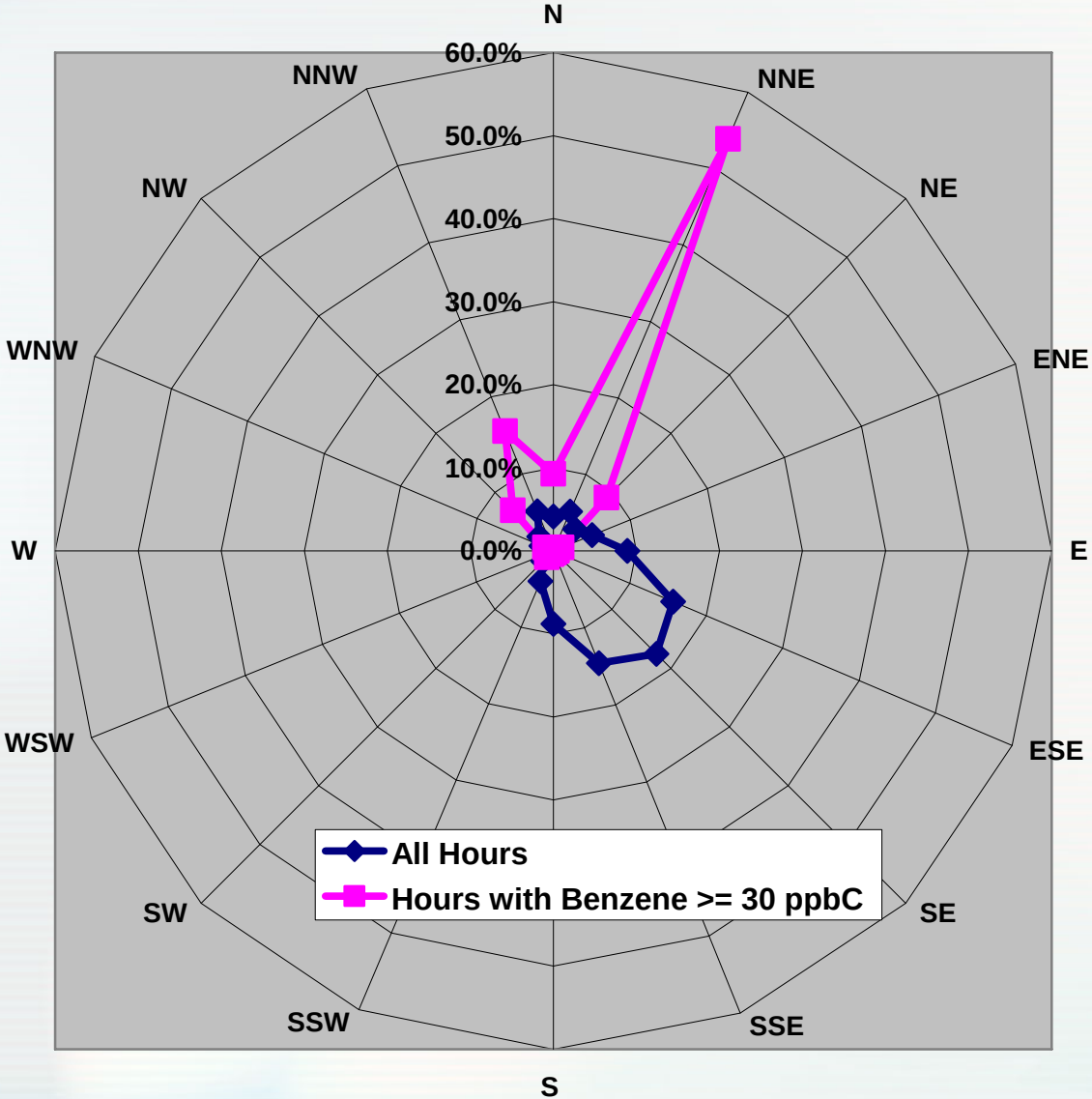
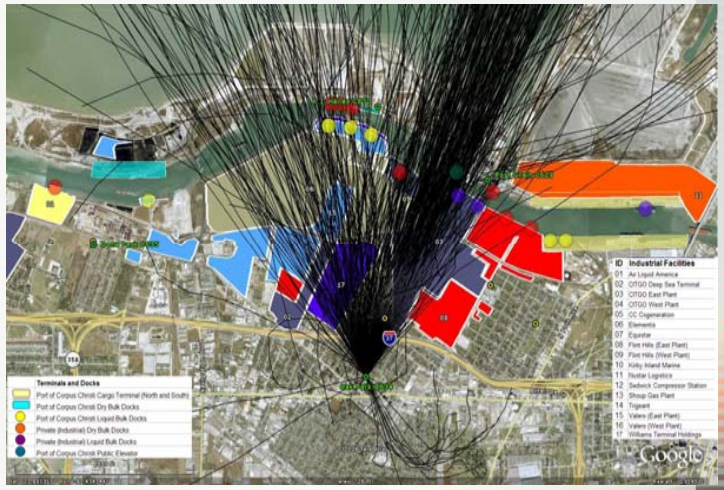
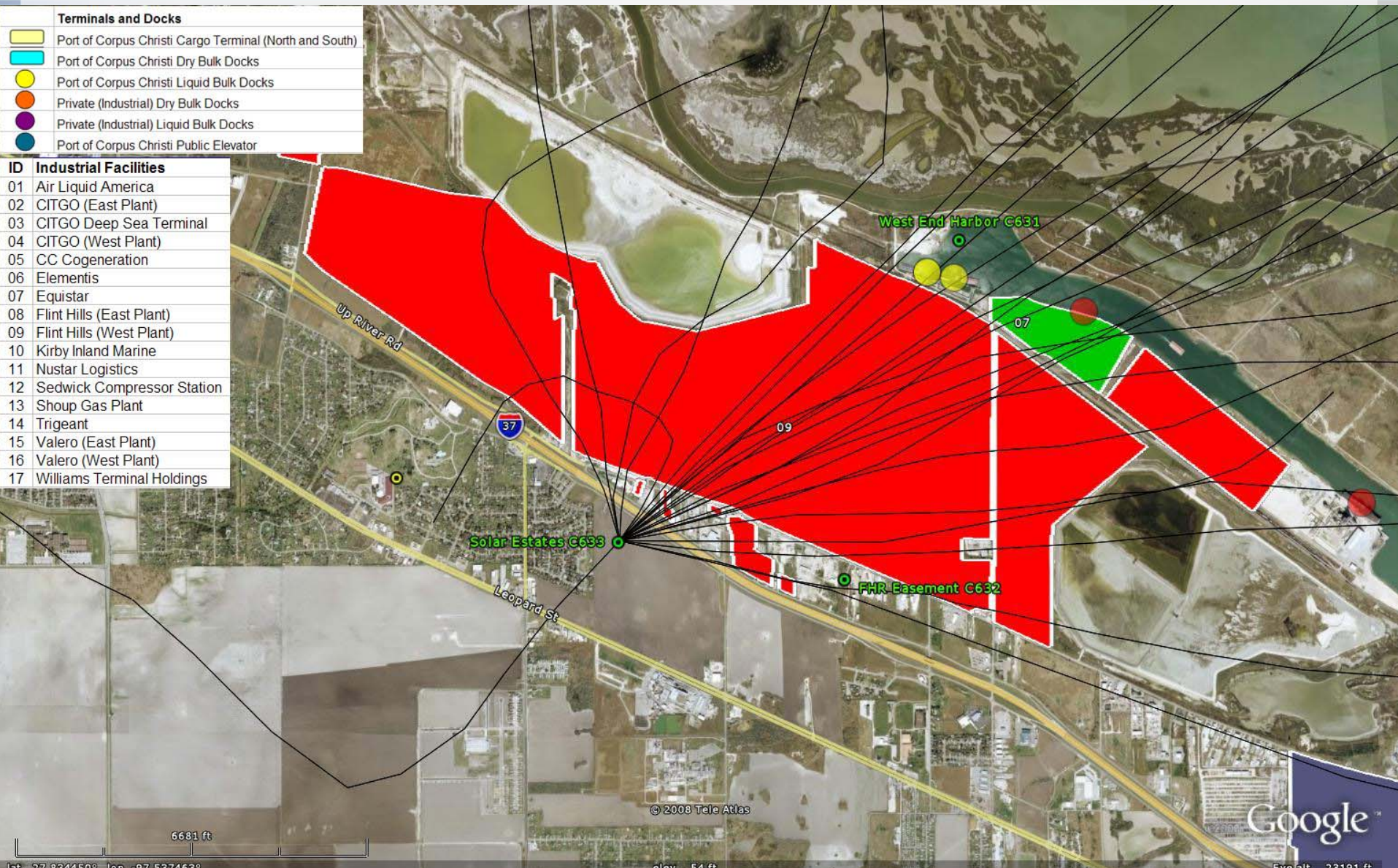
Wind roses for all hours and high benzene hours at Oak Park

Oak Park Hourly Benzene Concentrations Frequency of Occurrence by Wind Direction
Based on Observations during the June 2005 through May 2008 period.

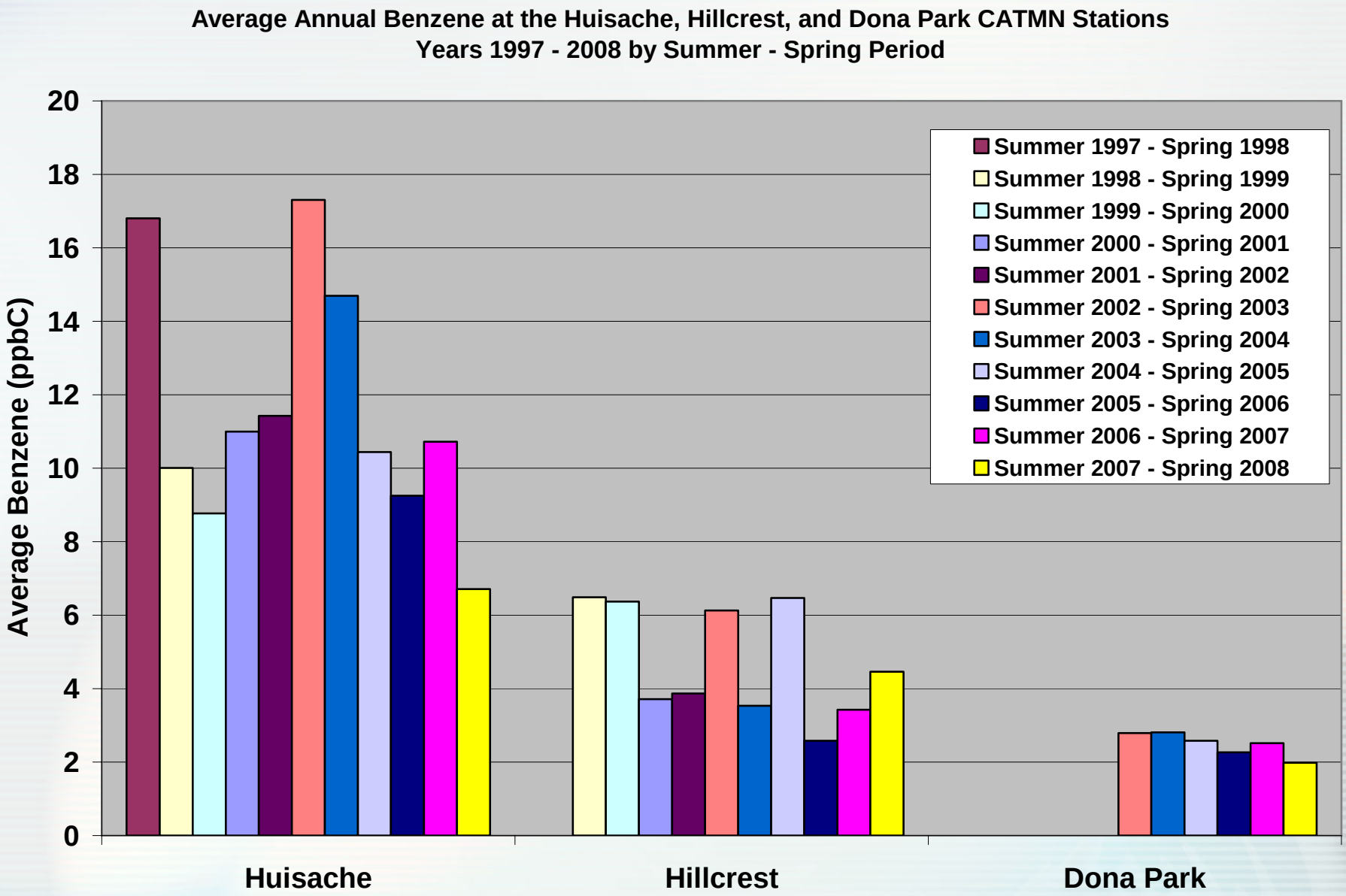




Back-trajectories for 30 ppbC hours at Solar Estates



Annual Benzene Trends at Huisache, Hillcrest, and Dona Park



Key Findings for Benzene Concentrations

- Annual benzene trends show some indication of lower concentrations at Huisache and Oak Park.
- Back-trajectories at Oak Park and Solar Estates indicate that nearby industrial facilities are often in the upwind area prior to high benzene events.
- Stations are characterized by high concentrations during the early morning hours during fall/winter.
- The day-of-week analysis demonstrates a weak trend towards lower concentrations on Sunday.

Key Questions

1. Utilizing the extensive datasets of the Corpus Christi ambient monitoring network, what are the key characteristics of air toxic pollutant events in the Corpus Christi area? Should a second generation of monitors and monitoring locations be different than the current system design?

Monitors are not at fencelines and, therefore, do not represent peak concentrations.

Can we infer the concentrations in other areas, based on the existing network? To do this we will need reliable emissions information and reliable air quality models.

Key Questions

1. Utilizing the extensive datasets of the Corpus Christi ambient monitoring network, what are the key characteristics of air toxic pollutant events in the Corpus Christi area?

2. **Are there differences in existing emission inventories for the region and what does the ambient monitoring network indicate about the accuracy of the inventories?**

3. **Are the location of the air quality monitors consistent with the locations of maximum air toxics concentrations predicted by the air quality models?**

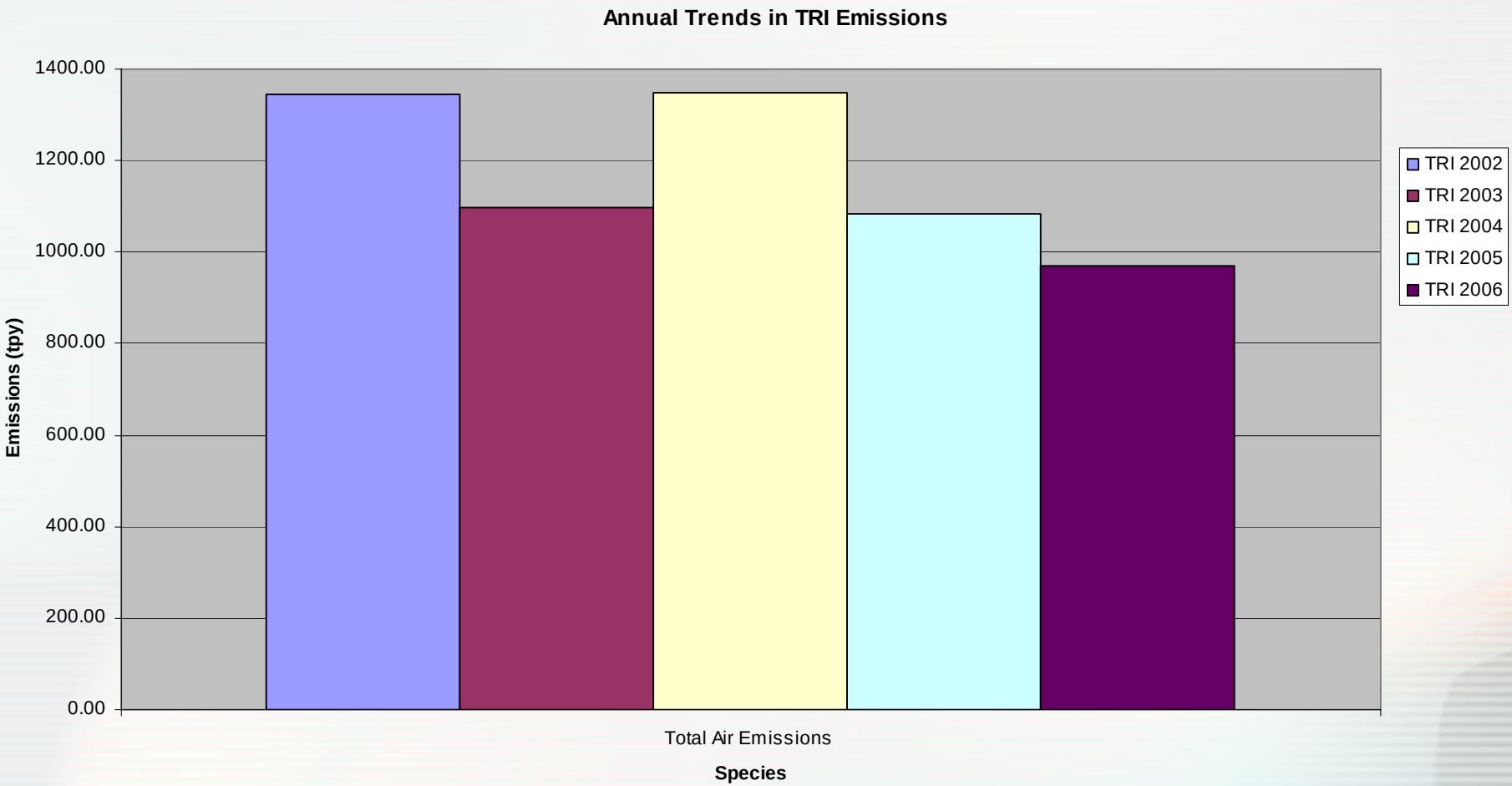
Are there differences in emission inventories?

- Emission inventories are compilations of emissions from different sources such as stationary industrial sites, on and off-road vehicles and equipment, small, numerous sources such as gas stations.
- Emissions can be measured or estimated.
- We focused on emissions from stationary industrial sources in Nueces and San Patricio Counties this year.
- Why is this analysis important?
  - Are reported emissions **accurate**?
  - Many different inventories exist and are used for human health risk assessment and air quality planning activities by the State and by the EPA. Are the different inventories **consisten**t?
  - Are emissions **increasing or decreasing** in the region and what does this mean for the community?

Emission Inventories: Sources

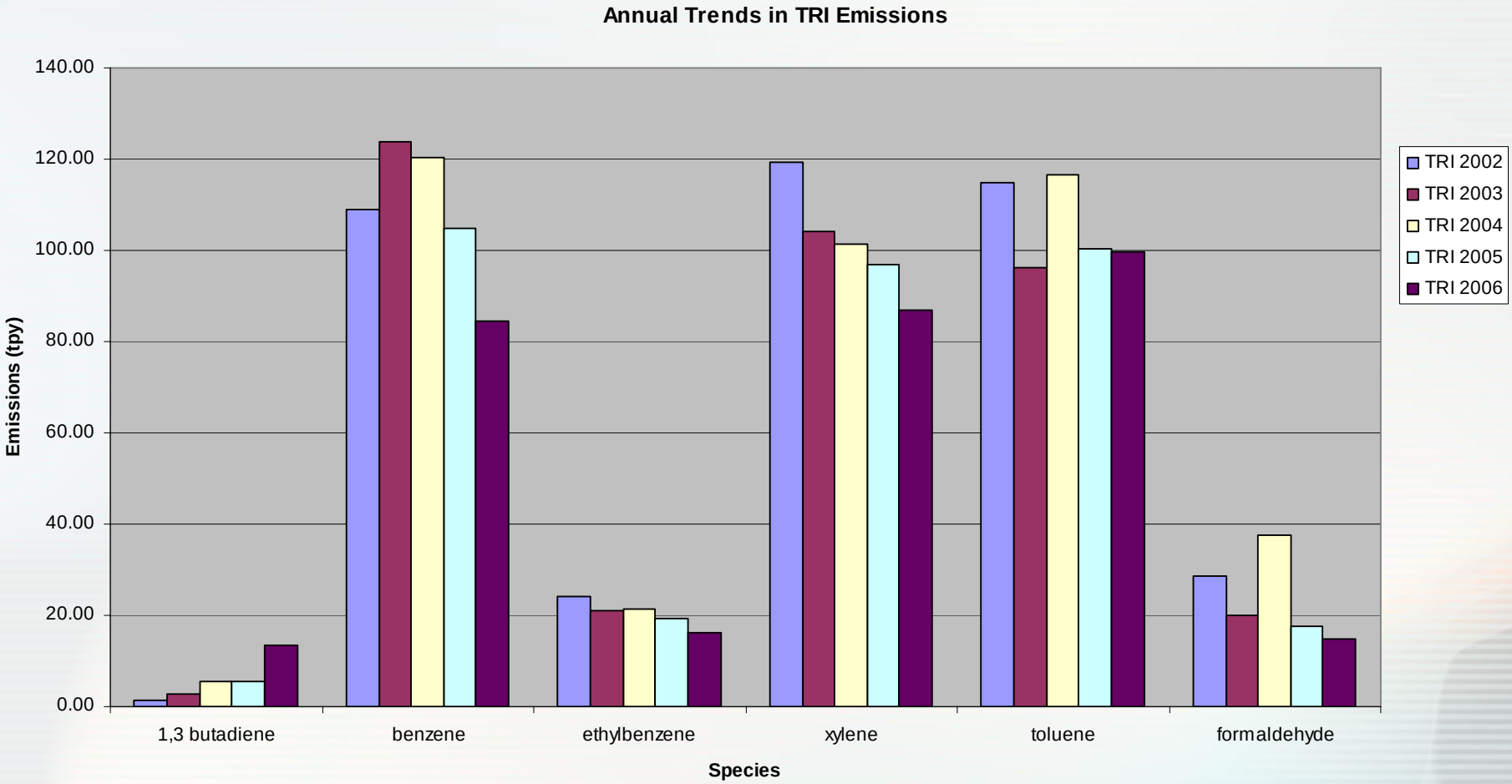
- **Toxics Release Inventory Program (2002-2006)**
  - Sites are required to report emissions of air toxics to the EPA and TCEQ annually
  - Useful for examining annual trends
  - No detailed data on emission locations within property boundaries
  - Emergency Planning and Community Right to Know Act of 1986
- **National Emissions Inventories (2002, 2005)**
  - Three-year reporting cycle
  - Widely used
- **TCEQ Photochemical Modeling EI (2000, 2005)**
  - Developed by the TCEQ
  - Used for air quality planning in Texas
  - Most detailed information on composition of emissions

Emission Inventories: Key Findings



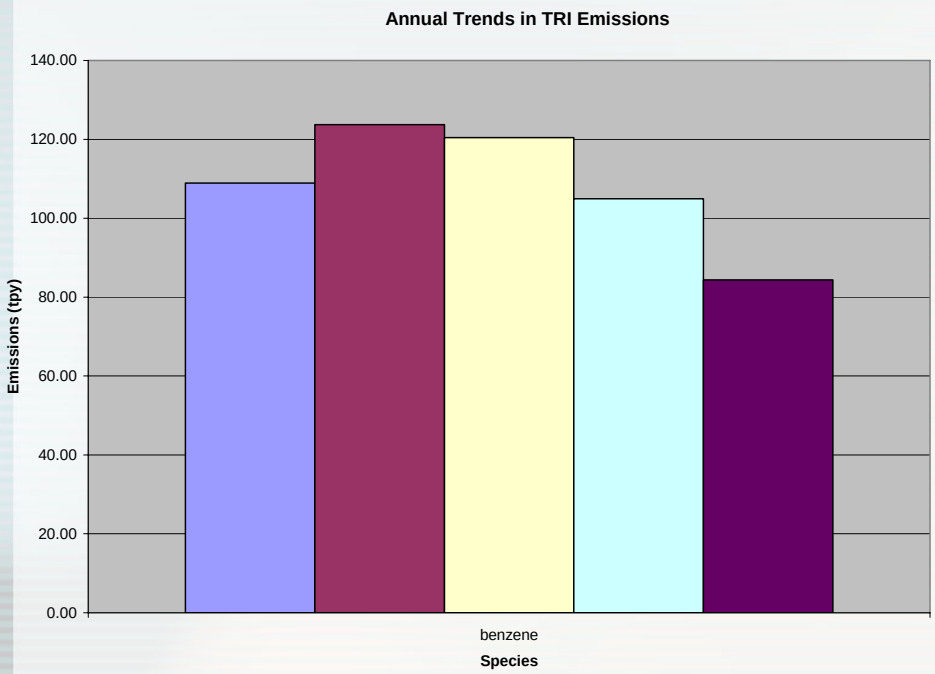
TRI indicates that reported air emissions in Nueces County have generally been decreasing over time

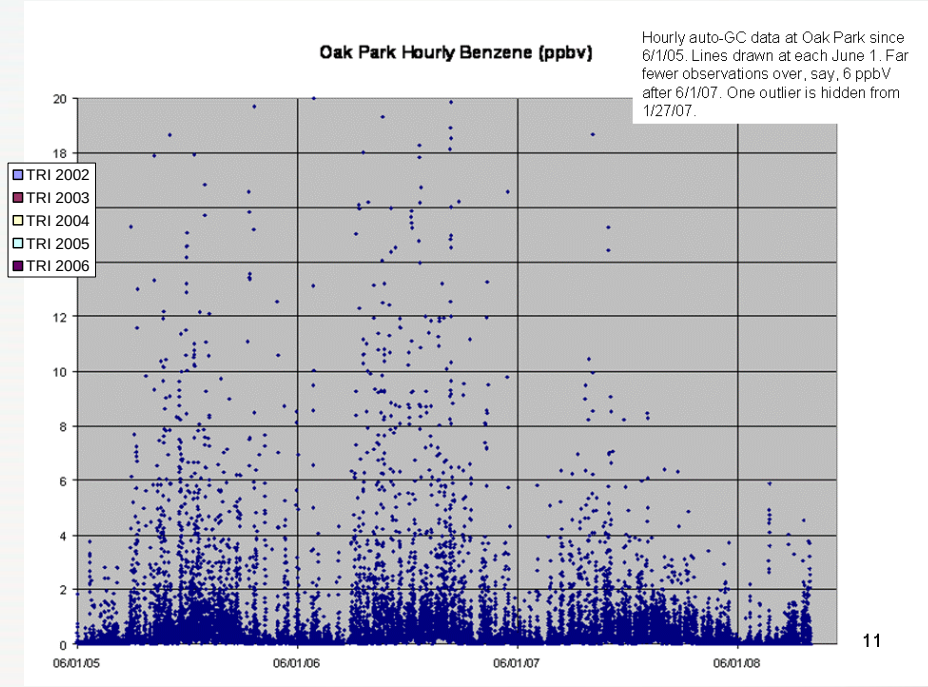
Emission Inventories: Key Findings



Reported benzene, toluene, ethylbenzene, and xylene emissions have decreased, but 1,3-butadiene emissions have increased recently

Emission Inventories: Key Findings





TRI Reported Benzene Emissions: 2002-2006

Measured Concentrations at Oak Park: 2005-2008

Reported benzene emissions for Nueces County and measured ambient benzene concentrations at Oak Park

Emission Inventories: Key Findings

- **Is the reported decrease consistent with what we observe at the monitors?**

- **There is more than a factor of two difference between some of the inventories.**
  - TCEQ Photochemical Modeling Inventory has much more detailed information about the chemical composition of emissions than other inventories.
  - This could have important implications for our predictions of concentrations of air toxics in the region.

On-Going Work

Develop and use air quality models:

- To compare the accuracy of the inventories against the ambient data
- To examine whether the location of the air quality monitors captures the locations of maximum air toxics concentrations predicted by the air quality models

Domain for the AERMOD Dispersion Model

- October-November 2006 period was modeled using the U.S. EPA's AERMOD dispersion model.

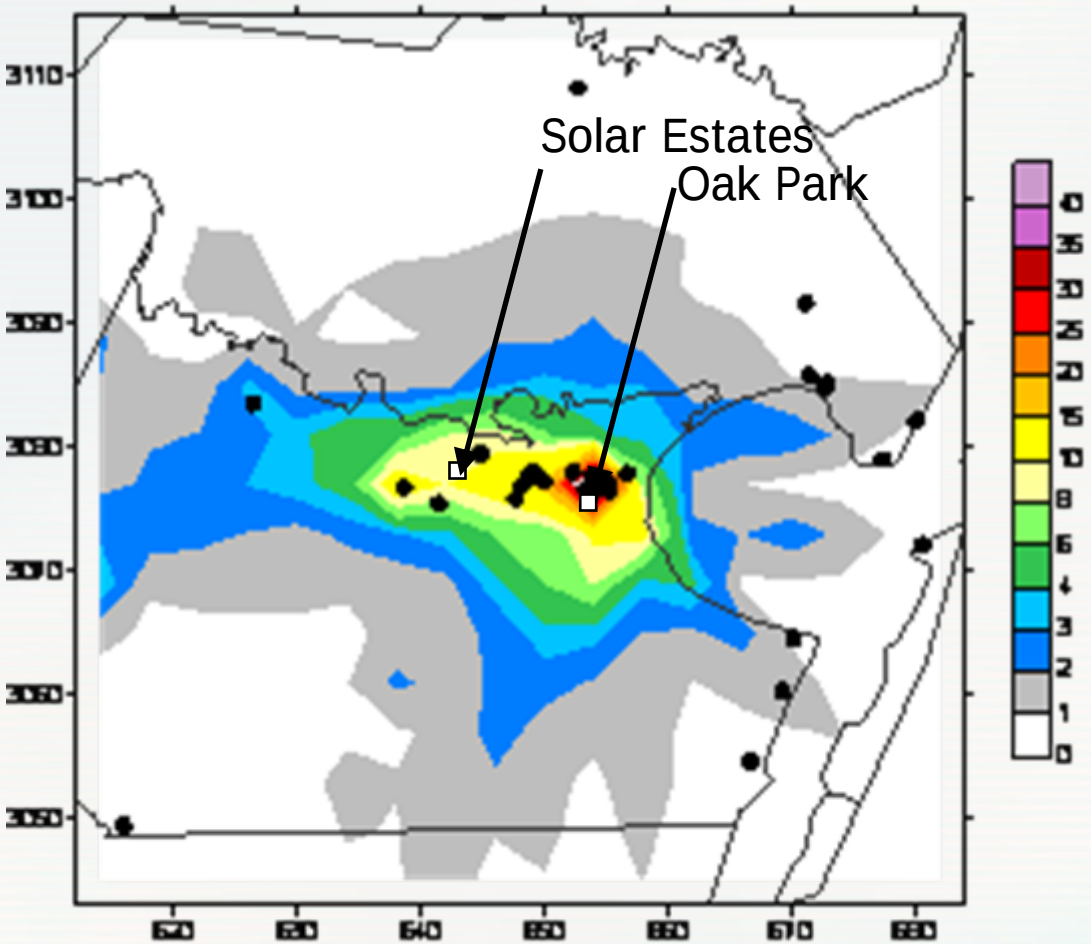
- AERMOD represents the current state of practice in air toxics modeling in the U.S.

- Stationary point sources of benzene in the domain were included from the 2005 TCEQ Photochemical Modeling Inventory.

- Surface characteristics, terrain, and meteorological data for Corpus Christi were included for the modeling period.

Red box shows the modeling domain

Example: Preliminary Predicted Maximum 1-hour Benzene Concentrations for Modeled Time Period



Outreach and Collaboration

- State
  - Dr. Allen and Dr. McDonald-Buller have briefed:
    - TCEQ (August 2008)
    - Texas Environmental Research Consortium with representatives from the Mickey Leland National Urban Air Toxics Research Center and the Houston Advanced Research Center (October 2008)
- National
  - Dr. McDonald-Buller briefed the U.S. EPA in October 2008.