Corpus Christi Air Monitoring and Surveillance Camera Project
Fourth Annual Report to the US District Court

by

THE UNIVERSITY OF TEXAS AT AUSTIN

Center for Energy and Environmental Resources

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January 22, 2008

Today's Presentation

- Introductions
- Project Overview
- Project Budget
- Project Financial Status
- Statement by Representatives of the Project Voluntary Advisory Board
- What Have We Learned from this Project?
- Ways to Improve the Network
- Q & A

Project Overview

- Year 1
  - Hired contractors and began construction of 7 sites
  - Established Voluntary Advisory Board
- Year 2
  - Completed construction of sites, acceptance testing of sites & began reporting data April 1, 2005 (collected data for 6 months of Year 2) through TCEQ & project websites
- Years 3 & 4
  - Continued collection & reporting of data; optimized operation of sites to maximize use of project funds
  - Project remains on schedule & within budget

Air Monitoring Network, Site Designations and Major Instrumentation

Contract Reference	TCEQ CAMS No.	Description of Site Location	Major Monitoring Equipment/Systems				
			Auto GC	Event Triggered Sampler	H2S & SO2 Monitor	Meteorology Station	Surveillance Camera
1.a	634	Oak Park Recreation Center	Yes			Yes	
1.b	629	Grain Elevator @ Port of Corpus Christi		Yes	Yes	Yes	
1.c	630	J. I. Hailey Site @ Port of Corpus Christi		Yes	Yes	Yes	
1.d	635	TCEQ Monitoring Site C199 @ Dona Park		Yes	Yes	Yes	Yes
1.e	631	West End of CC Inner Harbor @ Port of Corpus Christi		Yes	Yes	Yes	
1.f	632	Off Up River Road on Flint Hills Resources easement		Yes	Yes	Yes	
1.g	633	Solar Estates Park at end of Sunshine Road	Yes		Yes	Yes	Yes

Air Monitoring Network Site Locations

Project Budget

- Of total project costs for first 3 years, only site construction (1.5 years) and 1.5 year of operations & maintenance (O&M) costs have been funded by this project
- Additional funds provided by a Supplemental Environmental Project (SEP) awarded by the TCEQ funded O&M costs for one year
- Beginning October 2, 2006, all O&M costs are being charged to this project.
- Total expenditures for the first 4 years of the project included only 1.5 year of O&M costs

Project Financial Status

Expenditures

Total for prior years	$2,416,589.38
Current year (ending 9/30/07)	$782,424.65
Total* to date (9/30/07)	$3,199,014.03

* Initial budget estimated $2,300,000 for site construction & deployment and $967,349 for operations & maintenance after construction for approximately 1.5 year for a total initial estimate of $3,267,349; Actual costs were $3,199,014.03.

Funds Remaining

Initial deposit (10/2/03)	$6,761,718.02
Less expenditures to date (9/30/07)	($3,199,014.03)
Plus interest earned to date (9/30/07)	$533,138.93
Project funds remaining**	$4,095,842.92

**The remaining project funds plus future interest earned are estimated to allow the project to operate for four more years (total of 8 years compared to initial estimate of 7 years) to September 2011, assuming no extraordinary costs arise.

Statement by Representatives of the Volunteer Advisory Board

Ms. Gretchen Arnold
Mr. Ron Barnard

What Have We Learned from this Project?

- Established baseline quantitative air quality data
- Increased understanding of the impact of the port & refinery operations on air quality
- Ability to assess the impact of future port & refinery operation expansions (e.g., LNG)

DATA ANALYSIS

- Description of monitoring network & emission sources
- Establishing an air quality ***baseline*** in Corpus Christi residential areas
  - How do baselines compare to effects screening levels and standards?
  - How do baselines compare to other Texas cities?
  - How are baselines changing over time?
- Examining air pollution ***events*** in Corpus Christi as detected by the monitoring network
- Conclusion

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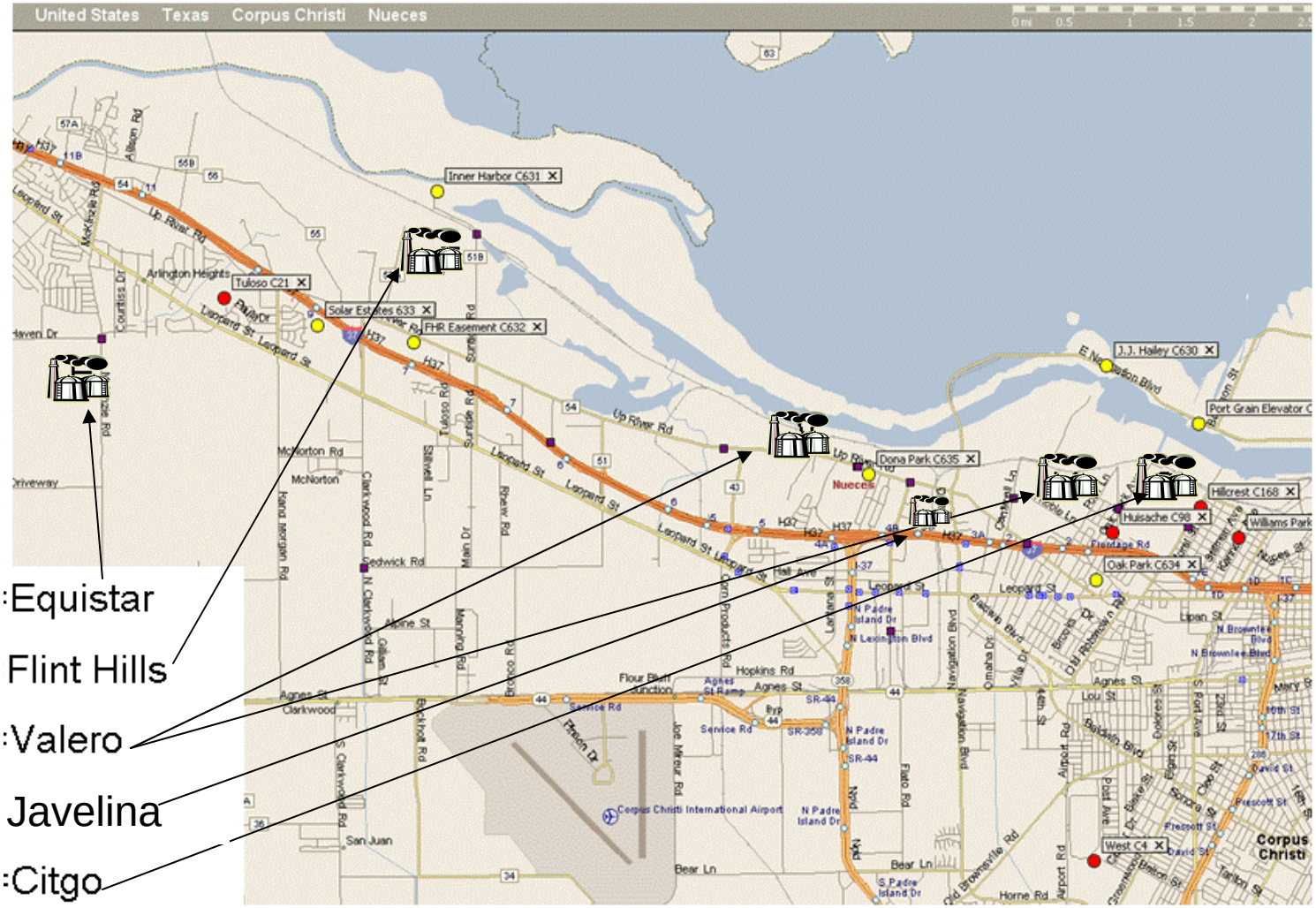
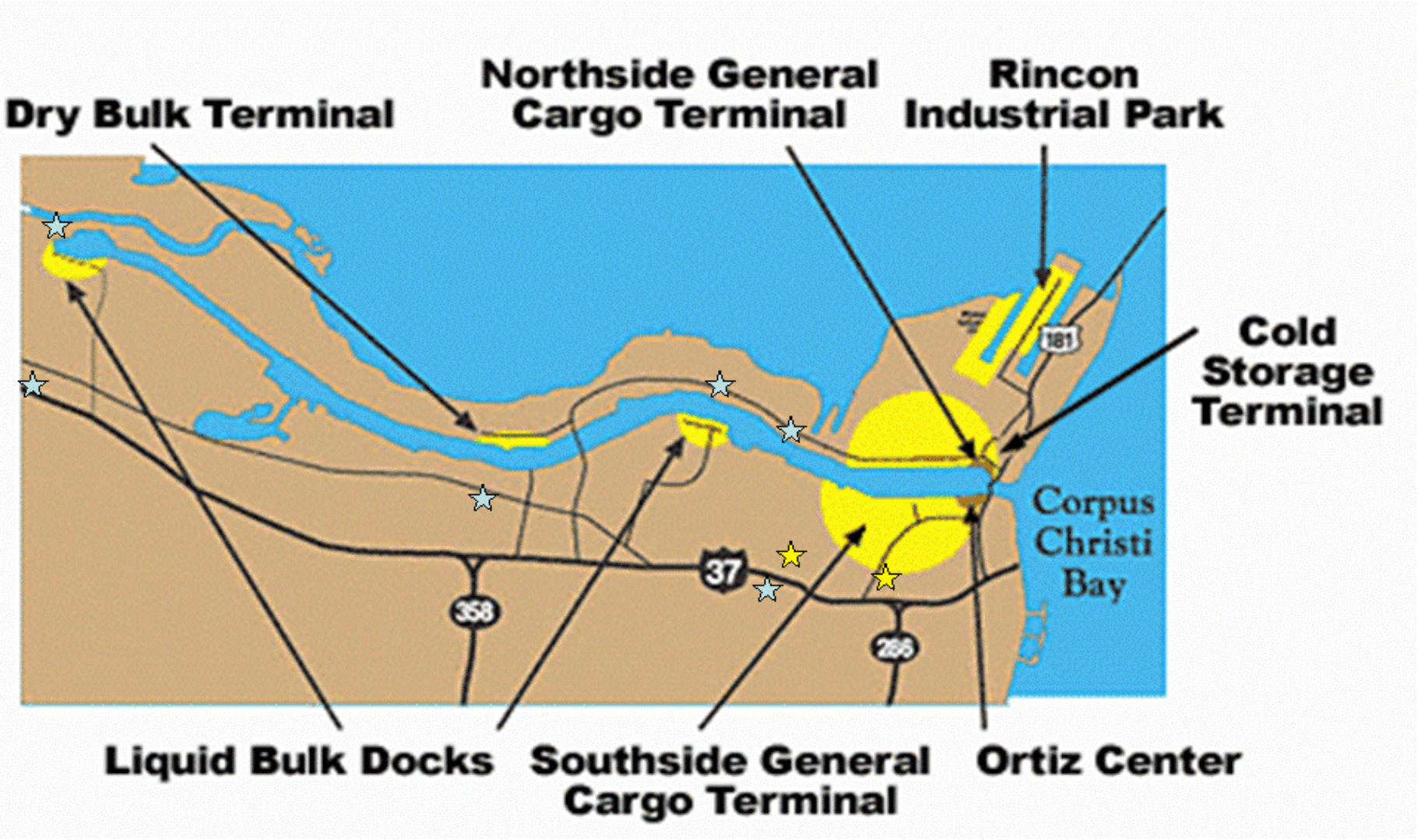
Air Monitoring Network Site Locations

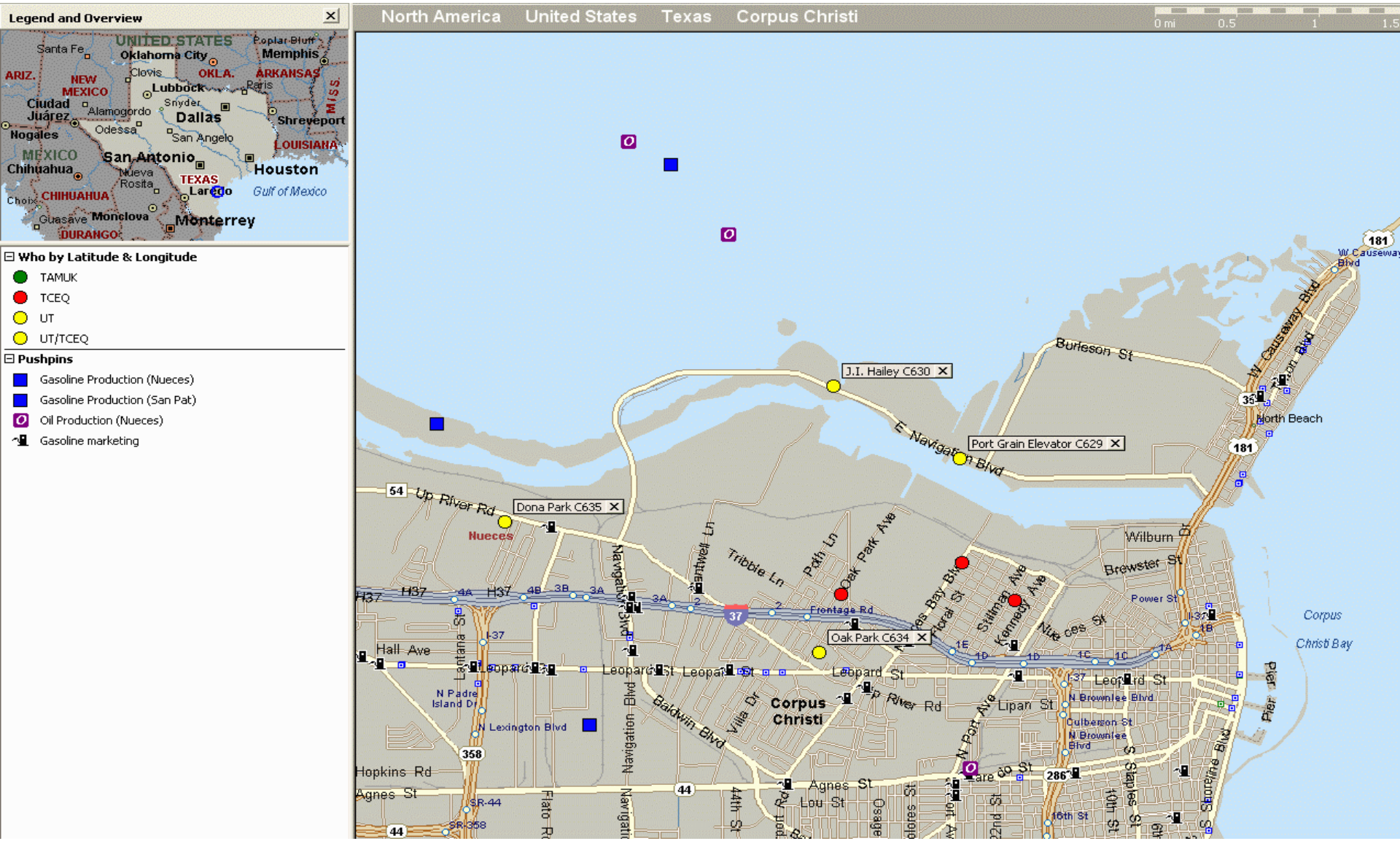
Monitors and Emissions - Industry



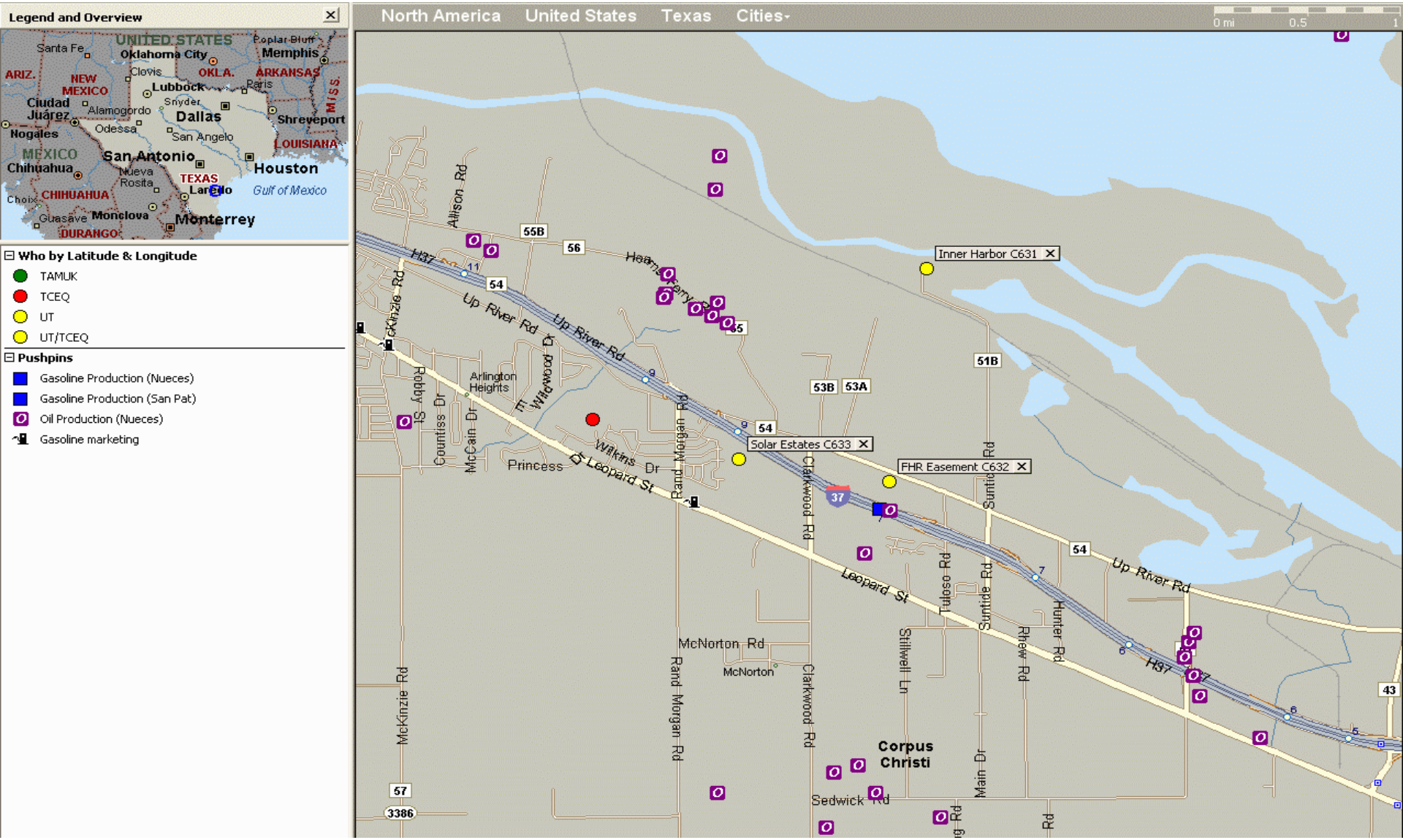
Monitors and Emissions - Shipping



Small Emission Sources Eastern Network



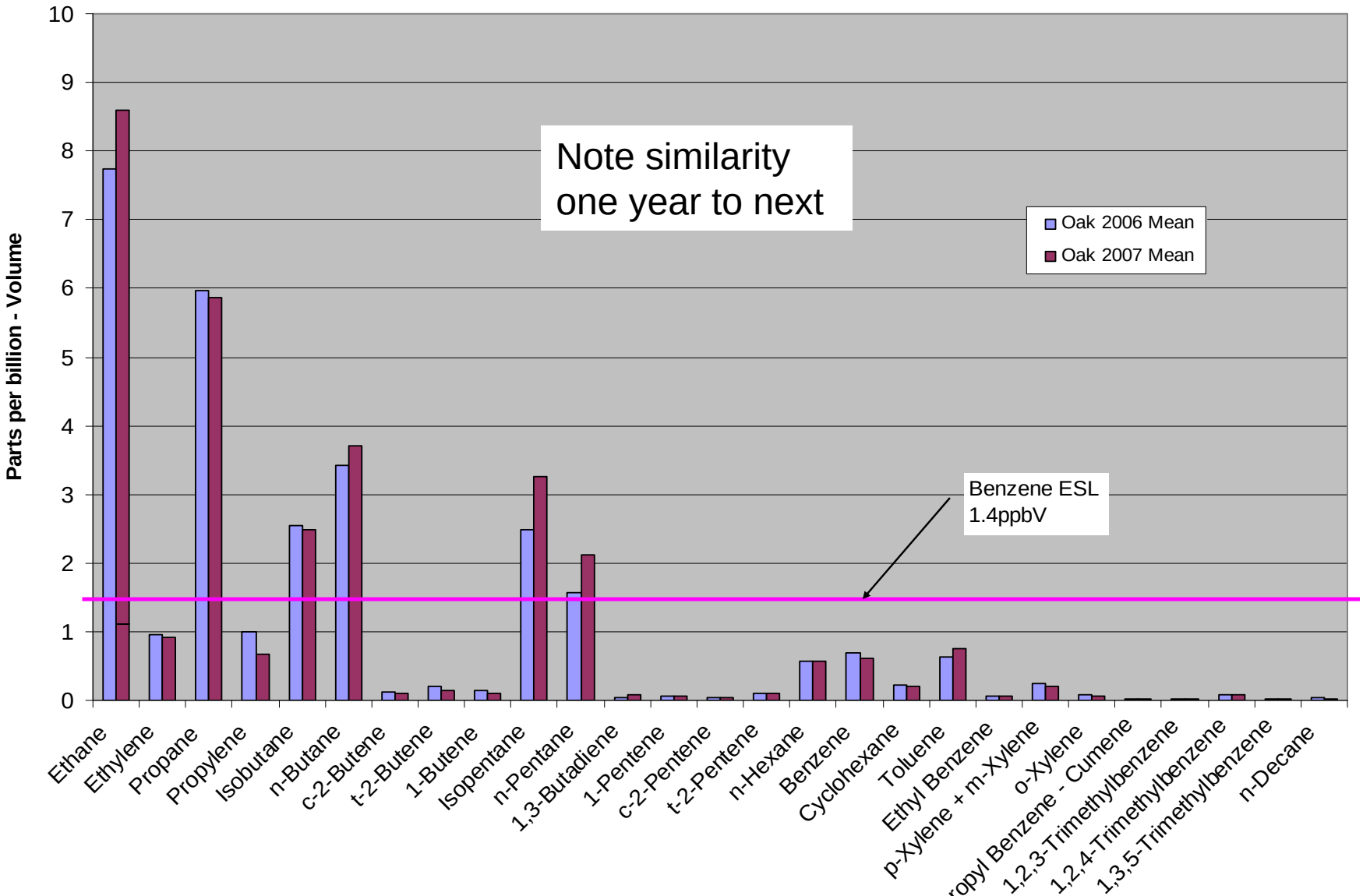
Small Emission Sources Western Network



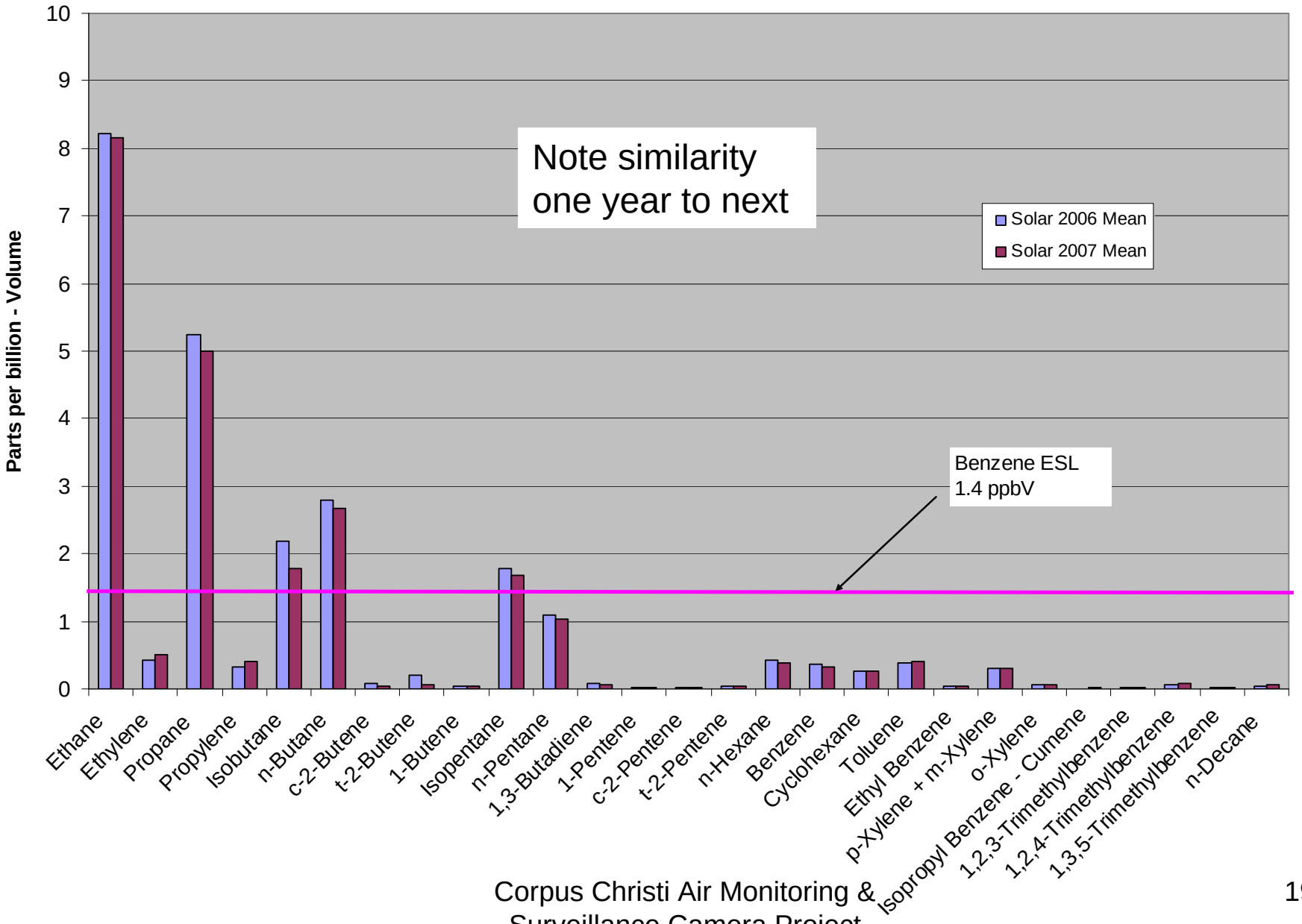
Baseline for Volatile Organic Compounds (Hydrocarbon Chemicals) in the Air

- No measured concentrations at or above TCEQ long-term health effects screening levels. Benzene occasionally above short-term ESL.
- VOCs higher at Oak Park than at Solar Estates; Oak, Solar lower than Upper Gulf Coast cities, higher than other urban areas.
- VOC concentrations relatively unchanged 2006-2007.

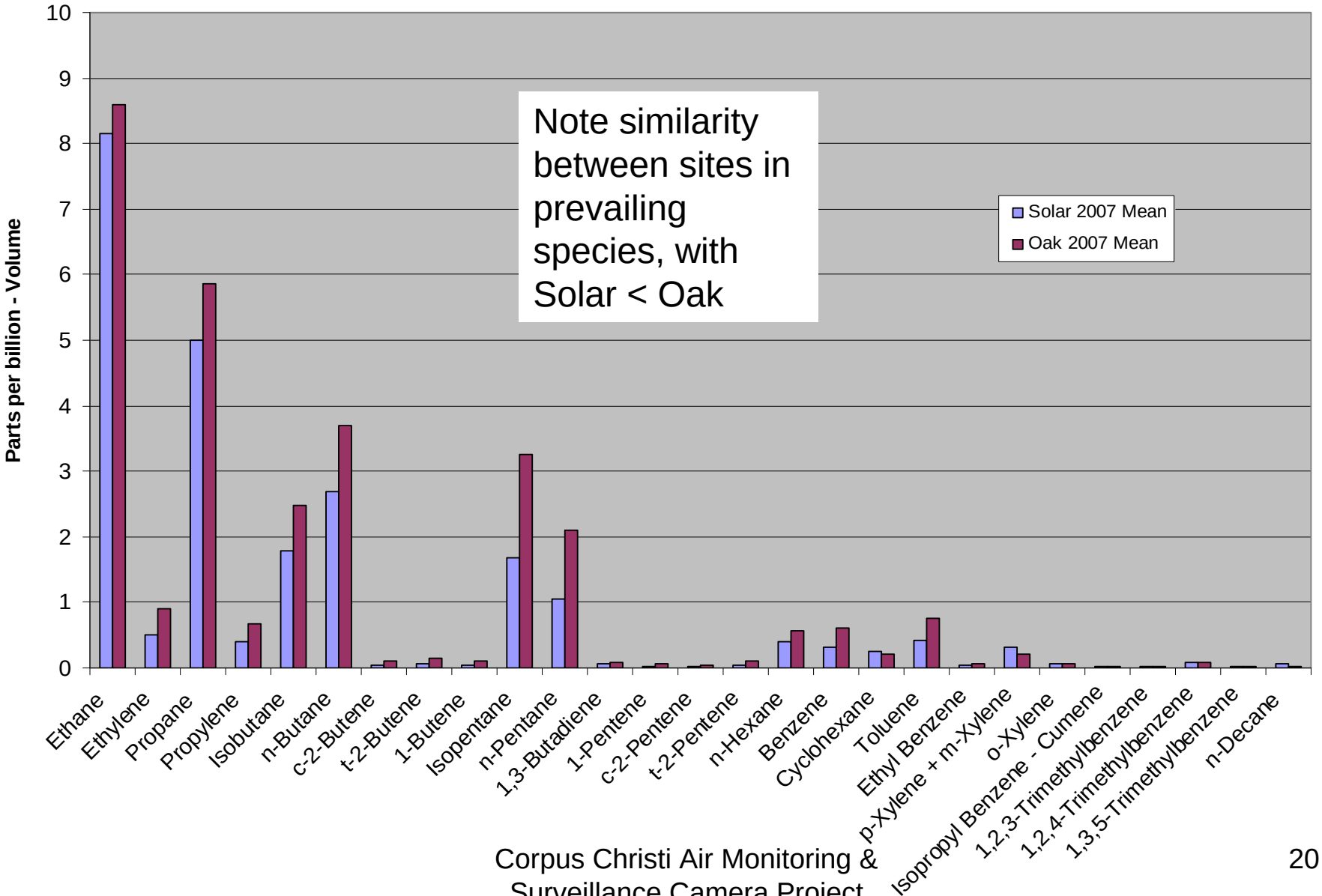
Comparing Mean Concentrations at Oak Park 2006-2007, ppbV Units with New Benzene Effects Screening Level



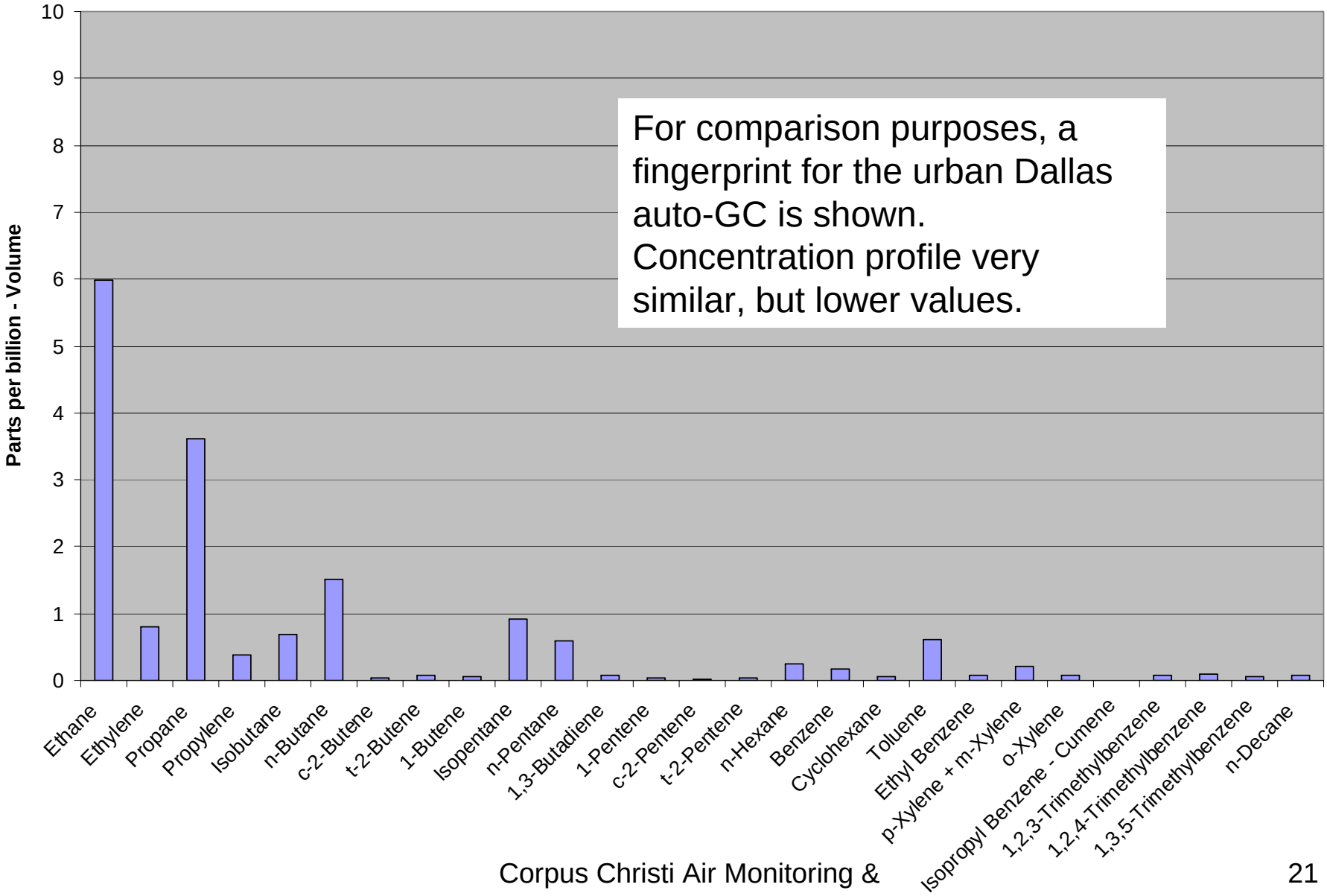
Comparing Mean Concentrations at Solar Estates 2006-2007, ppbV units, with New Benzene Effects Screening Level



Comparing Mean Concentrations at Solar vs Oak in 2007, ppbV units



Mean Concentrations in Dallas, 2006-2007 combined, ppbV units



Comparing Total Hydrocarbons in Texas

ppb-C units	Target Compounds	Total Hydrocarbons	ratio target/total
Beaumont-Nederland	156.34	168.44	93%
Houston-Deer Park	125.40	143.58	87%
Oak Park	120.82	136.79	88%
Solar Estates	99.13	111.35	89%
El Paso-Chamizal	85.34	98.87	86%
Fort Worth-Meacham	83.91	94.93	88%
Dallas-Hinton	65.32	75.78	86%

- For all sites, about 90 % of hydrocarbon mass identified.
- Corpus Christi sites fall in middle of the pack.
- All have similar mean composition.

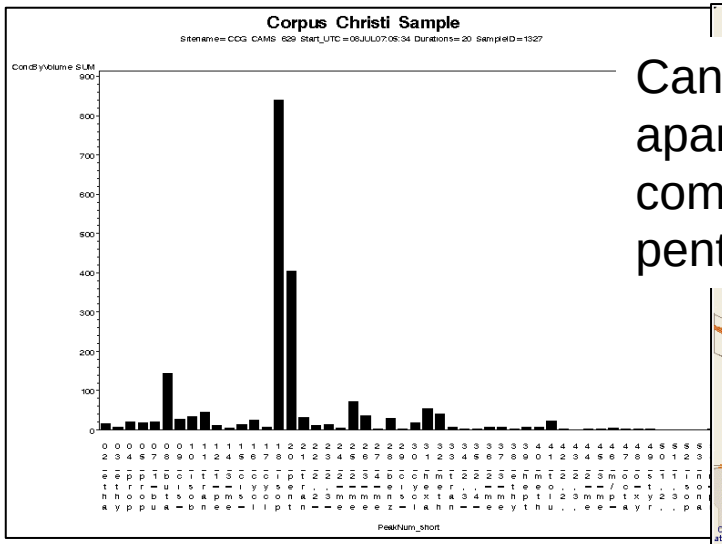
Air Pollution ***Events***

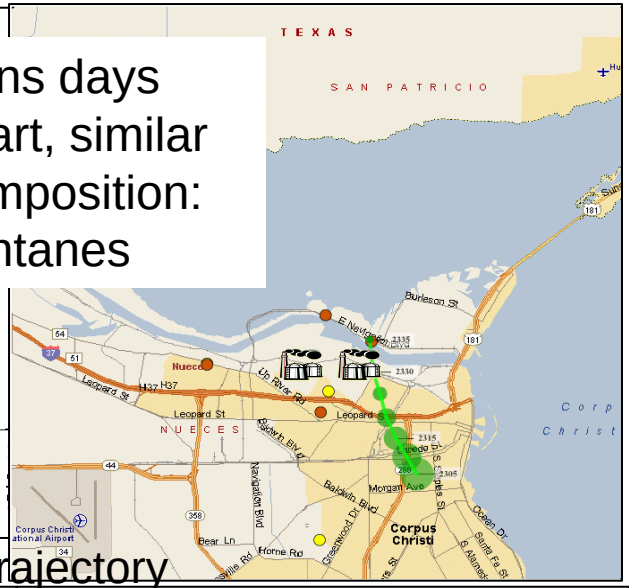
- Several different types of events detected
- Monitoring network provides chemical “fingerprints”
- Network rapidly provides back-trajectories to indicate possible upwind source locations
- Information is rapidy communicated to TCEQ
- Events are related shipping operations & refinery operations, other unknown factors.
- Occasional benzene > short-term ESL. Note that in Oct. 2007:
  - **short-term ESL** changed from 25.0 to **55.5 ppbV** and
  - **long-term ESL** changed from 1.0 to **1.4 ppbV**

Air Pollution ***Events***

- Alerts are sent to TCEQ & UT when specific short term thresholds are measured for sulfur species & VOCs
- If sulfur species averaged over 30 min. exceed thresholds, “exceedances” are logged by TCEQ Website.
- If TNMHC is > 2000 ppbC for 15 min., then canister sample is triggered.

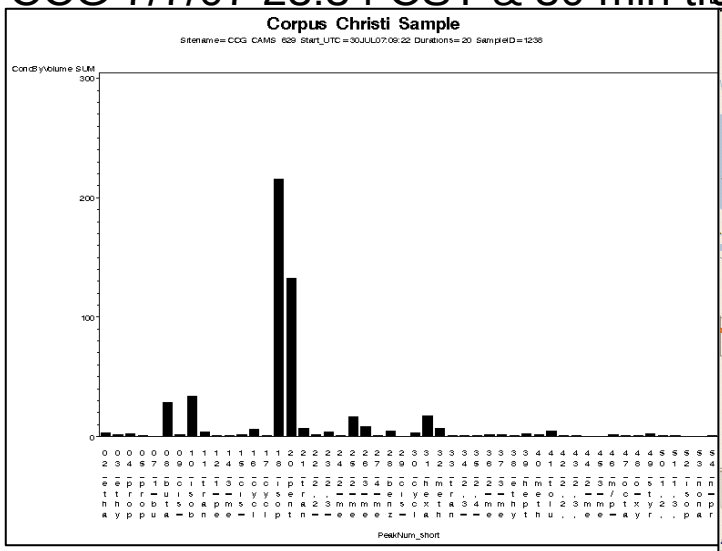
Recent Canisters at CC Grain





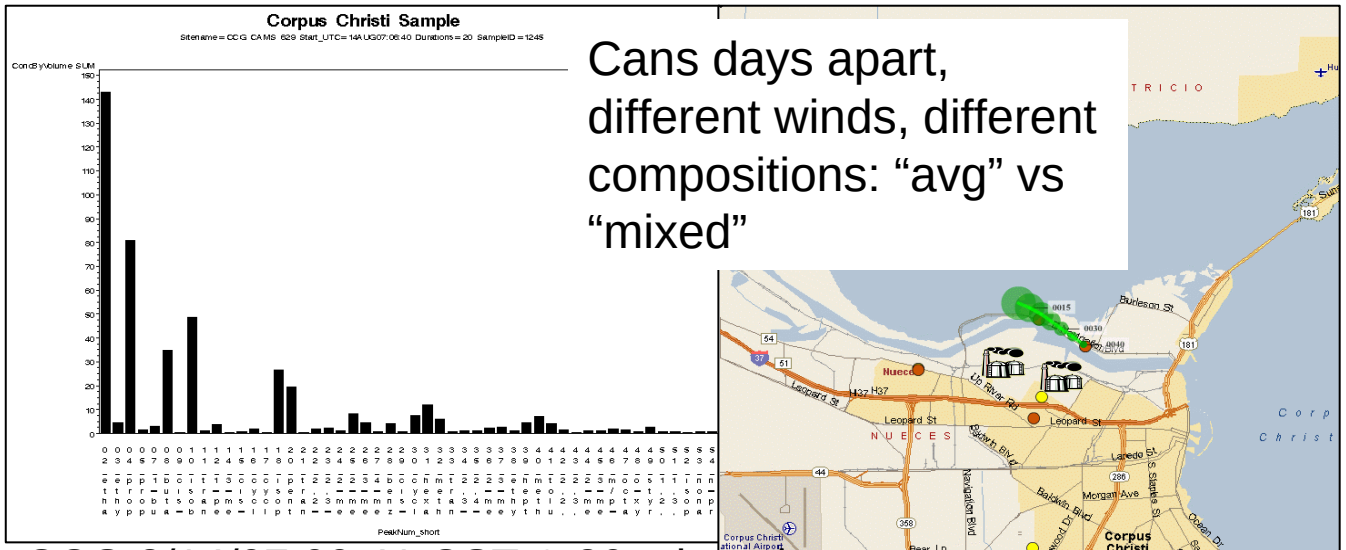
Cans days apart, similar composition: pentanes

CCG 7/7/07 23:34 CST & 30 min trajectory

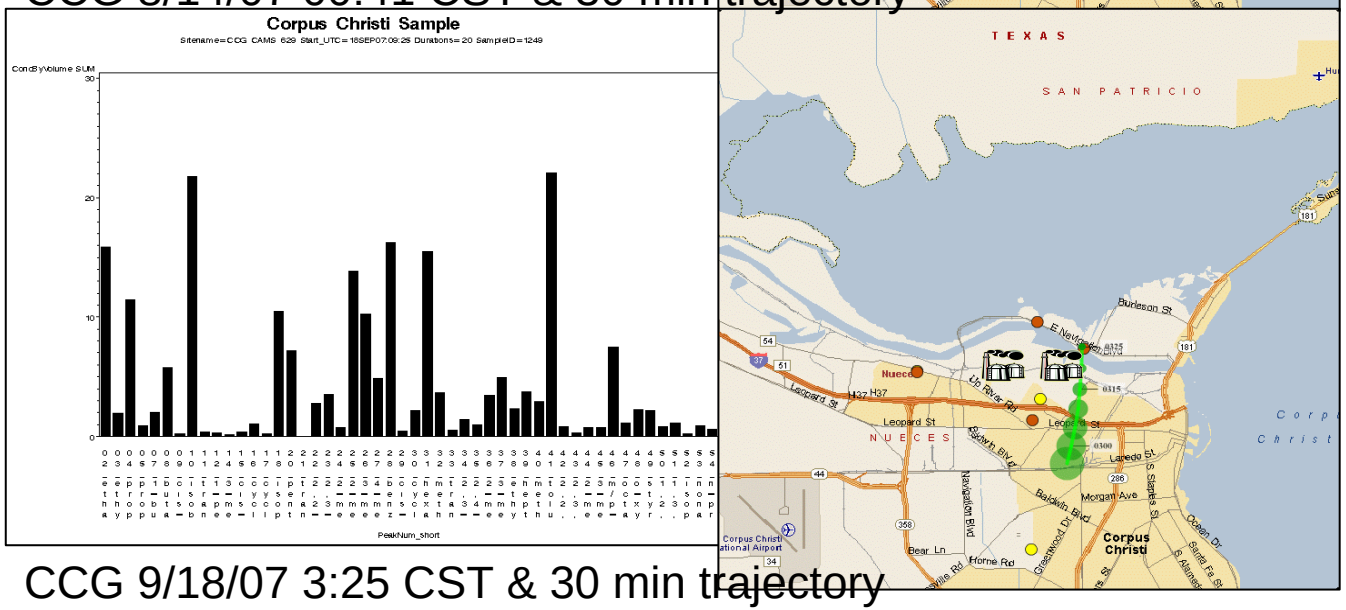


CCG 7/30/07 3:33 CST & 30 min trajectory

Recent Canisters at CC Grain

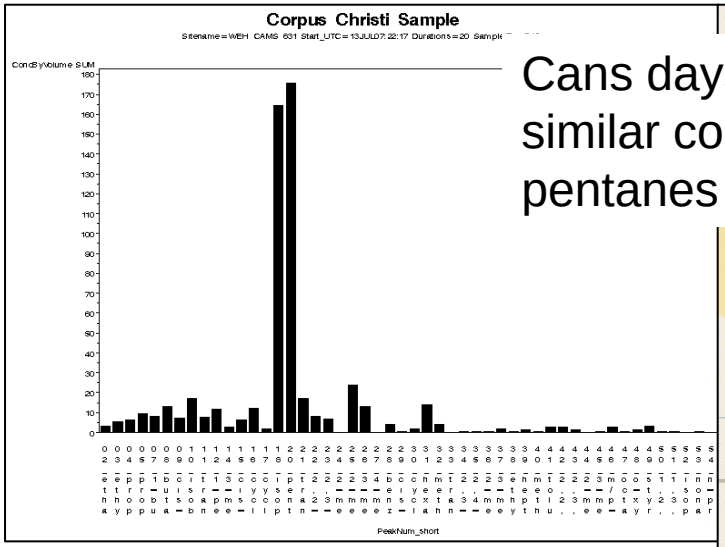


CCG 8/14/07 00:41 CST & 30 min trajectory



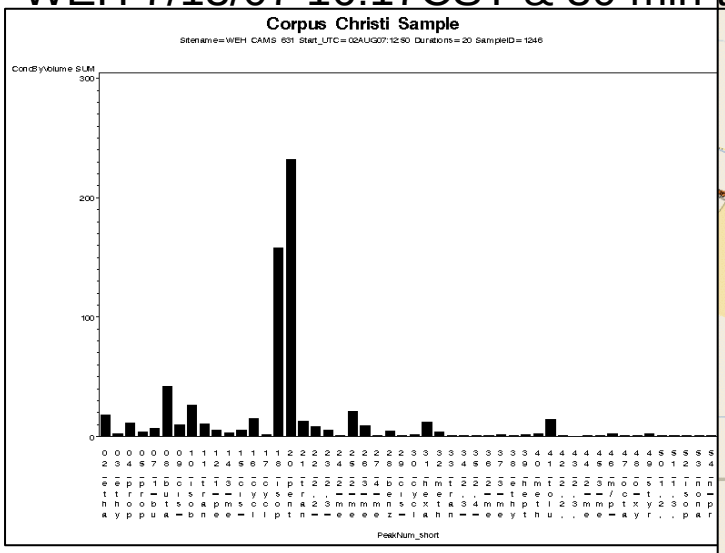
CCG 9/18/07 3:25 CST & 30 min trajectory

Recent Cans at West End Harbor



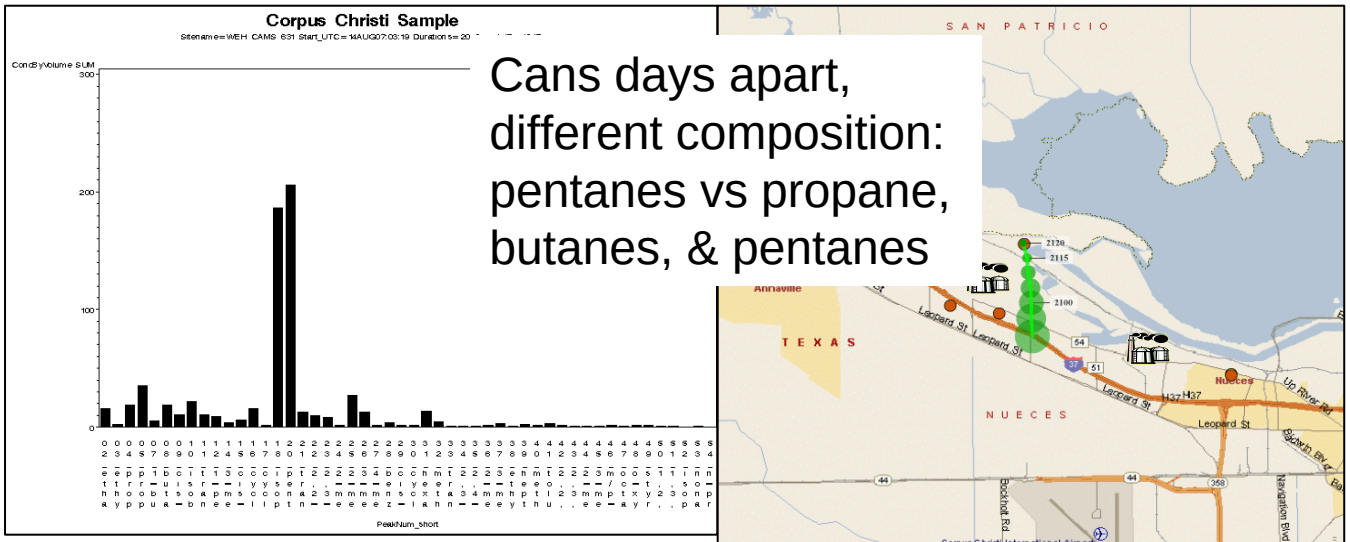
Cans days apart, similar composition: pentanes

WEH 7/13/07 16:17CST & 30 min trajectory



WEH 8/2/07 6:50 CST & 30 min trajectory

Recent Cans at West End Harbor

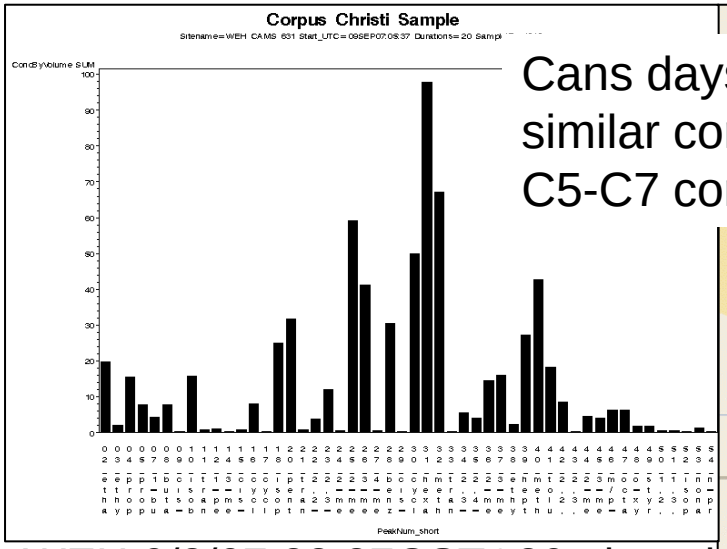


Cans days apart, different composition: pentanes vs propane, butanes, & pentanes

WEH 8/13/07 21:19 CST&30 min trajectory

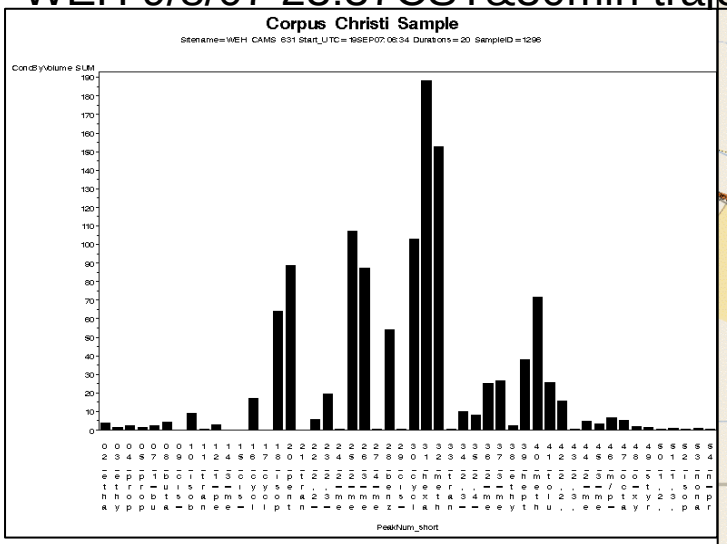
WEH 7/28/07 5:29 CST & 30 min trajectory

Recent Cans at West End Harbor



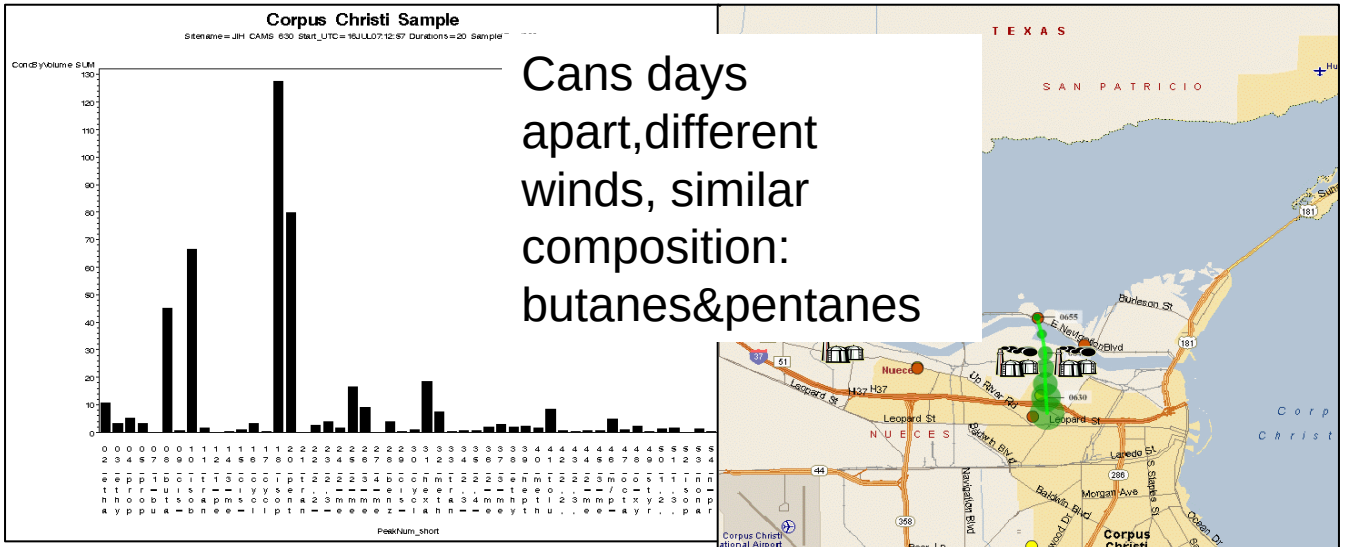
Cans days apart, similar composition: C5-C7 compounds

WEH 9/8/07 23:37CST&30min trajectory



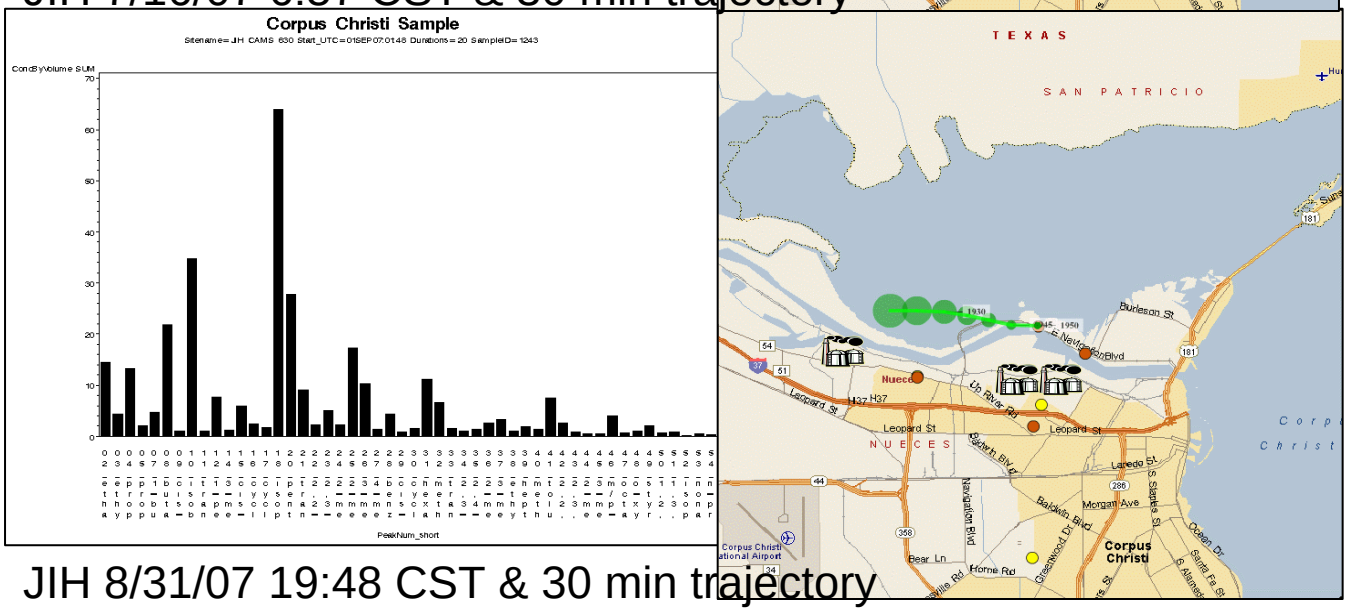
WEH 9/19/07 0:34CST&30min trajectory

Canisters at J. I. Hailey



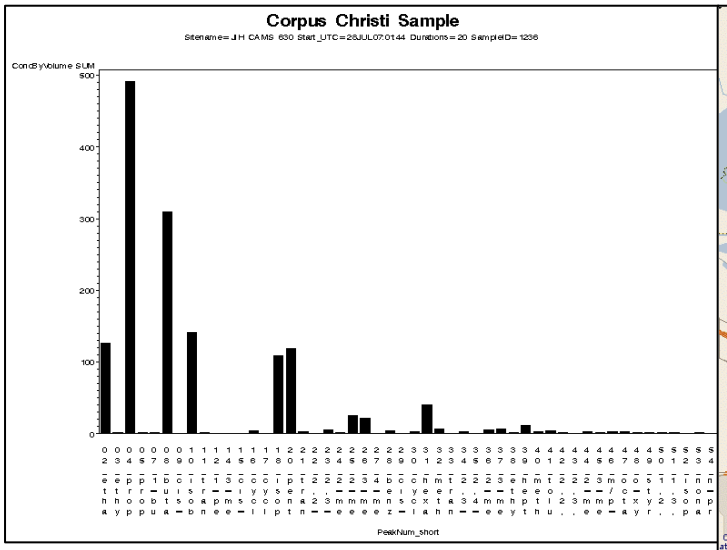
Cans days apart,different winds, similar composition: butanes&pentanes

JIH 7/16/07 6:57 CST & 30 min trajectory



JIH 8/31/07 19:48 CST & 30 min trajectory

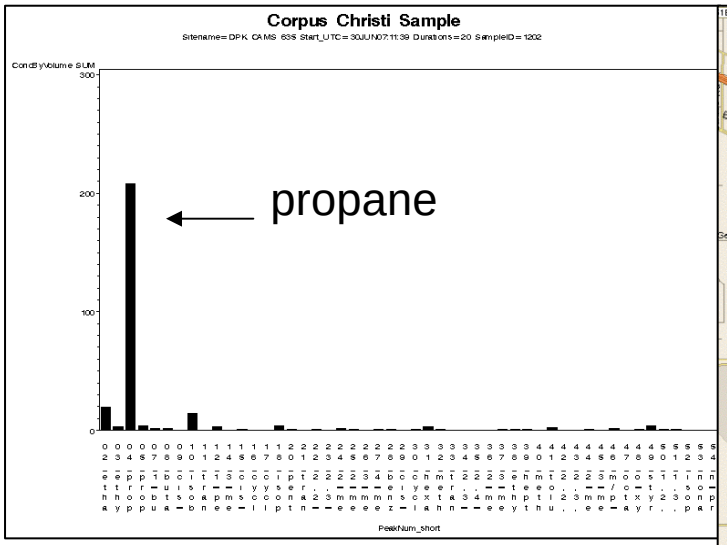
Canisters at J. I. Hailey

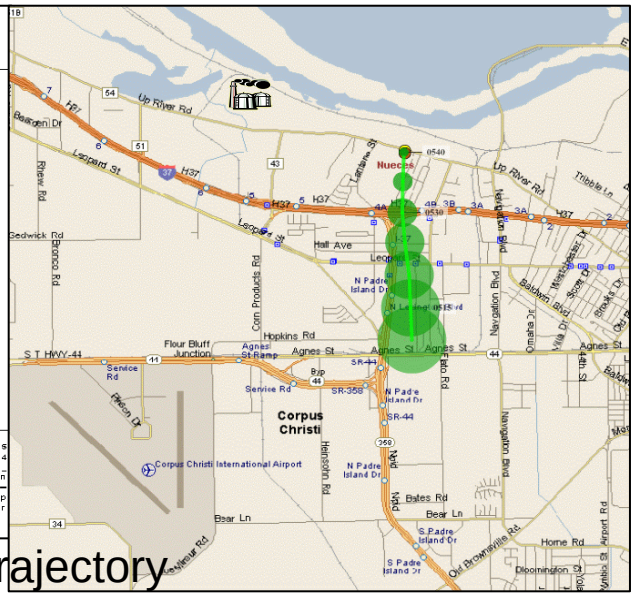


JIH 7/27/07 19:44 CST & 30min trajectory

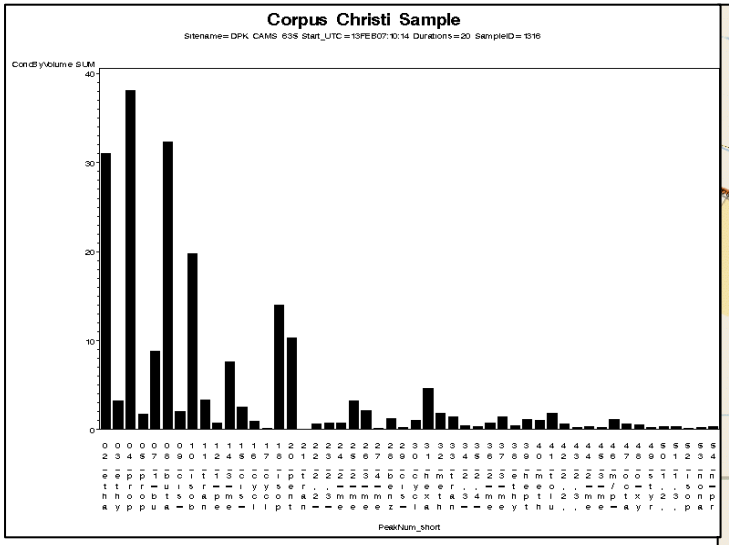
This episode also had elevated H_2S, and elevated H_2S and TNMHC persisted to next morning.

Canisters at Dona Park





DPK 6/30/07 5:39 CST & 30 min trajectory



DPK 2/13/07 4:14 CST & 30 min trajectory

H_2S event case studies

- May 3, 2007 JIH
- July 27, 2007 JIH

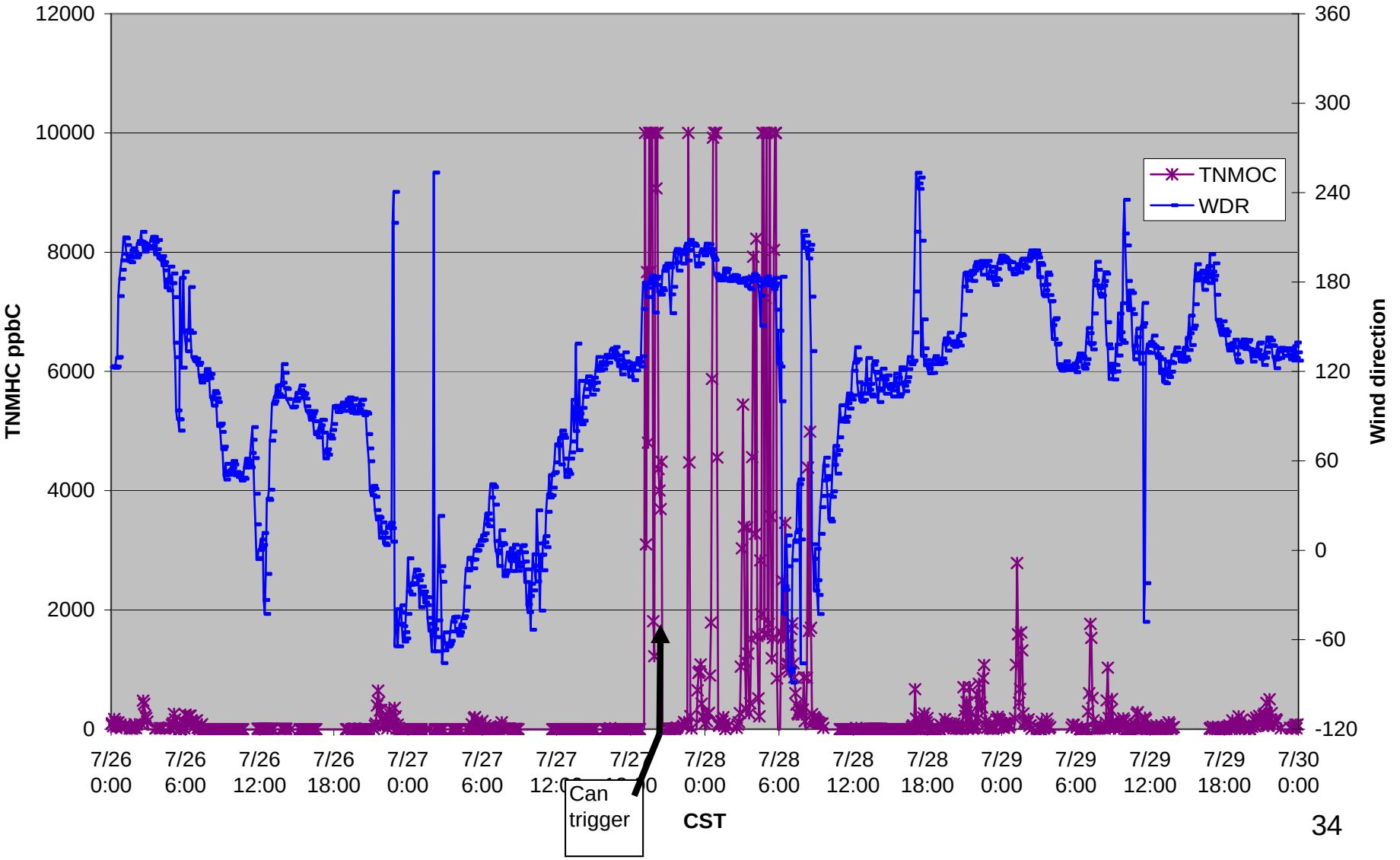
– Two dates on which alerts were received and state standard challenged at JIH site.

– May 3, max 30-min value = 113 ppb. Residential standard 80 ppb exceeded 13:40 – 14:25 CST, but not a residential area; 120 ppb industrial standard not exceeded….

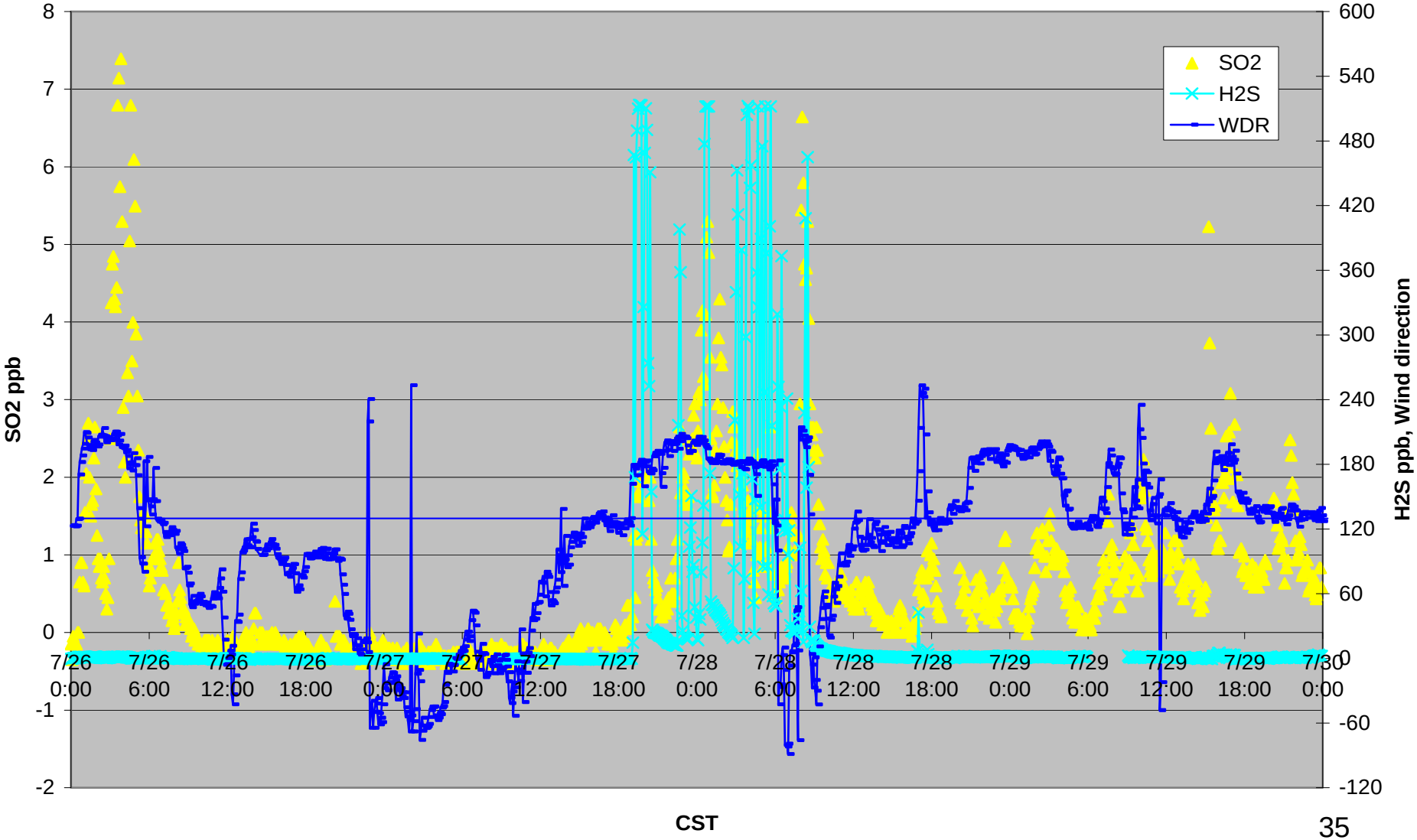
– July 27 – 28, max 30-min value = 500 ppb. Industrial standard 120 ppb exceeded 7/27 18:55 CST – 7/28 8:55 CST. Note significant cropping of H_2S & TNMHC.

– Both events associated with southerly winds.

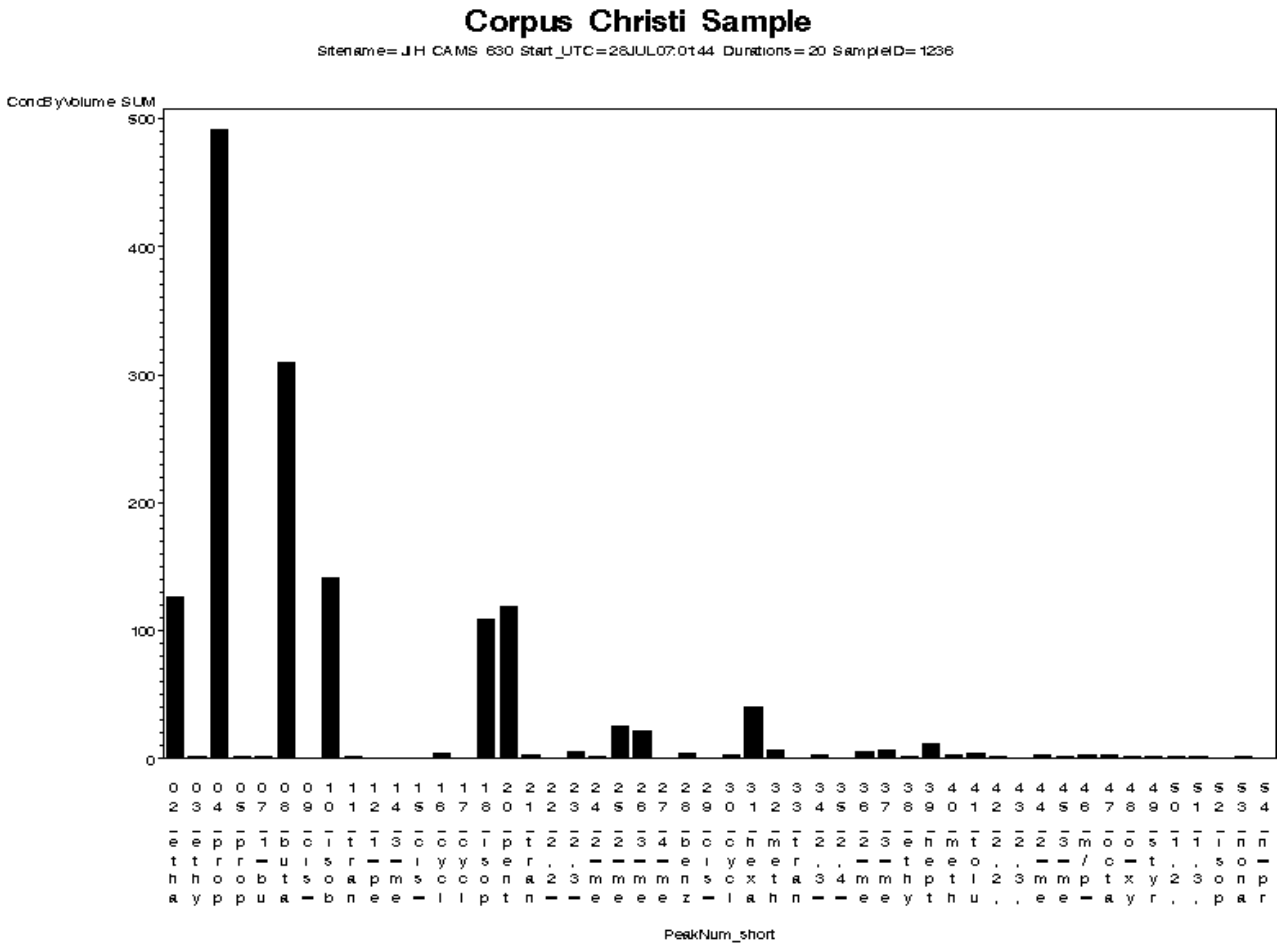
J.I. Hailey Event July 27-28, 2007



J.I. Hailey Event July 27-28, 2007

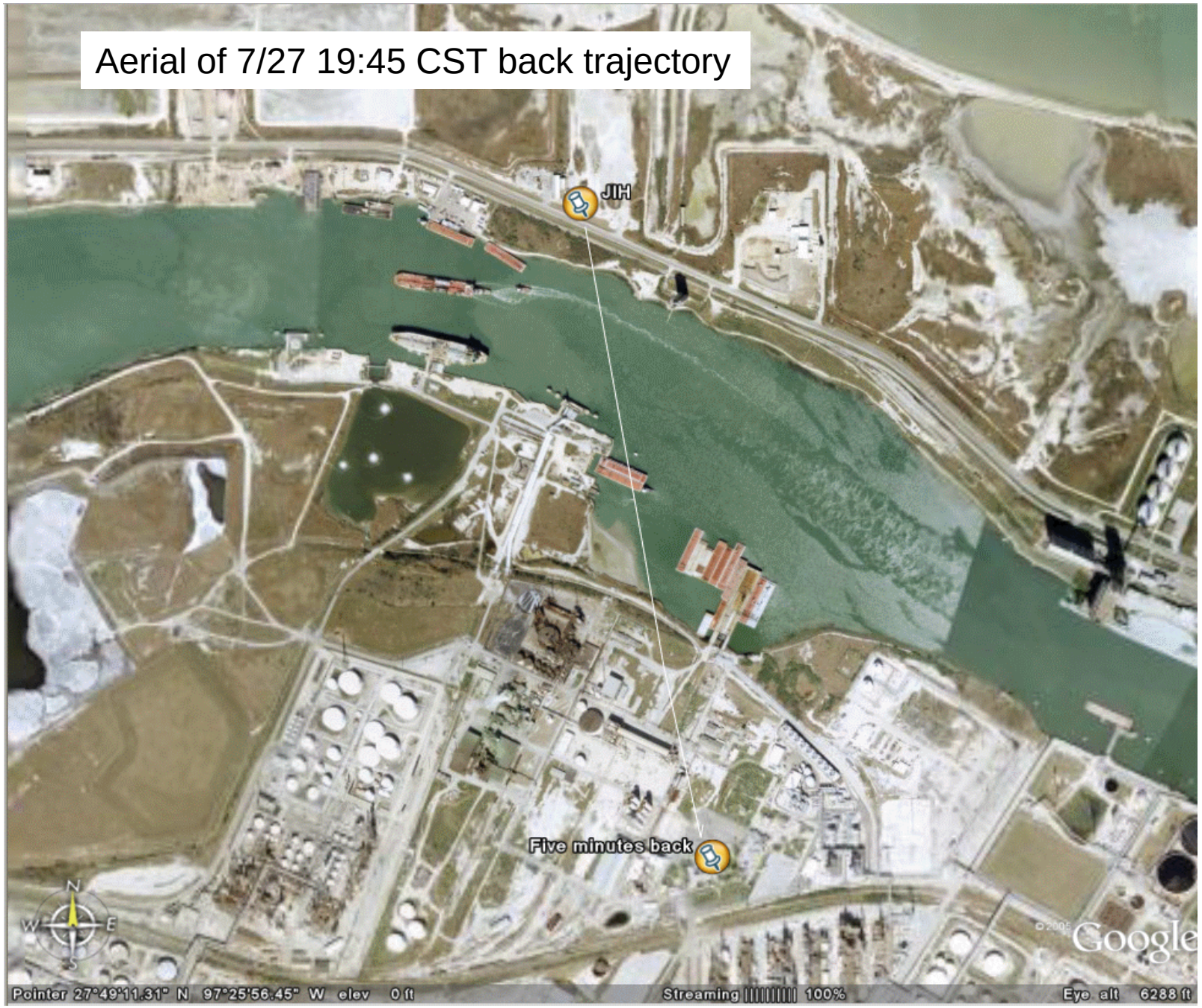


Canister at 19:44 CST 7/27 JIH with elevated H_2S & TNMHC



Species

02 ethane 03 ethylene
04 propane 05 propylene
07 1-butene 08 butane
09 cis-2-butene
10 isobutane
11 trans-2-butene
12 1-pentene
14 3-methyl-1-butene
15 cis-2-pentene
16 cyclopentane
17 cyclopentene
18 isopentane 20 pentane
21 trans-2-pentene
22 2,2-dimethylbutane
23 2,3-dimethylbutane
24 2-methyl-1-pentene
25 2-methylpentane
26 3-methylpentane
27 4-methyl-1-pentene
28 benzene 29 cis-2-hexene
30 cyclohexane 31 hexane
32 methylcyclopentane
33 trans-2-hexene
34 2,3-dimethylpentane
35 2,4-dimethylpentane
36 2-methylhexane
37 3-methylhexane
38 ethylbenzene
39 heptane
40 methylcyclohexane
41 toluene
42 2,2,4-trimethylpentane
43 2,3,4-trimethylpentane
44 2-methylheptane
45 3-methylheptane
46 m/p-xylene 47 octane
48 o-xylene 49 styrene
50 1,2,4-trimethylbenzene
51 1,3,5-trimethybenzene
52 isopropylbenzene
53 nonane
54 n-propylbenzene


Aerial of 7/27 19:45 CST back trajectory
JIH
Five minutes back
N
W
E
S
Google
Pointer 27°49'11.31" N 97°25'56.45" W elev 0 ft
Streaming 100%
Eye alt 6288 ft

What actually happened?

- (From TCEQ) Theory is that a ship that had unloaded sour crude oil (>3% sulfur) on July 26, 2007 was the source of these emissions.
  - The ship was receiving a load of "cut residual" during this time frame. Material being loaded had a low (<1.5 psi) vapor pressure and low sulfur content, however residual vapors in the ship from the crude oil were forced from the ship during loading of the cut resid, thus causing the elevated levels of pollutants detected.
- This monitor is in an unpopulated, industrial area. No complaints were received by the regional office during this time frame.

Conclusion

- New on-line tools – UT Trajectory Tool, Internet-based maps & aerials, LEADS Web pages – are very useful.
- Baseline air quality now well-established, will allow assessment of changes in the future
- Events detected by monitors continue to provide assistance in diagnosing sources of pollution.
  - Hourly benzene measurements occasionally greater than 1 hr ESL. Has not been greater than annual ESL.
  - H_2S occasionally greater than State standards.

Contact Information for Project Personnel

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Project Web Site: http://www.utexas.edu/research/ceer/ccaqp