Examining the 2006 Hourly VOC Emission Inventory

TexAQS II Principal Findings / Data Analysis Workshop

John Jolly and Danielle Nesvacil
TCEQ

May 31, 2007

Background

- TexAQS 2000 measurements showed ~ 10-100 fold underestimation in Houston point source VOC EI
- Point source EIs from 2000-2004 did not respond to this finding – in fact, slight decrease in total reported VOC from 2000 → 2004
- TCEQ HRVOC process flow monitoring (flares, cooling towers) implemented Jan. 2006 (some enhanced fugitives monitoring started earlier)
- TCEQ Hourly Inventory (8/15 – 9/15/2006) is thus the first EI in Houston to incorporate this monitoring on a broad scale… **What does this inventory tell us about reported VOCs in the HRVOC monitoring era?**

Method

- Compared 2006 Hourly EI against the TCEQ 2004 Ozone Season Daily EI (OSD EI)
  - For accounts (plants) common to both Hourly and OSD, compared only where matching process units and emission points (i.e. FINs and EPNs)
  - Summed Hourly EI emissions across entire period (lb/32 days)
  - For comparison, calculated same rate for OSD
- Focused on comparison of aggregated 32-day Hourly emission rates vs OSD rates, rather than analyzing hourly variation

The Hourly Emission Inventory

- 141 Accounts (plants) selected from 24 counties
  - HGB, Beaumont, Corpus Christi / Victoria, and elsewhere within TXAQS II study area
  - 247 total species reported, including VOCs, nonreactives, CO, NOx, and SO_2
- Plants typically reported emissions for process units that had some amount of monitoring data available
- Hourly variation greater than that seen in 2005 “pilot” hourly EI

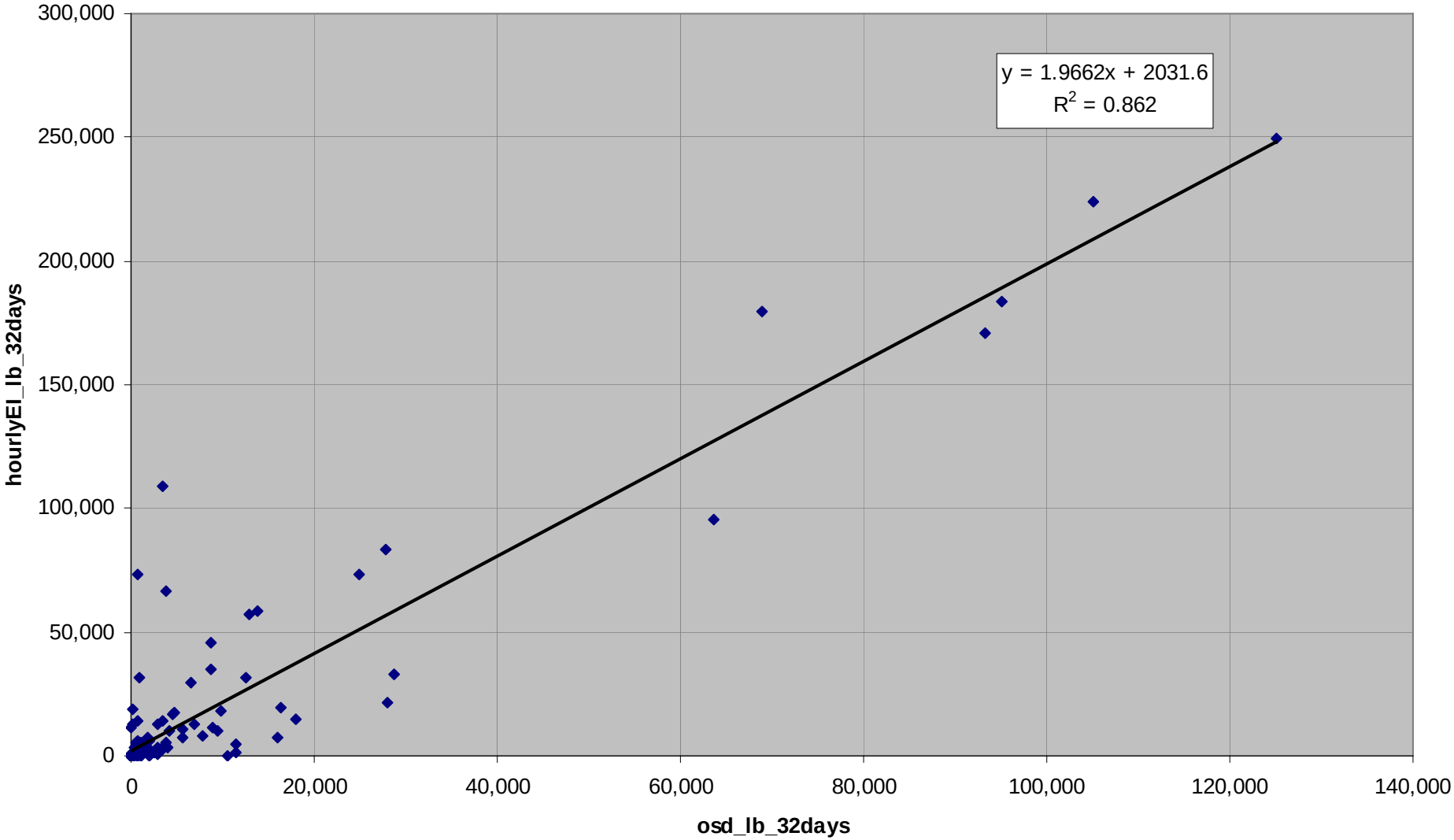
The HGB VOC Hourly EI

- 79 accts, 405 paths (process units * emission point combinations) – less than 2% of paths in OSD EI

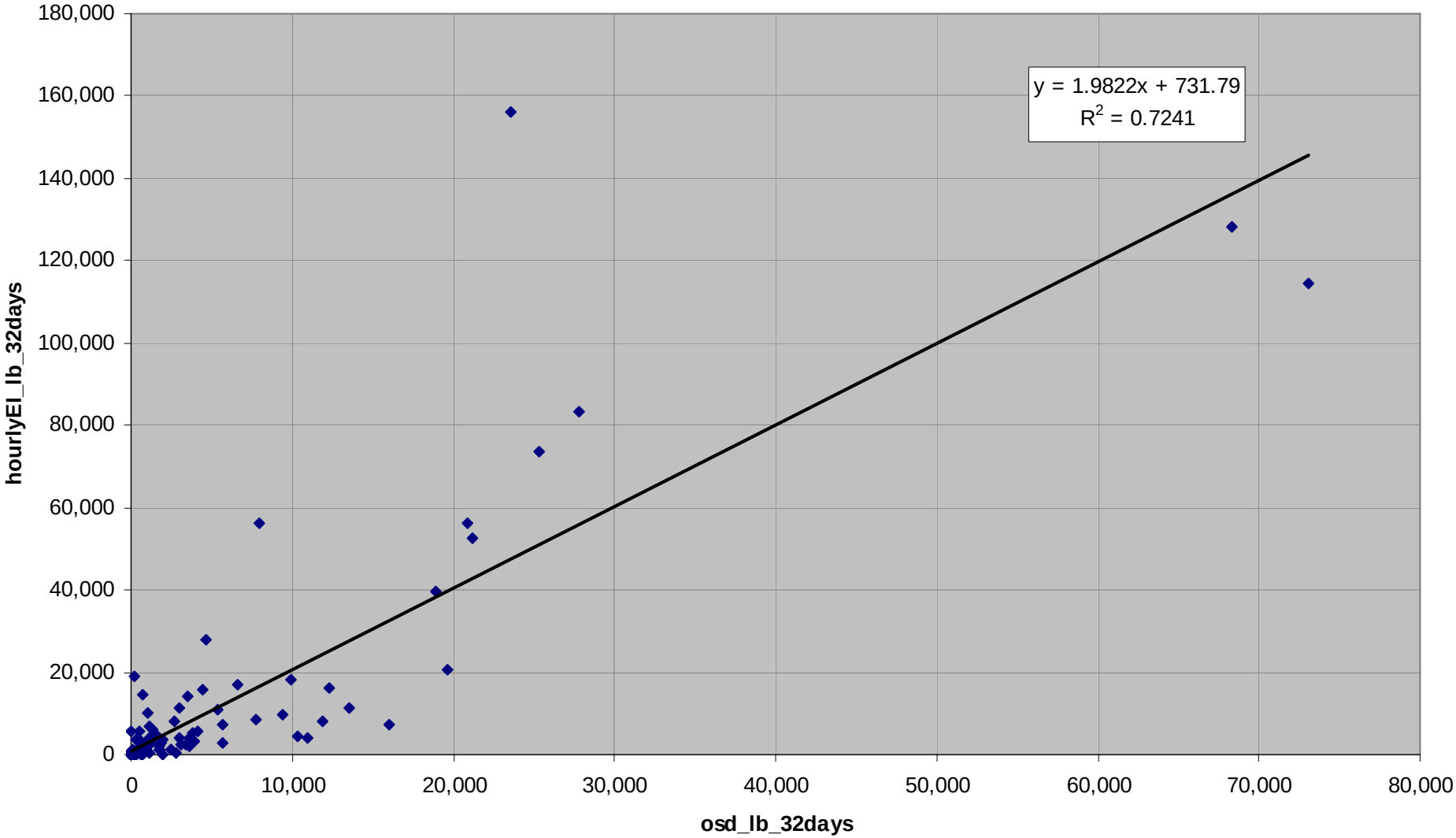
- Emissions from these paths encompass 16% of OSD EI (17% in Harris County)

Total VOC Emissions, by Geographical Group, Hourly EI vs OSD EI			
Group	**hourlyEI_lb_32days**	**osd_lb_32days**	**HourlyEI_OSDEI_ratio**
24 County	4,780,019	2,506,625	1.91
HGB 8 County	2,238,403	1,225,840	1.83
Harris County	1,165,652	676,541	1.72

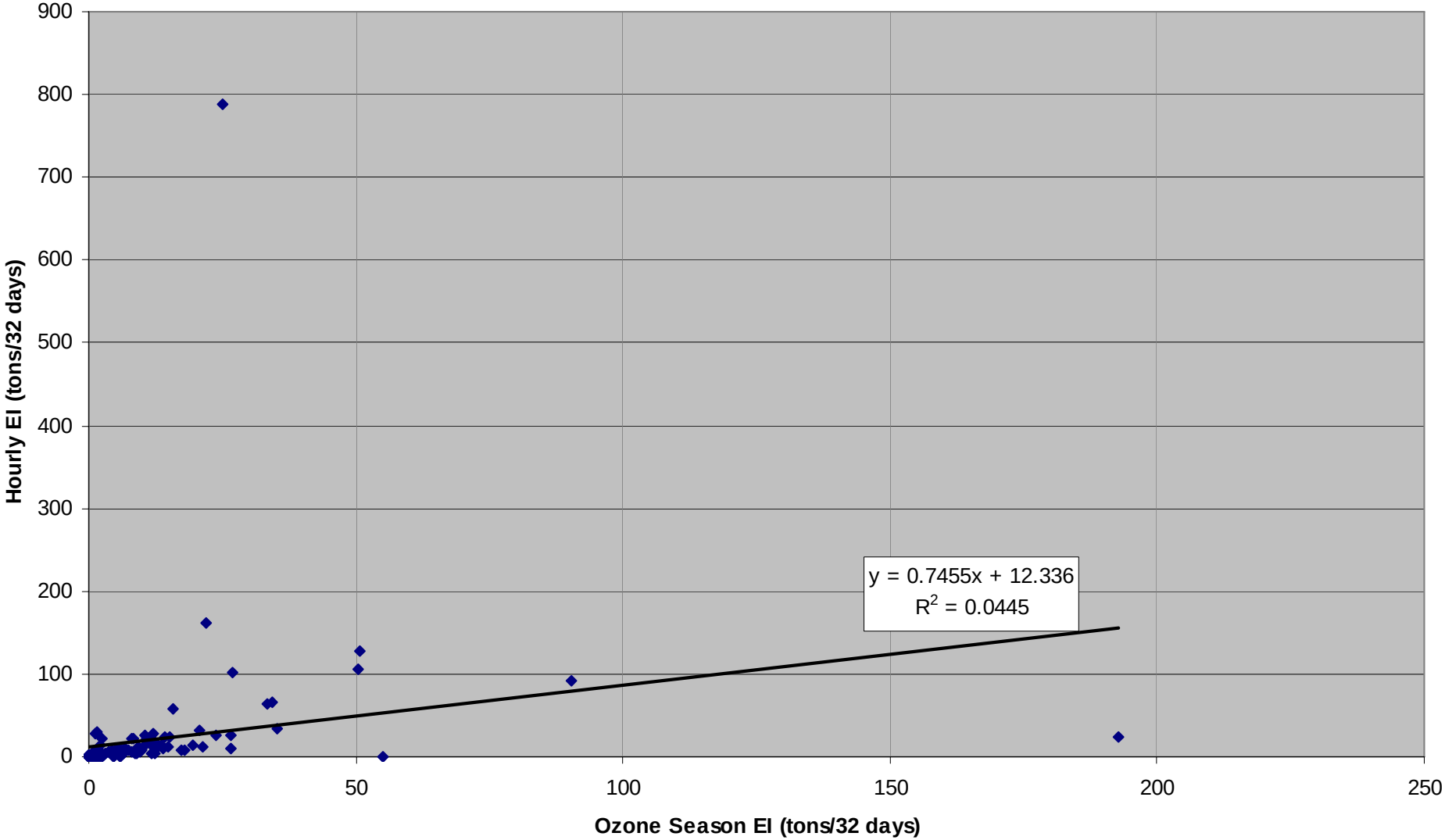
8-County HGB Hourly EI vs OSD EI
Total Emissions per Compound
(N=165 cpds)



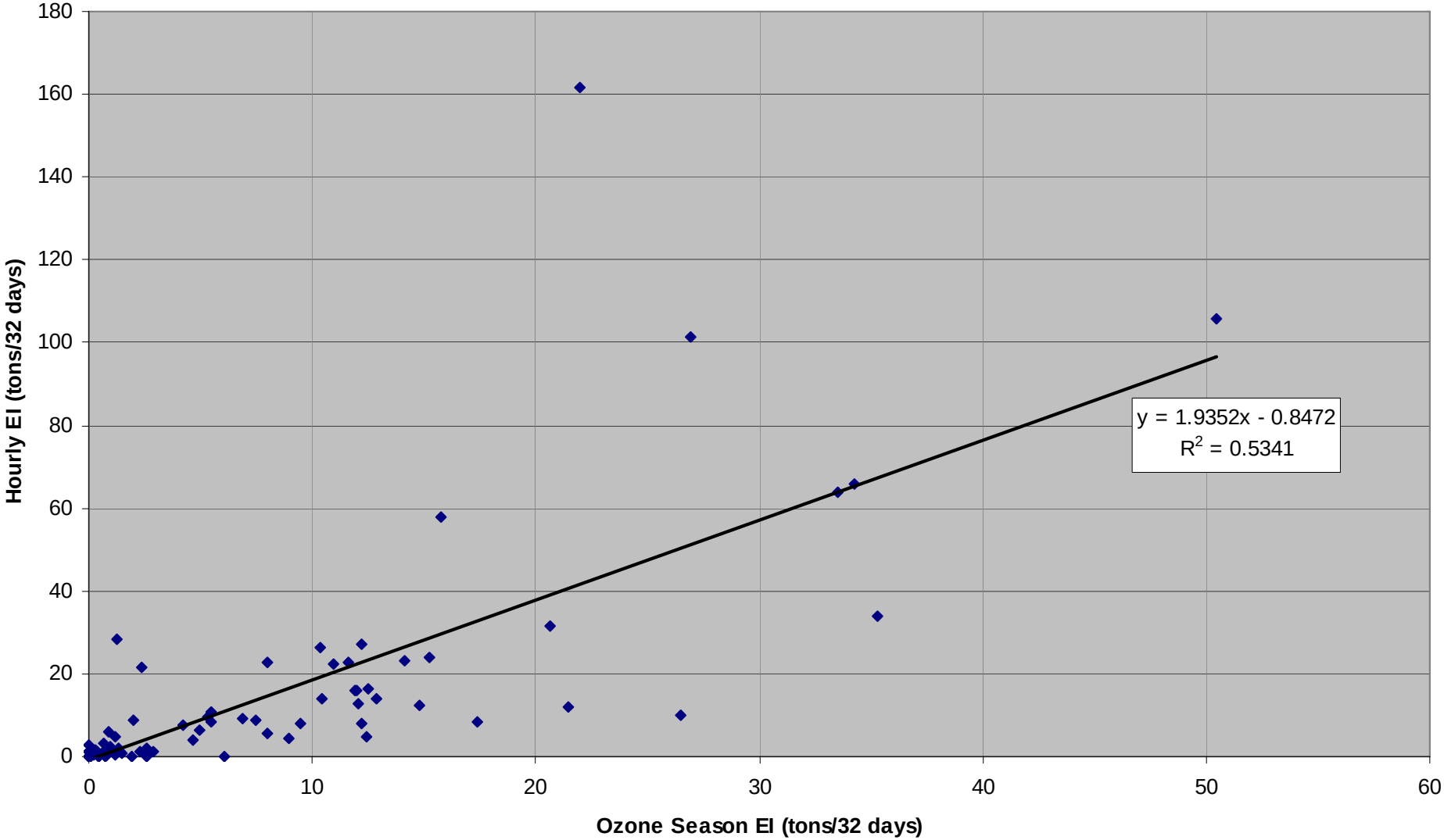
Harris County Hourly EI vs OSD EI
Total Emissions per Compound
(N=143 cpds)



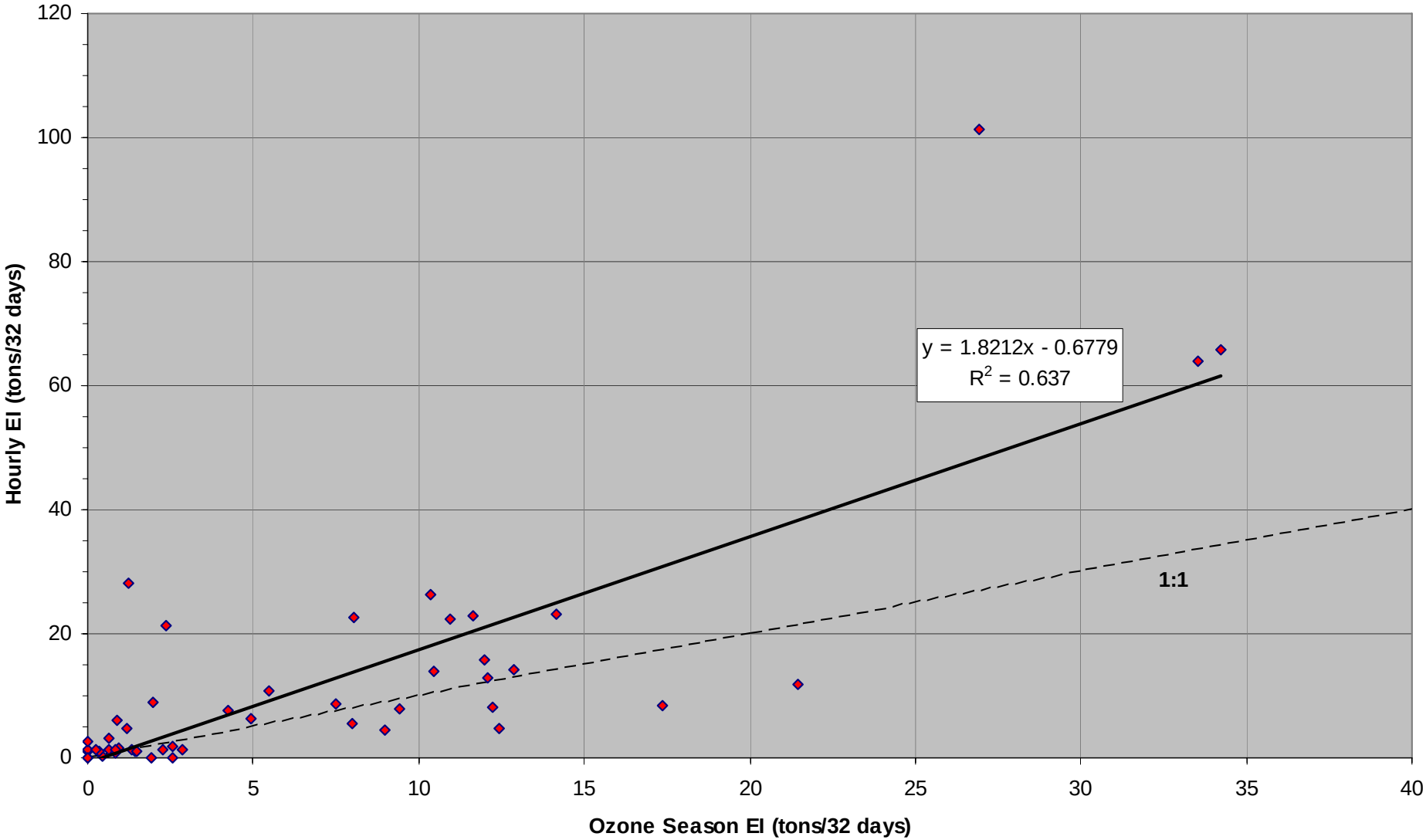
Total VOC, Hourly vs OSD Inventories
118 Facilities in entire 24-County Hourly Inventory domain



Total VOC, Hourly vs OSD Inventories
79 Facilities in 8-County HGB Area

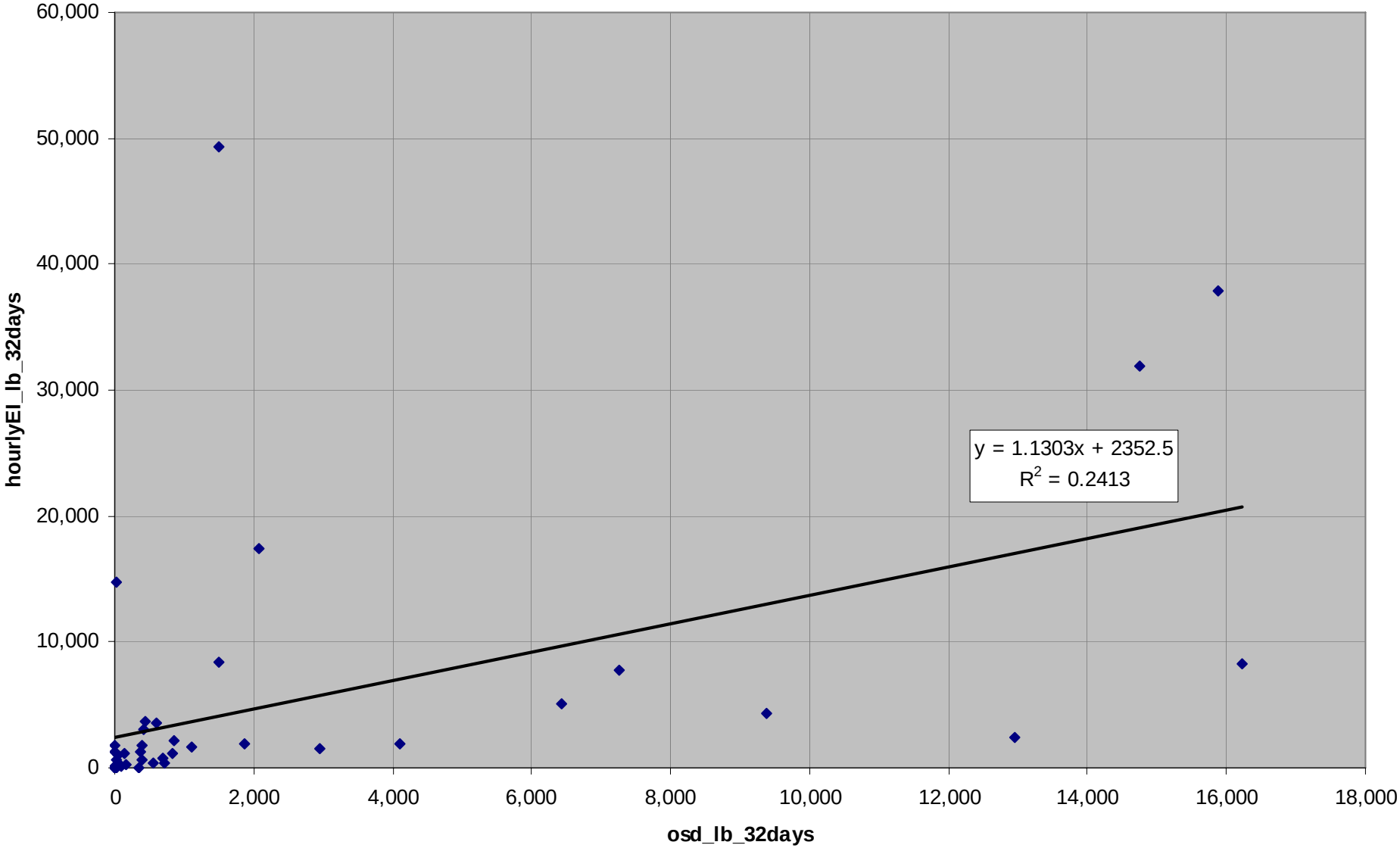


Total VOC, Hourly vs OSD Inventories
49 Harris County Facilities

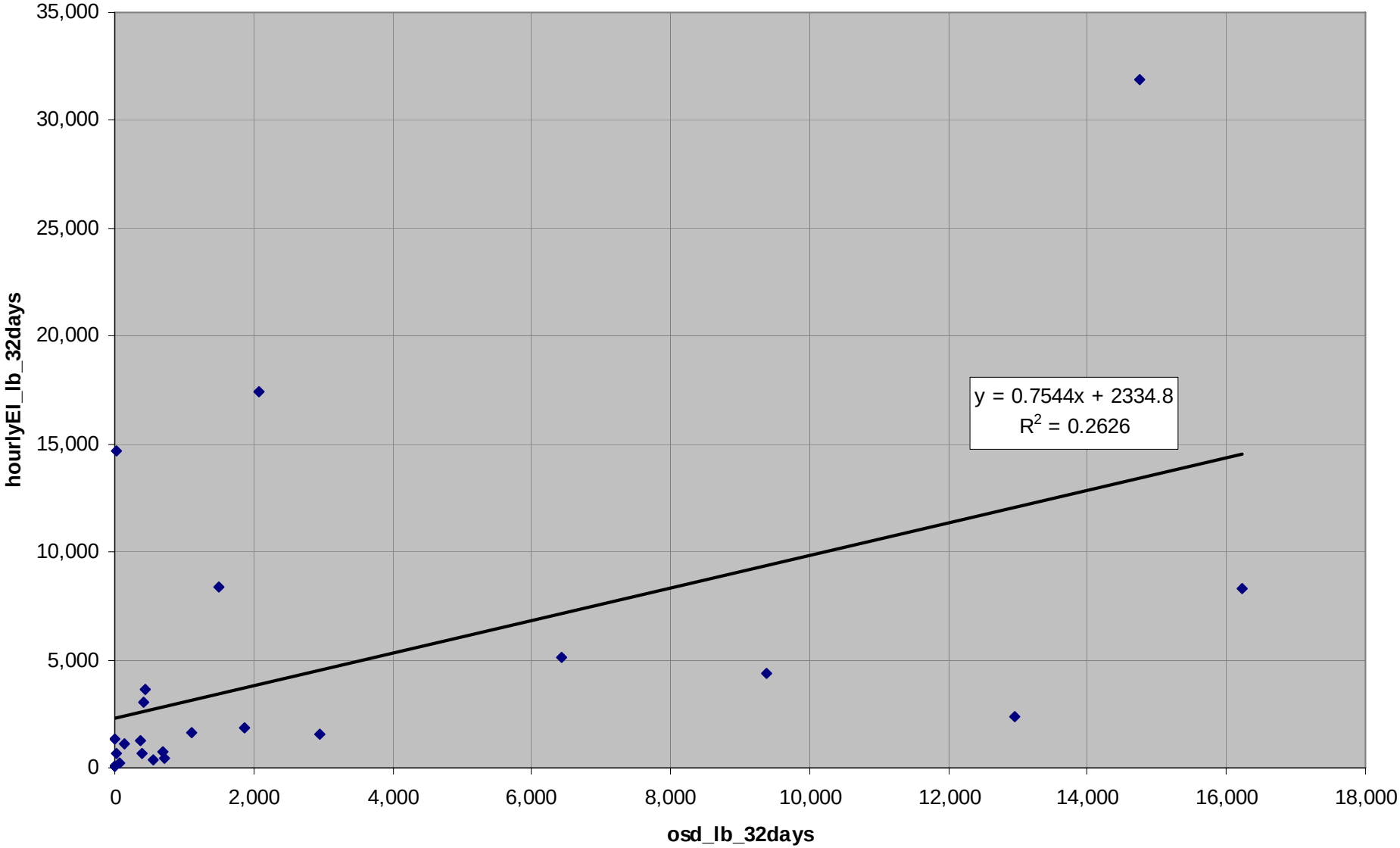


Total Ethene/Propene Point Source Emissions by Inventory and Geog. Region						
	HGB 8-county			Harris county		
	OSD	Hourly	Hourly:OSD Ratio	OSD	Hourly	Hourly:OSD Ratio
Ethene	105,134	219,995	2.1	73,084	111,171	1.5
Propene	95,165	183,044	1.9	68,281	128,004	1.9

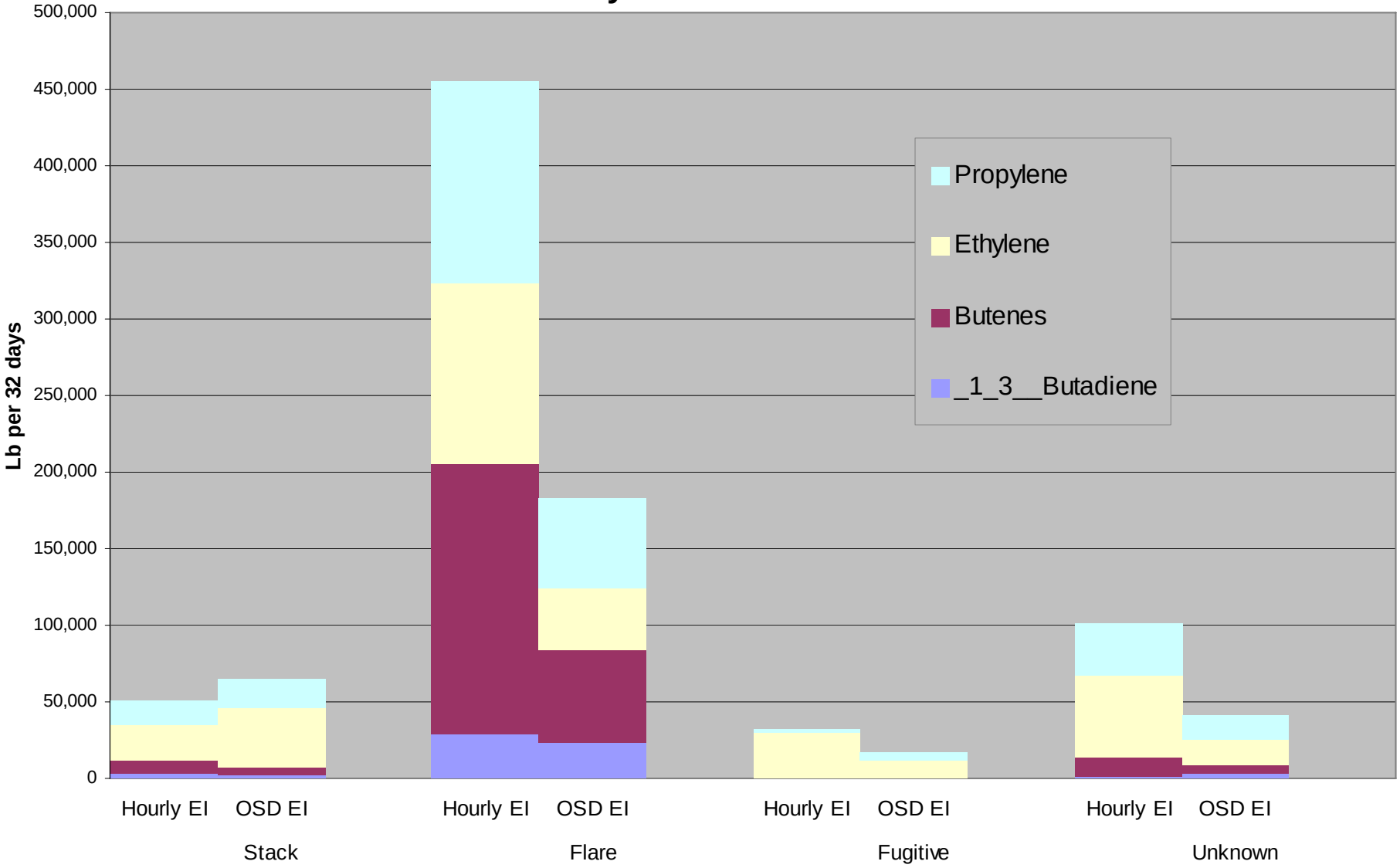
Total Ethene Emissions by Account -- 8-County HGB Area

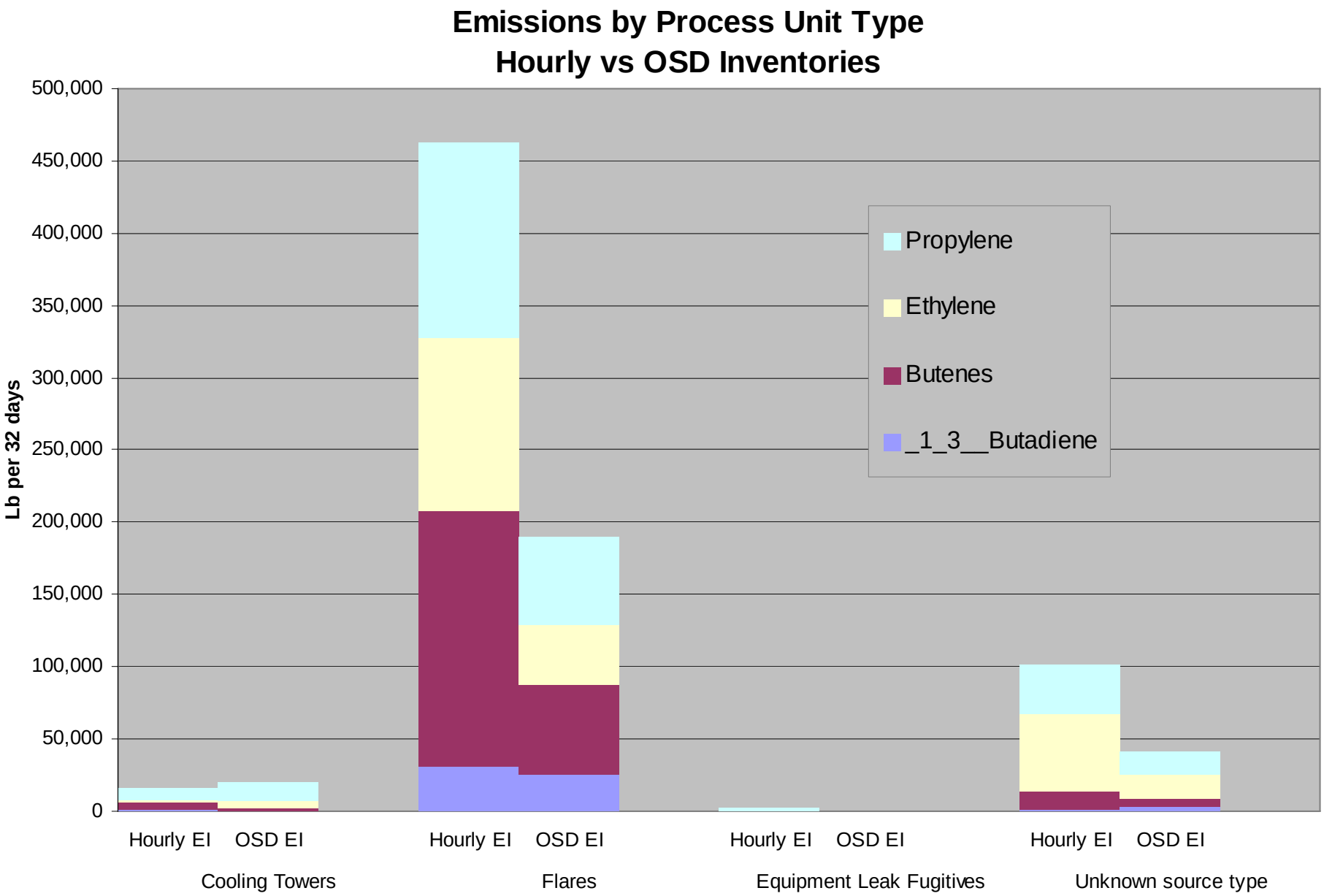


Total Ethene Emissions by Account -- Harris County

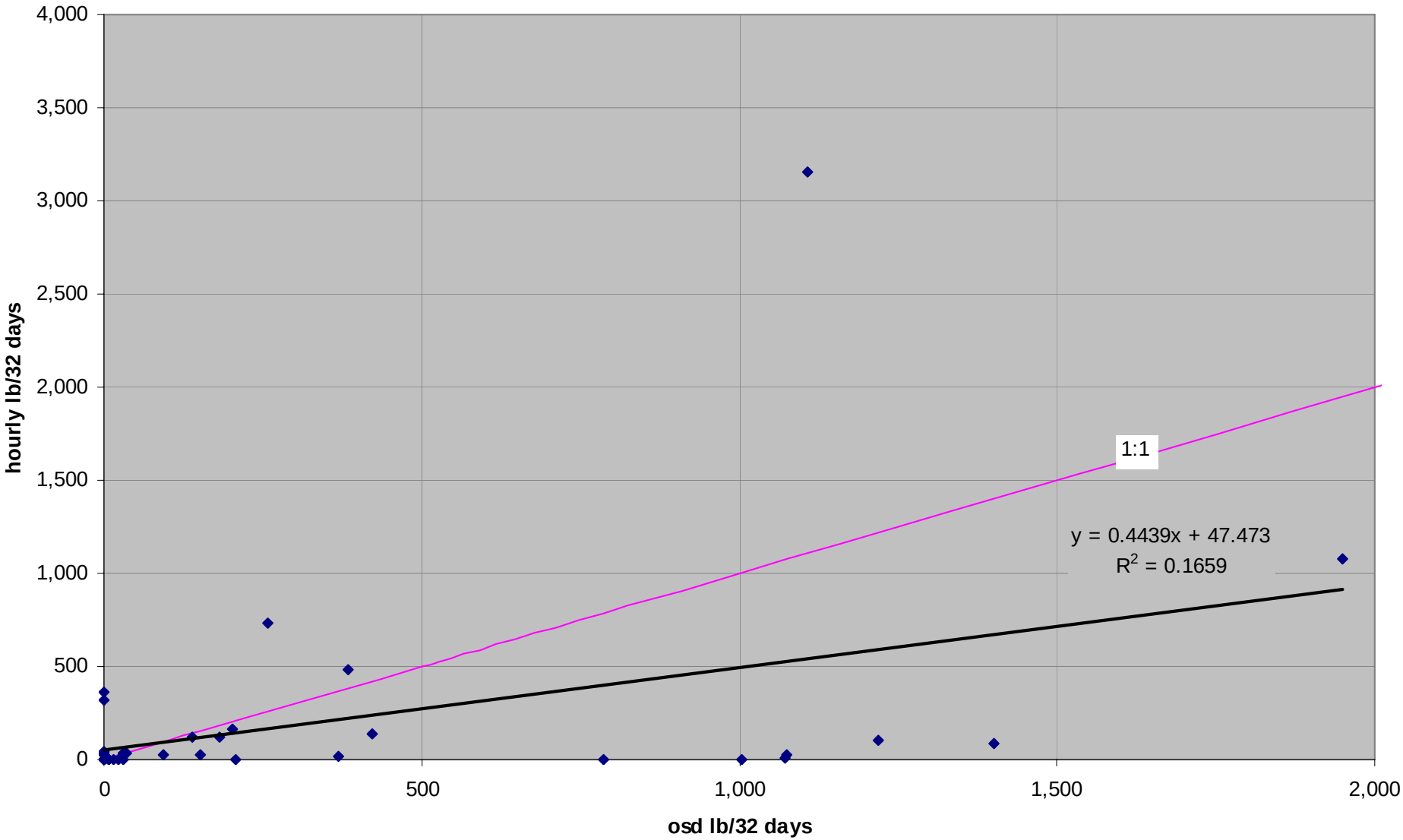


Emissions by Point Type
Hourly vs OSD Inventories

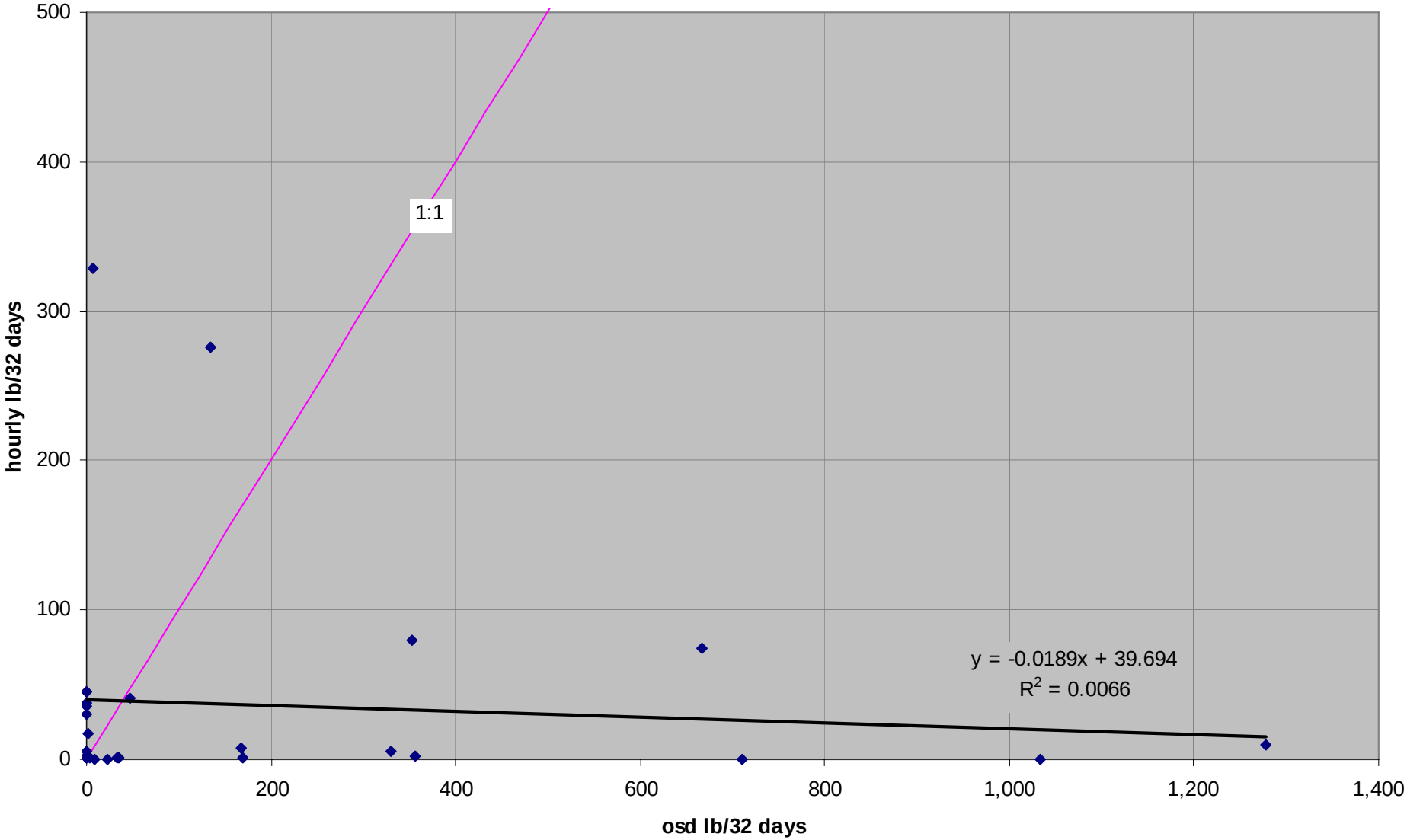



Emissions by Process Unit Type
Hourly vs OSD Inventories
Lb per 32 days
500,000
450,000
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
Propylene
Ethylene
Butenes
_1_3__Butadiene
Hourly EI
OSD EI
Cooling Towers
Flares
Equipment Leak Fugitives
Unknown source type

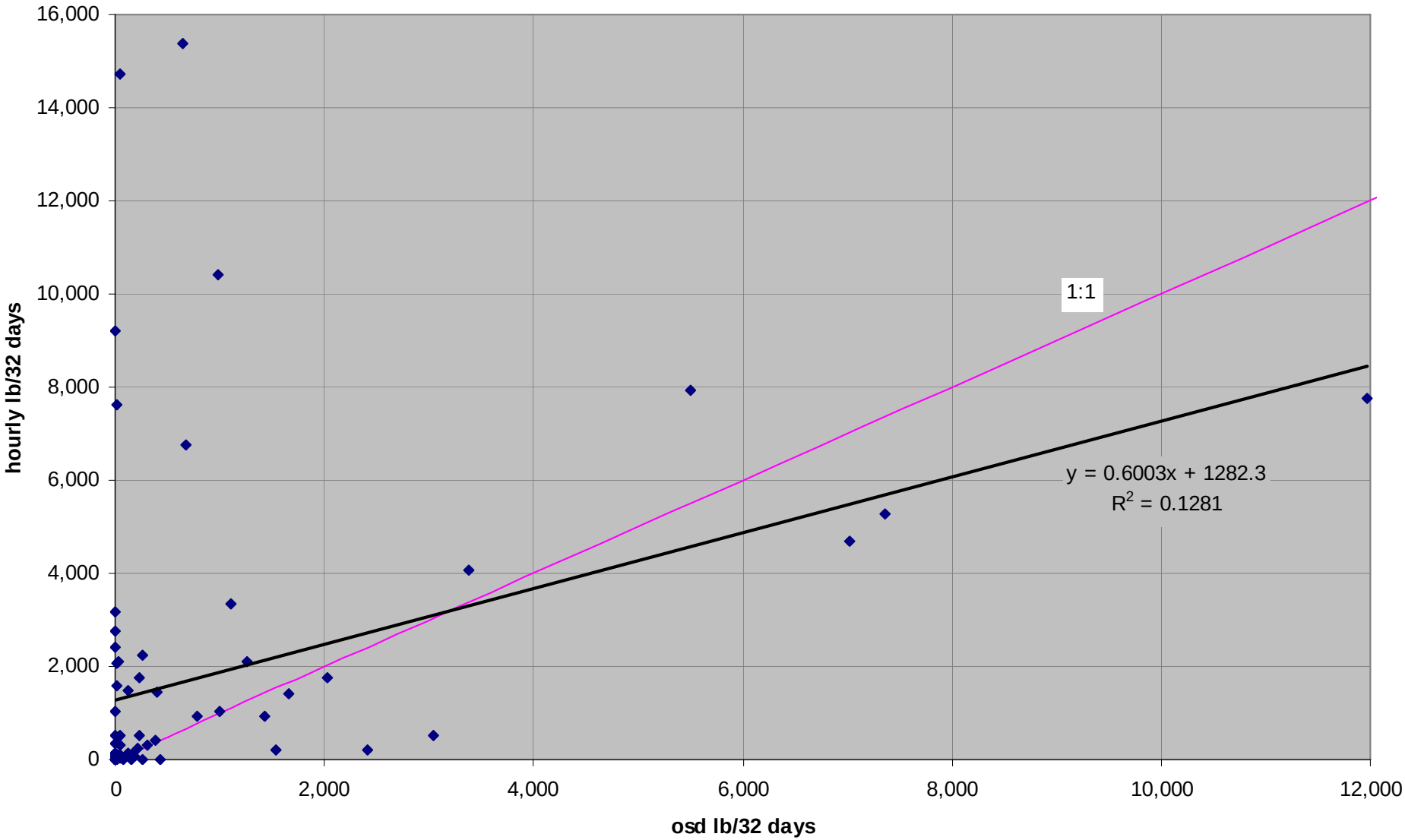
Cooling Tower - Propylene



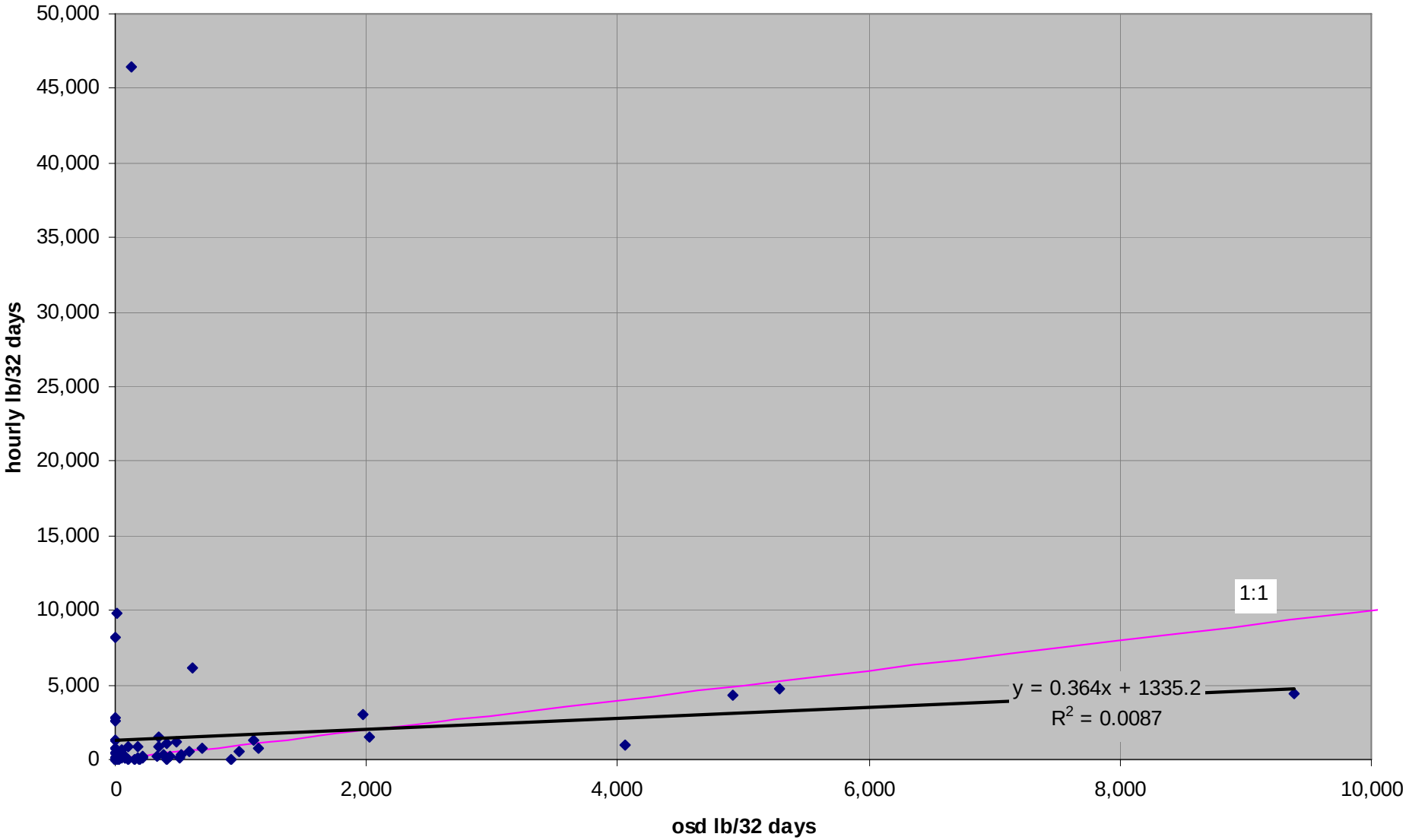
Cooling Tower - Ethylene



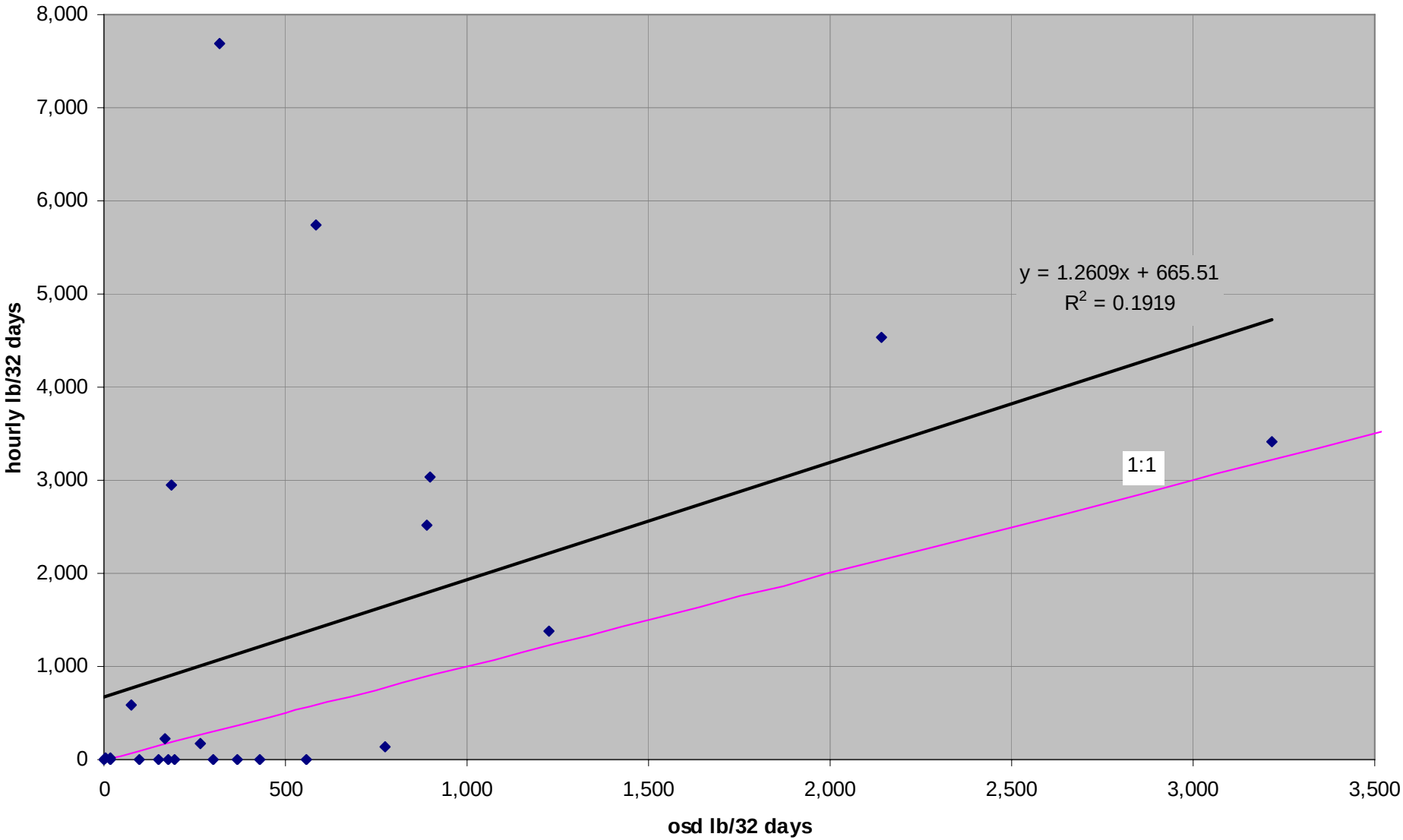
Flare - Propylene



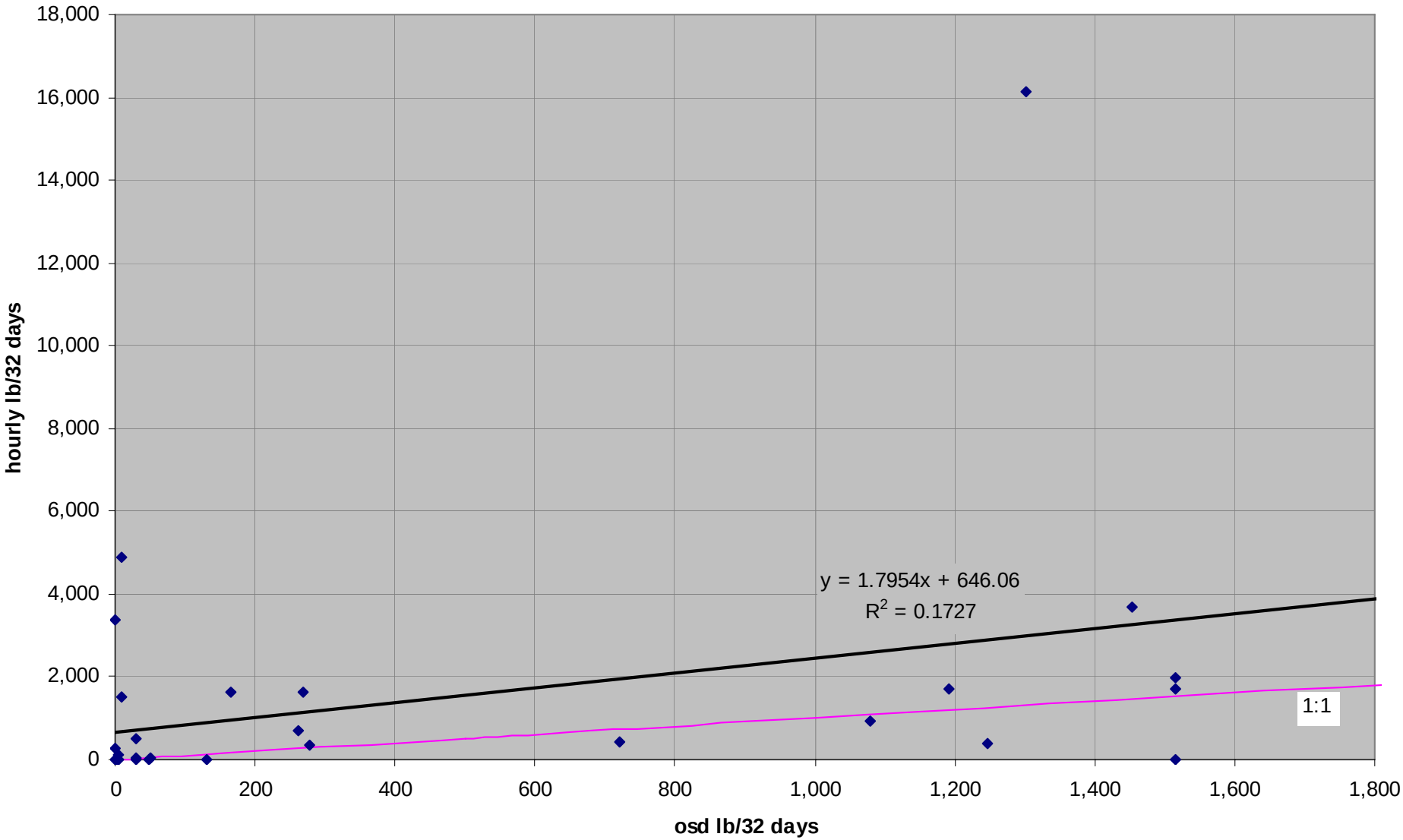
Flare - Ethylene



Unknown source type - Propylene



Unknown source type - Ethylene



Uncertainties

- One month EI may not be representative of a year or an ozone season
- Only about 1/6 of HGB VOC EI is represented here
- About ~10% of the process units were undefined (this to be fixed soon)
- Some inconsistencies in matching-up of Hourly paths and OSD paths
  - Some paths in one EI had large emissions, whereas corresponding path had zero emissions
  - In some cases paths in Hourly EI were not present in OSD

Conclusions / Next Steps

- Substantial increase in HRVOC, VOC emissions in HGB Hourly Inventory versus equivalent OSD EI
  - 70-80% increase in Total VOC
  - 90% increase in propylene
  - 50-110% increase in ethylene
- Flares were dominant process/point type behind the large increases
  - Cooling towers showed decreases
- Differences (Hourly vs OSD) in emissions of the individual species correlated well with the change in total emissions
- Changes in process unit and account emissions correlated poorly with changes in emissions totals

Acknowledgments/Contact Info

- Thanks to:
  - Vincent Meiller
  - Marvin Jones
  - Ron Thomas

- Authors
  - John Jolly, jjolly@tceq.state.tx.us, 512-239-1491
  - Danielle Nesvacil, dnesvaci@tceq.state.tx.us, 512-239-2102