

Emissions Reductions

TPC Group Houston Plant Experience

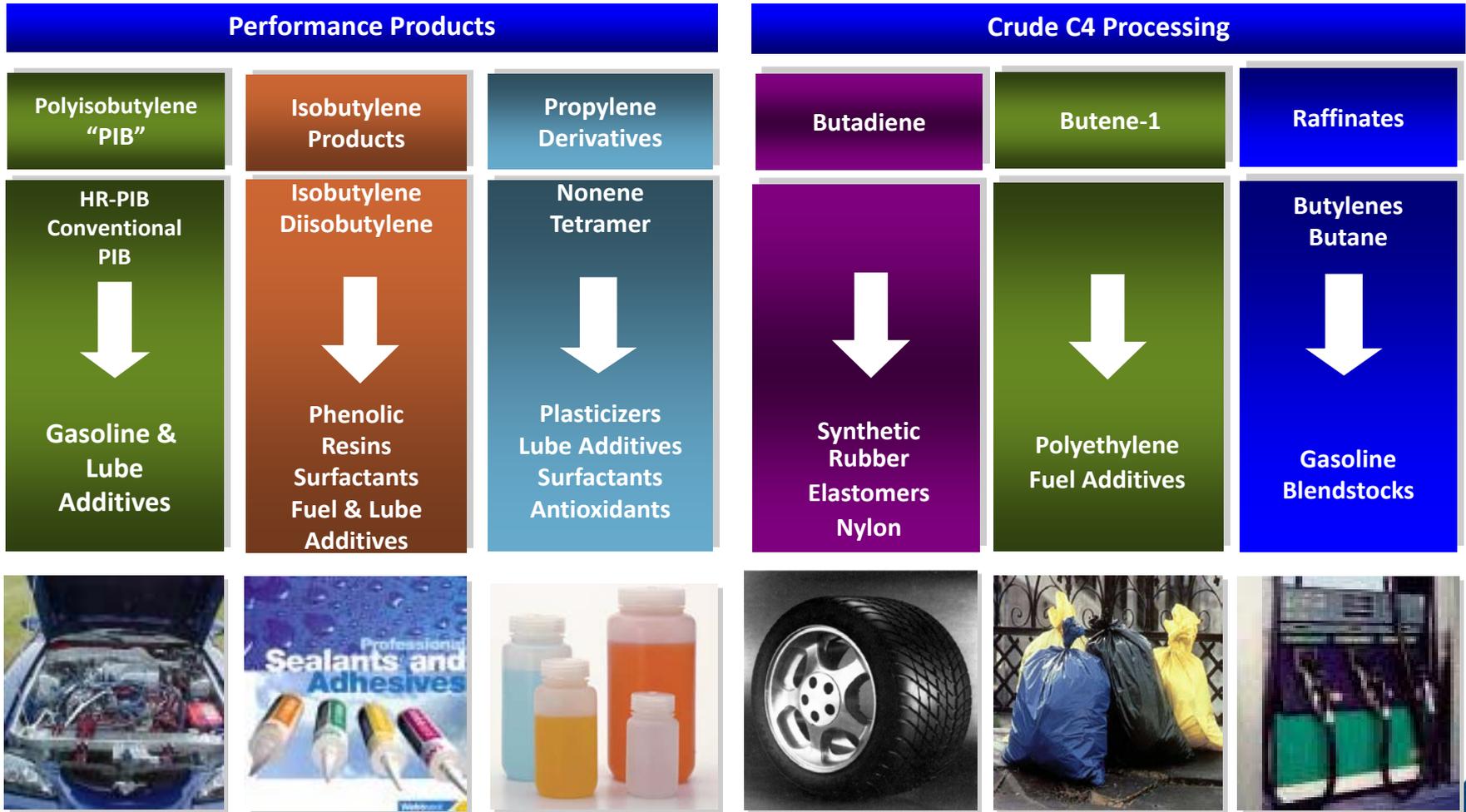
June 2011

Company Quick Facts

- » **Headquartered in Houston, Texas**
- » **More than \$2 billion in annual sales**
- » **Products sold into a wide range of performance, specialty and intermediate markets, including synthetic rubber, fuel additives, plastics and detergents**
- » **Manufacturing facilities in the industrial corridor adjacent to the Houston Ship Channel, Port Neches and Baytown, Texas and operates a product terminal in Lake Charles, Louisiana**
- » **Nearly 800 employees and full-time contractors**
- » **Formerly called “Texas Petrochemicals”, changed Company name to TPC Group in early 2010**

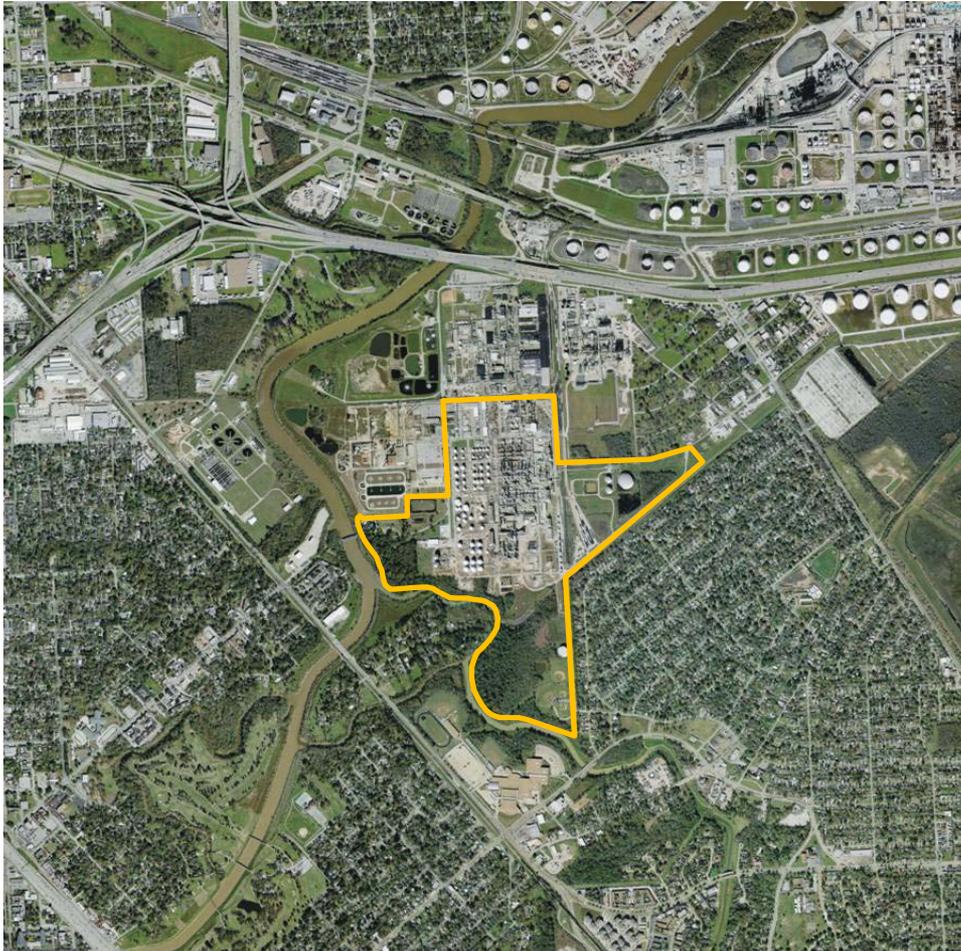
Medium-Sized Chemical Company

Products and Their Uses



**Company Manufactures
Industrial Intermediate Chemicals**

Houston Plant – Aerial Photo



**Residential Community
Located At
Plant South Fence-line
and Nearby
*Milby Park Adjacent to
Northeast Corner of Plant***

- “Milby Park, off the La Porte Freeway, is just north of one of the largest emitters of butadiene in the state, Texas Petrochemicals.” *1/13/2005*
- “ ‘Please use your authority to require ... the companies to take immediate corrective action to reduce their 1,3-butadiene levels to levels that do not pose enhanced cancer risks,’ [Mayor Bill] White wrote in a letter addressed to Kathleen Hartnett White, chairwoman of the Texas Commission on Environmental Quality. . . . The report named three facilities specifically: Texas Petrochemicals. . . . “ *1/15/2005*
- “Taking his strongest stance yet on the city's air pollution problems, Mayor Bill White on Monday said the city would set up an air pollution monitoring network along the fences of some of the region's industrial plants to track down companies contributing to risky levels of carcinogenic chemicals in city air.” *1/25/2005*
- “In a series of heated exchanges between council members and TCEQ officials that came toward the end of four hours of testimony from public health officials, company representatives and citizens, agency officials were urged to act sooner on the air pollution problem in Houston. . . . Mayor Bill White wanted to know when agency personnel would be able to tell him how much 1,3-butadiene should be allowed in the air.” *2/8/2005*
- “ ‘When you look at wind direction, the data seems to point to those sources,’ said Arturo Blanco, of the city's Air Quality Control Bureau.... ‘We are concentrating on the most potentially likely sources – . . . and Texas Petrochemicals.’ “ *3/27/2005*

**TPC Identified by Houston Mayor Bill White
And Houston Chronicle
As Source of 1,3-Butadiene to Nearby Milby Park**

Voluntary Emissions Reduction Agreement (VERA)

Agreement Finalized June 9, 2005

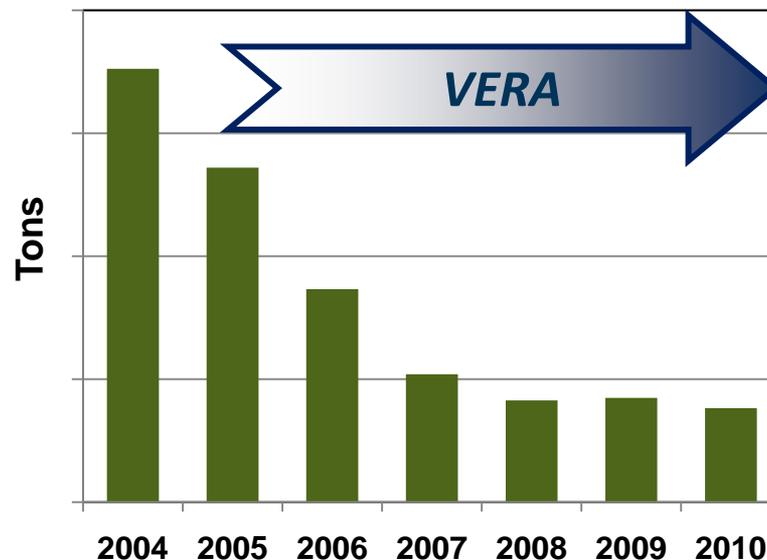
Status of Required Actions

- Install Flare Gas Recovery
- Comply with Flare Limit Requirements, 5702 lb BD/yr
- Establish 250 ppm as leak level for repairs
- Install dry-break loading equipment at Rail Racks
- Install Fenceline Monitoring
- Net Fenceline BD Concentration Goal 1 ppb
- Monitor cooling towers
- Review plant-wide maintenance clearing procedures
- Use Ultrae (portable spectrometer)
- Use FLIR to supplement LDAR monitoring
- Investigate whenever Milby Park monitor detects BD
- Submit report whenever Milby exceeds trigger level
- Work with industrial neighbors
- Include emissions reductions in air permits
- Submit quarterly reports
- Obtain independent audits and reports

Date

Dec-05	Item completed
Dec-05	Item completed and incorporated into air permits
Jan-06	Item completed
Dec-06	Item completed
Jan-06	Item completed
Dec-07	Item completed
Dec-05	Item completed
Jun-05	Item completed
Aug-05	Item completed
Dec-05	Item completed
N/A	Item completed
Feb-07	Item completed
Various	Item completed

Total Butadiene Emissions

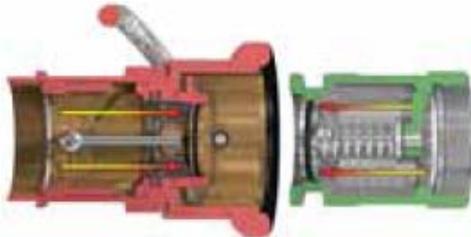


Key:

- Item completed
- Item completed and incorporated into air permits

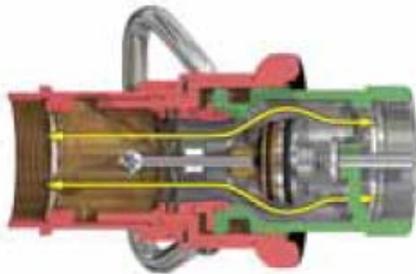
Reduced Butadiene Emissions By 78 Percent
2010 Flare Butadiene Emissions Reduced to 2% of 2004

DryLok Loading Hose Disconnects



Closed:

- Turn and pull
it's released - *no spillage*



Open:

- Push and turn
it's coupled - *full flow*

Source:

www.dixonvalve.com



DryLok Fitting With Elbow Attached To Railcar Primary Valve

**Fittings Eliminate
Rail Loading Hose Emissions**



Fence-Line Monitoring: FTIR Equipment

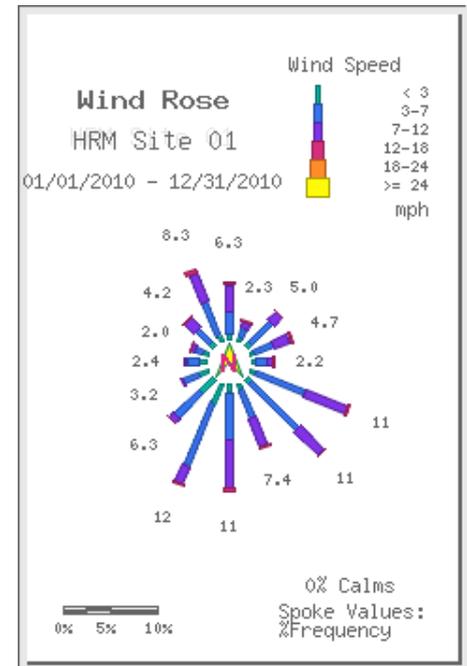
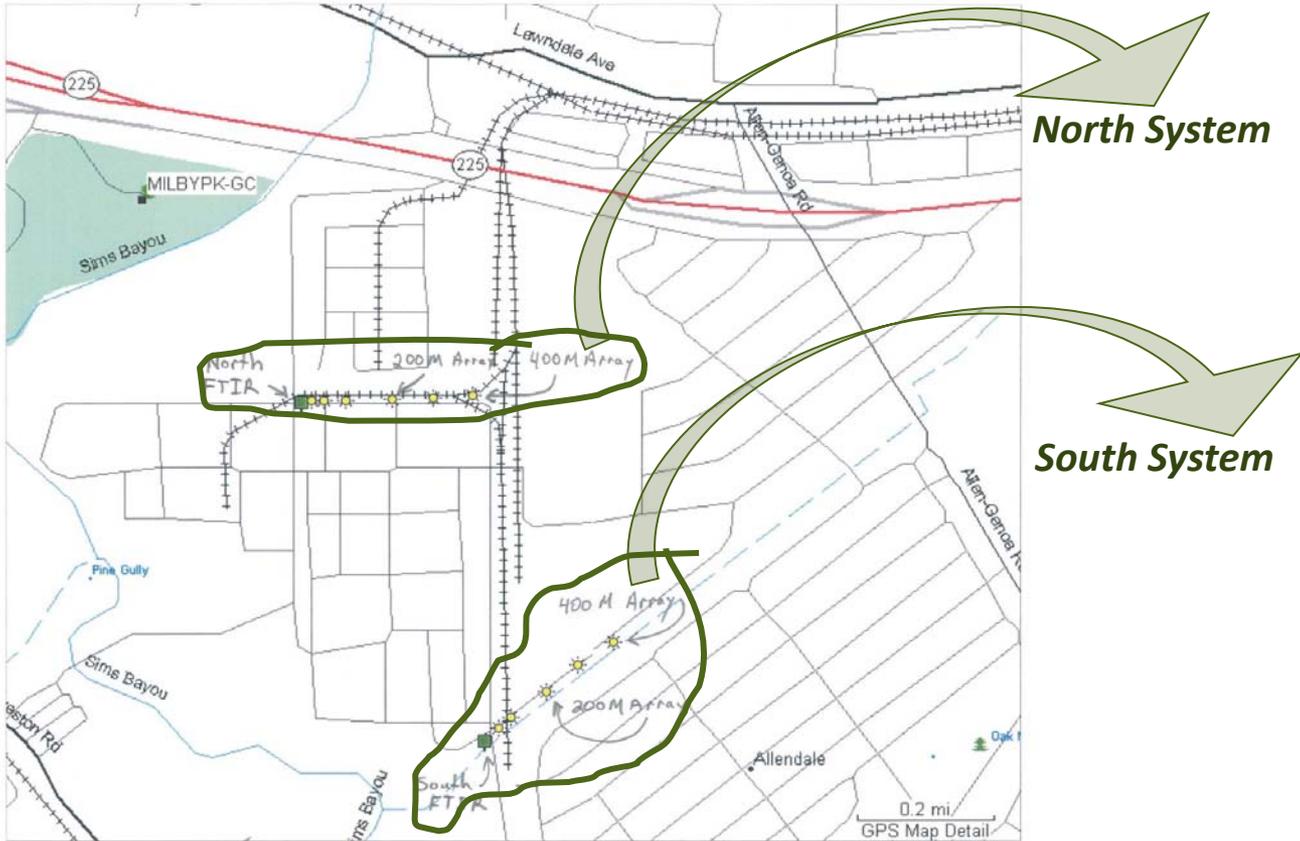
(Fourier Transform Infrared)



Infrared Beam Bounces Back From Mirrors
400 Meters Coverage on North and South Fencelines

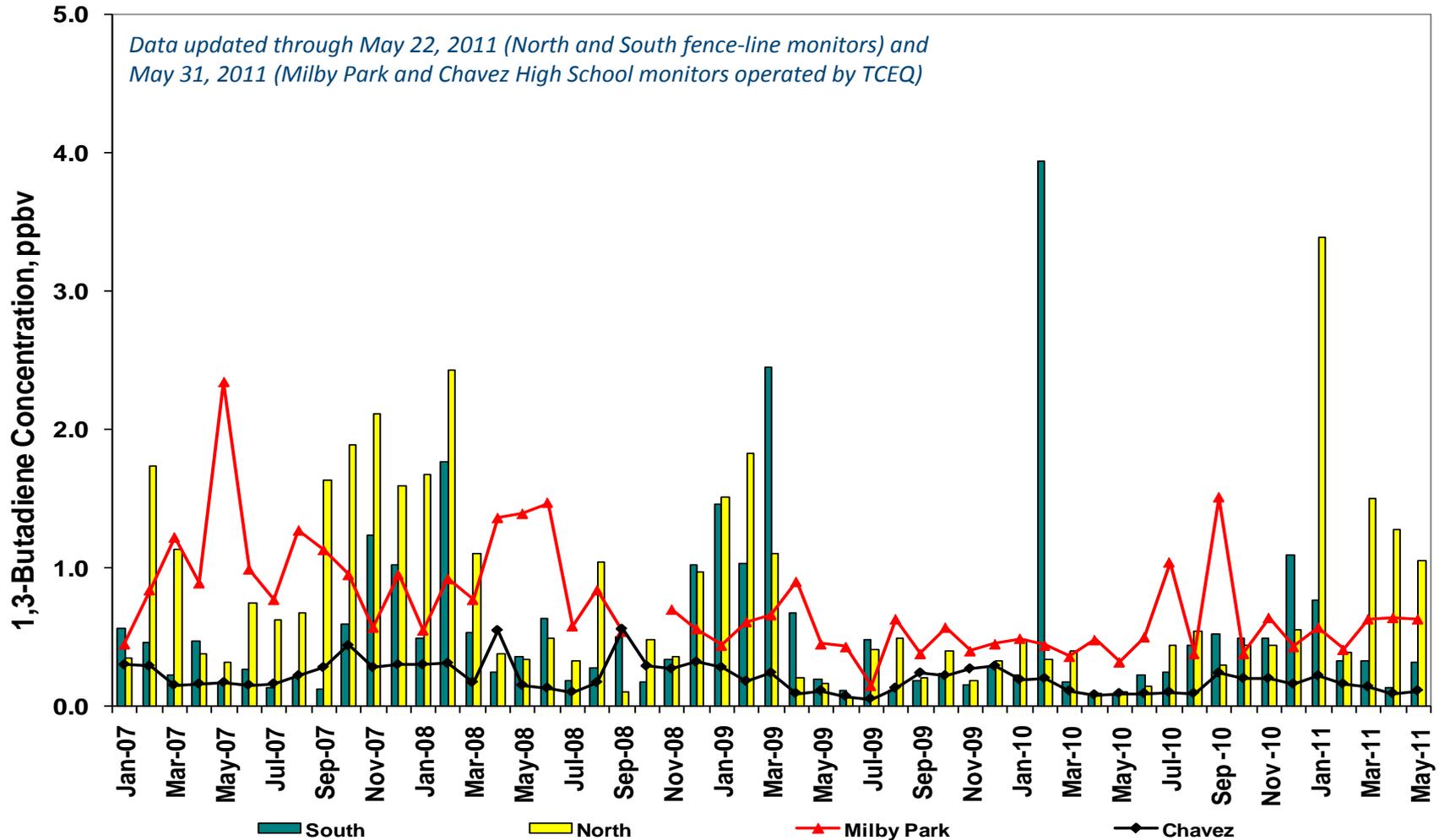


FTIR System Plot Plan



**Two FTIR Systems:
North Fenceline and South Fenceline**

1,3-Butadiene Monitoring



Fence-line System Provides Excellent Diagnostic Tool

» Tools

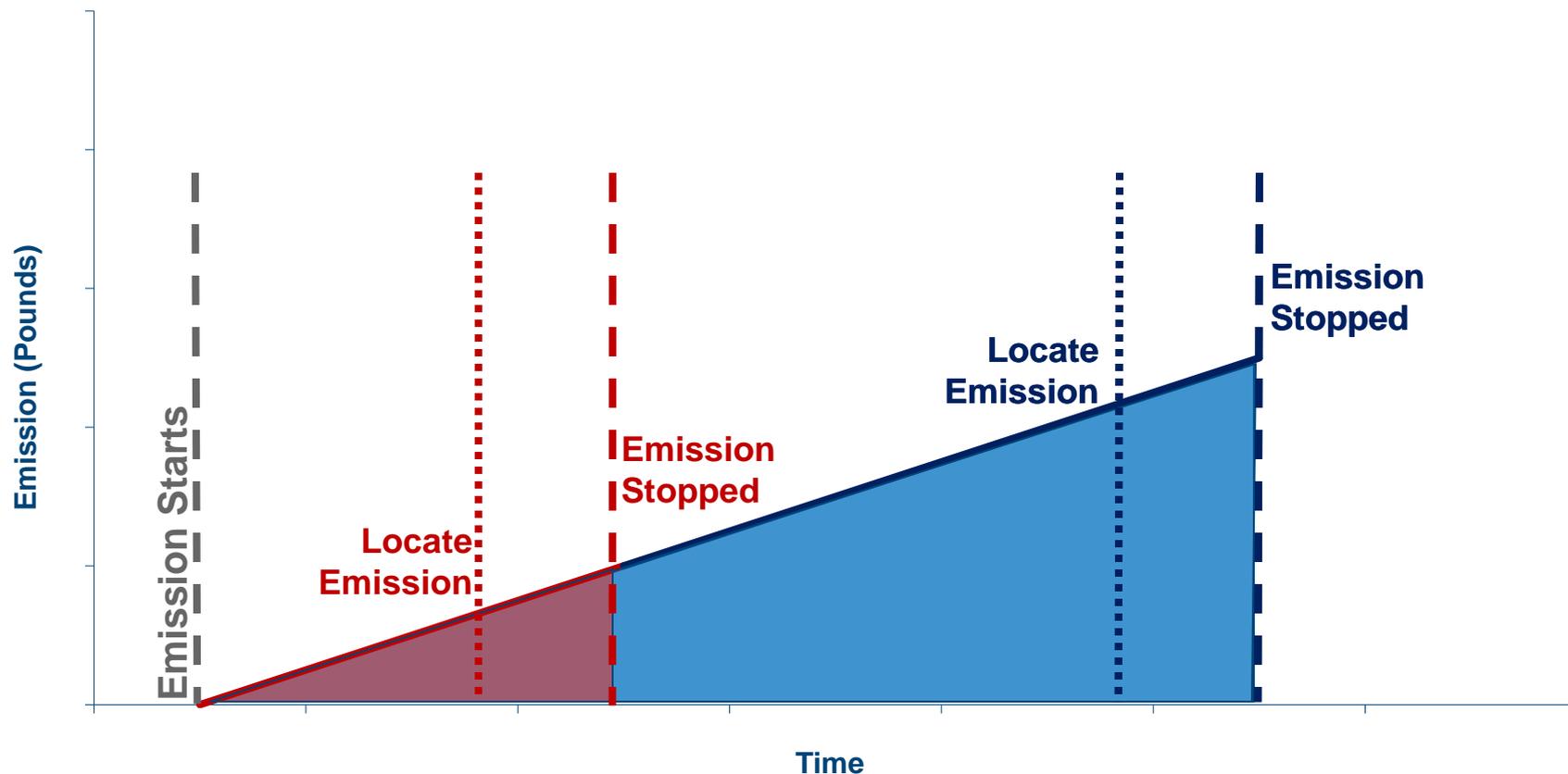
- Cutting-edge Fence-line Technology (infrared)
- UltraRAE (combination filter tube and photo ionization detector)
- Ppb RAE (photo ionization detector)
- COSMO (photo ionization detector)
- Toxic Vapor Analyzer (flame ionization detector)
- FLIR Camera (forward-looking infrared camera)
- MSA Sirius (photo ionization detector)

» Use of Tools

- Measures 1,3-Butadiene
- Measures Total Volatile Organic Compounds
- Used to help determine the general area of the source or the actual source of the fenceline triggers

Handheld Tools + Fenceline System = Powerful Combination

Technology: Impact on Performance



Fence-line Monitors Result In Shorter Duration Emissions
But Calculations Based On Longer Time Period

» Key features

- Order Effective Date May 3, 2009
- Covers 5-year term
- Requires continued operation of fence-line monitoring
- Requires \$20 million spending for incremental projects to reduce emissions
- Requires 20,000 pounds reduction per rolling 12-month period for VOC emissions from releases compared to prior 12-month period
- Requires semi-annual reports including reports of root causes of emission events and corrective actions
- Provides stipulated penalties for reportable VOC release and opacity incidents
- Requires various routine reports

**Addresses VERA's
Unintended Consequences**

» Rotating equipment

- Pump seals

- » 32 pump seal upgrades and replacements completed through 2010
- » 20 additional planned for 2011

» Instrumentation and controls

- Replace No. 9 Boiler control system

» Instrument / plant air

- Instrument air reliability improvement

- » Added instrumentation and controls

» Pressure equipment (static / piping)

- Vessels/piping upgrade

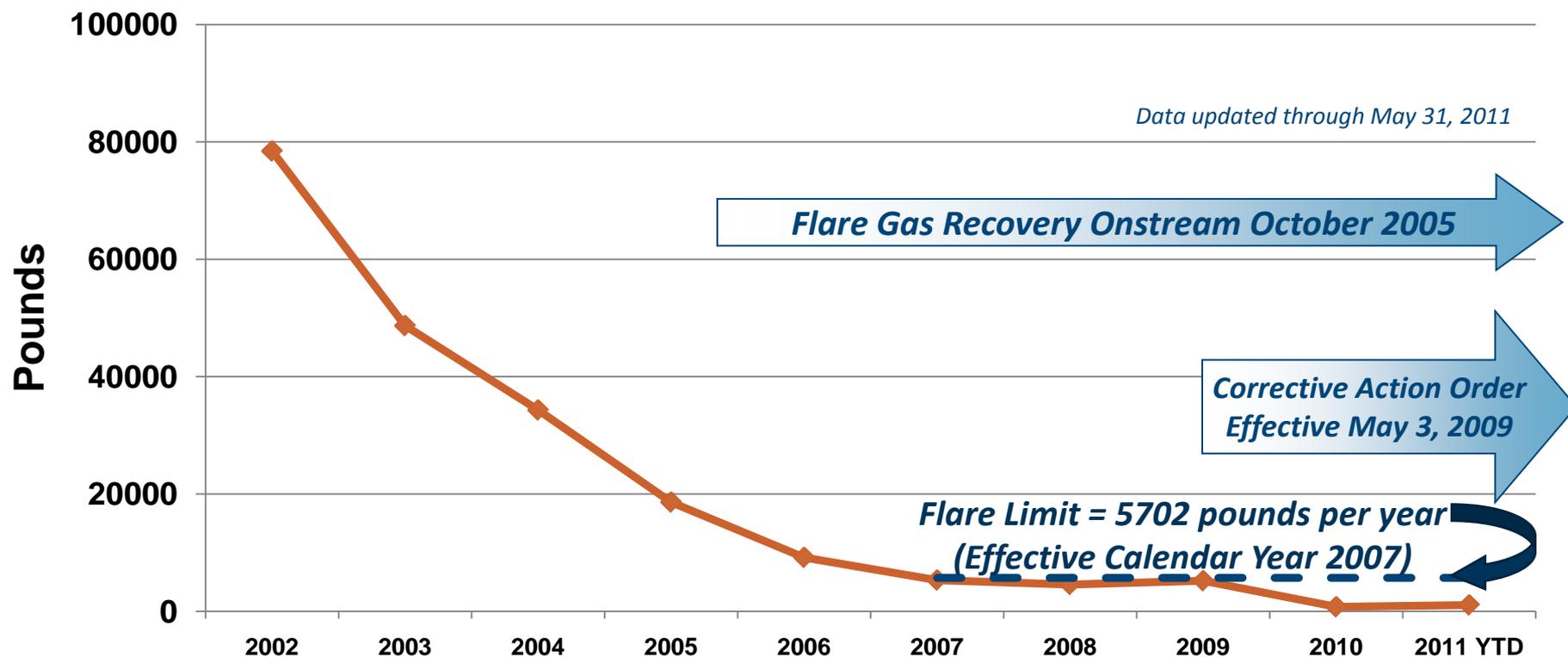
- Heat exchanger bundle replacement and metallurgy upgrade

- Wastewater and wastewater collection system phased upgrade

**Projects Focused On Items Expected
To Yield Greatest Reduction in Events**

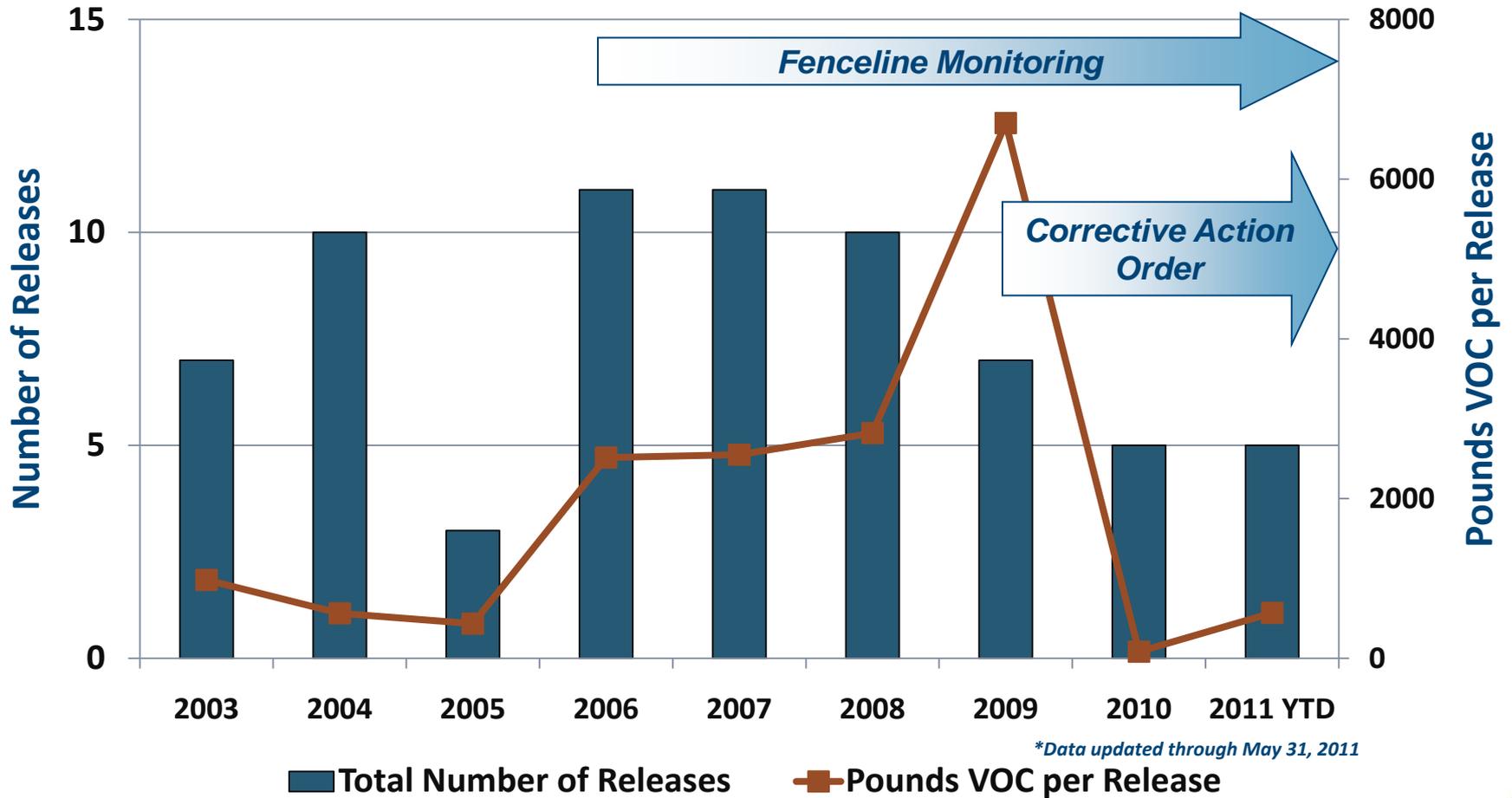
***Based on Root Cause Analyses and
Emissions and Release Data***

Yearly Flare 1,3-Butadiene Emissions



**Flare Emissions Well Within
VERA 1,3-Butadiene Limit**
*Success of Corrective Action Projects Resulted In
Even Lower Flare Emissions in 2010*

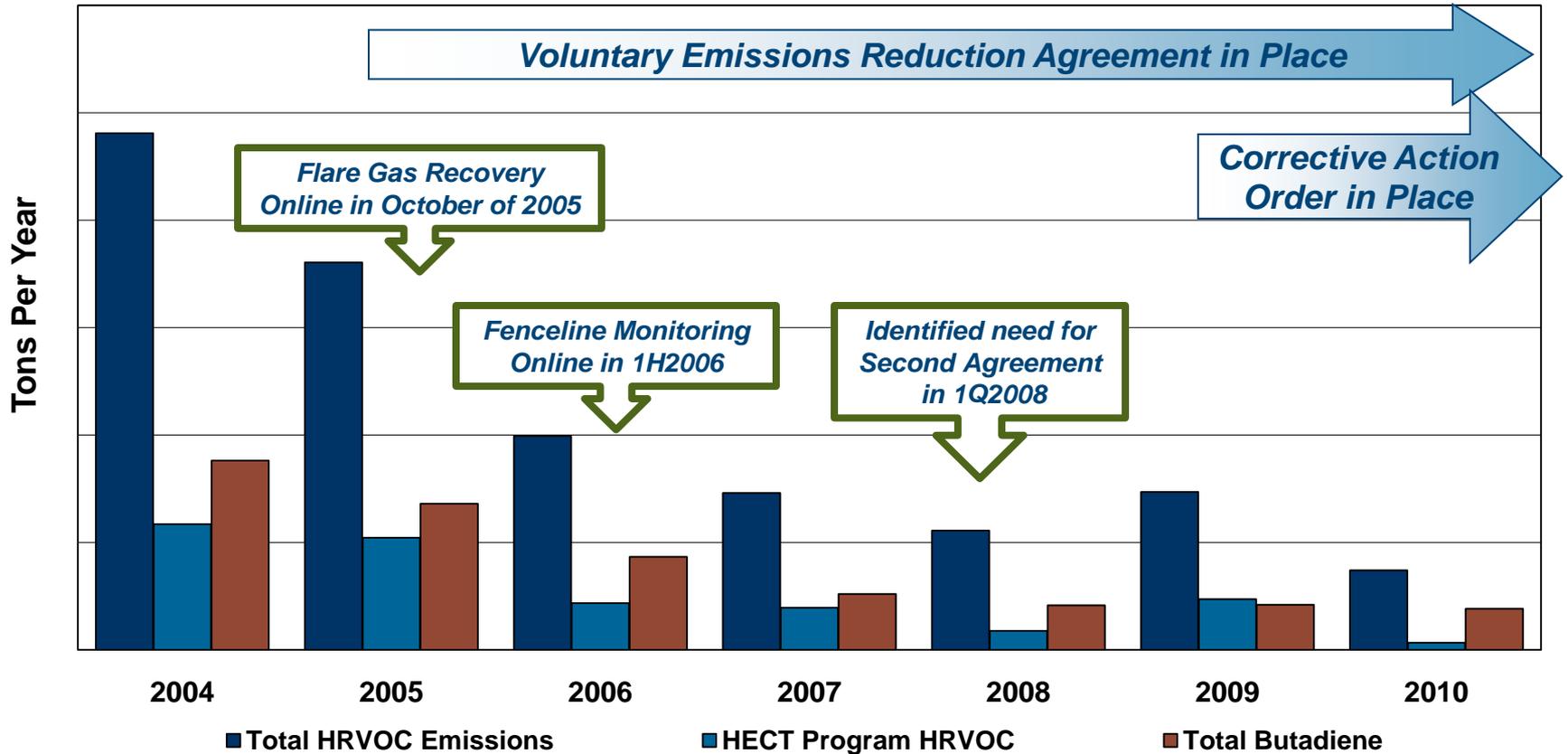
Reportable Air Releases



**Corrective Action Order
Effective For Reducing Releases**

Houston Plant HRVOC Emissions

(Highly Reactive Volatile Organic Compounds – React Readily to Form Ozone)

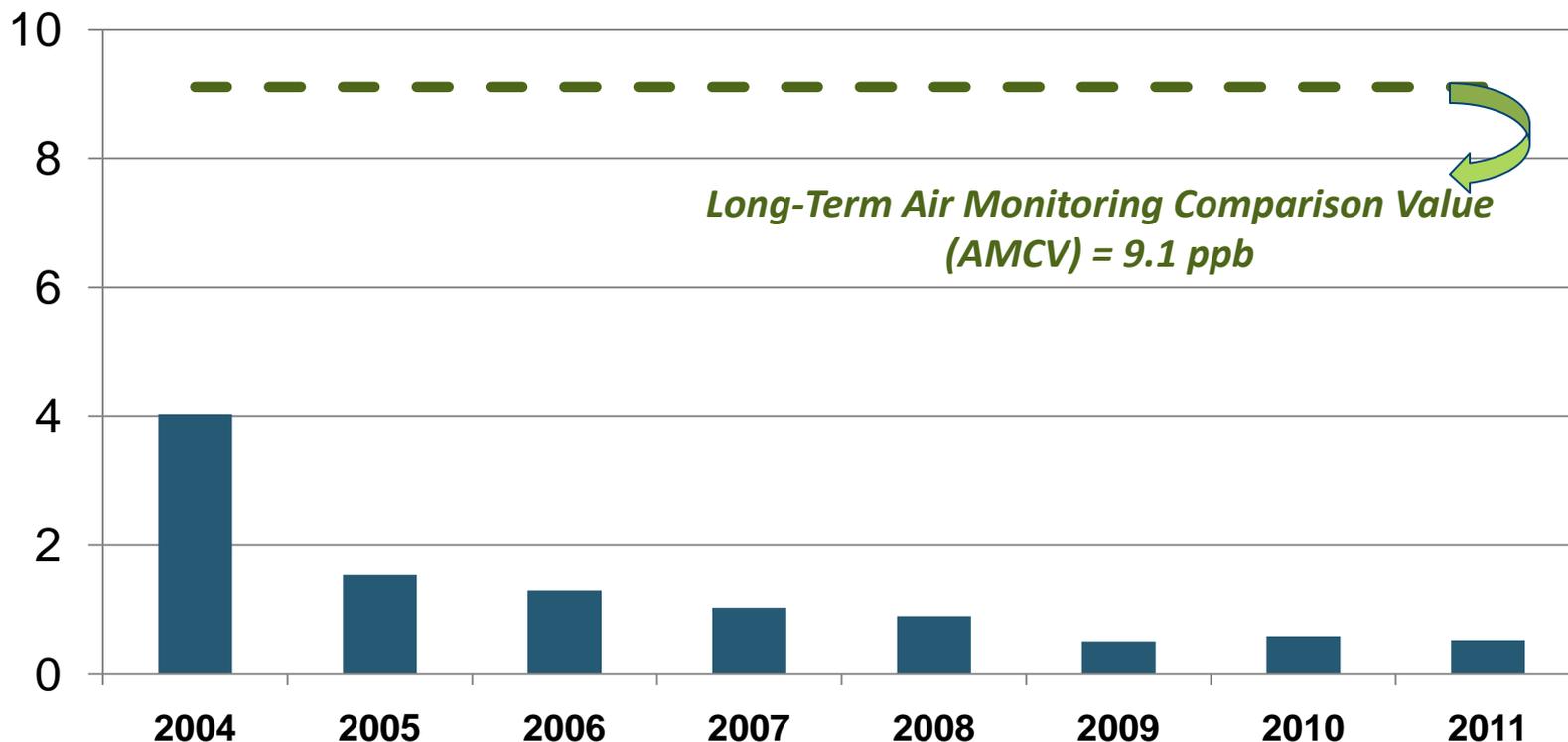


(HECT program is TCEQ's HRVOC Emissions Cap and Trade program as part of Houston area Ozone SIP, and caps point source non-fugitive emissions of C4-minus olefins.)

VERA Resulted In Reductions of All HRVOC Emissions

TCEQ Milby Park Monitor Results

1,3-Butadiene Concentration Measurement



Data updated through June 5, 2011

Source: TCEQ website at http://www.tceq.state.tx.us/cqi-bin/compliance/monops/site_photo.pl?cams=169

**Milby Park Concentrations
Demonstrate Success of
VERA and Corrective Action Order**

» Flare Gas Recovery

- Where applicable, can yield significant emissions reductions
- May not be applicable for all facilities

» Fenceline Monitoring

- Can be a tool to aid in protecting surrounding community from emissions
- Monitoring single compound allows very low detection
- “Marker compound” separates facility emissions from neighbor plant emissions
- Unintended consequences can be significant and require flexible approaches
- Installation cost significantly greater for large facility
 - » Two 400-meter segments adequate for TPC site compared to 56 segments of 400 meters in 16-mile perimeter of nearby large refining/petrochemical complex

» Other Technologies

- Handheld instruments provide synergism when coupled with fenceline monitors
- Other technologies (e.g. hose DryLok) can provide additional benefits

What Works for One . . . May Not Work for All

- » Recovered chemicals not sufficient to pay out capital costs
- » 2005 emissions database far out of date and no longer relevant due to significant post-2005 emission reductions
- » Phase-in learning periods needed for best implementation
 - Each facility is unique and will have unique challenges
- » Emissions reductions similar magnitude to and in addition to HON (Hazardous Organic NESHAPS) reductions

Flexibility Critical for Best Results
TPC's Next Steps Driven By Resolving Issues
Arising From Previous Steps

Email from Mayor's Director of Environmental Policy

October 21, 2009 - After TPC Presentation to City Council

Textor, Marise L.

From: Marks, Elena - MYR [Elena.Marks@cityofhouston.net]
Sent: Wednesday, October 21, 2009 11:40 AM
To: Textor, Marise L.
Subject: RE: City Council Presentation for tomorrow

Marise, Luis, Sara and Chris—thanks for coming down here this morning and sharing your work. It has been an interesting road to say the least, and I'm so glad to have wound up where we are together. This is a lasting legacy and a true gift to the City.
Elena

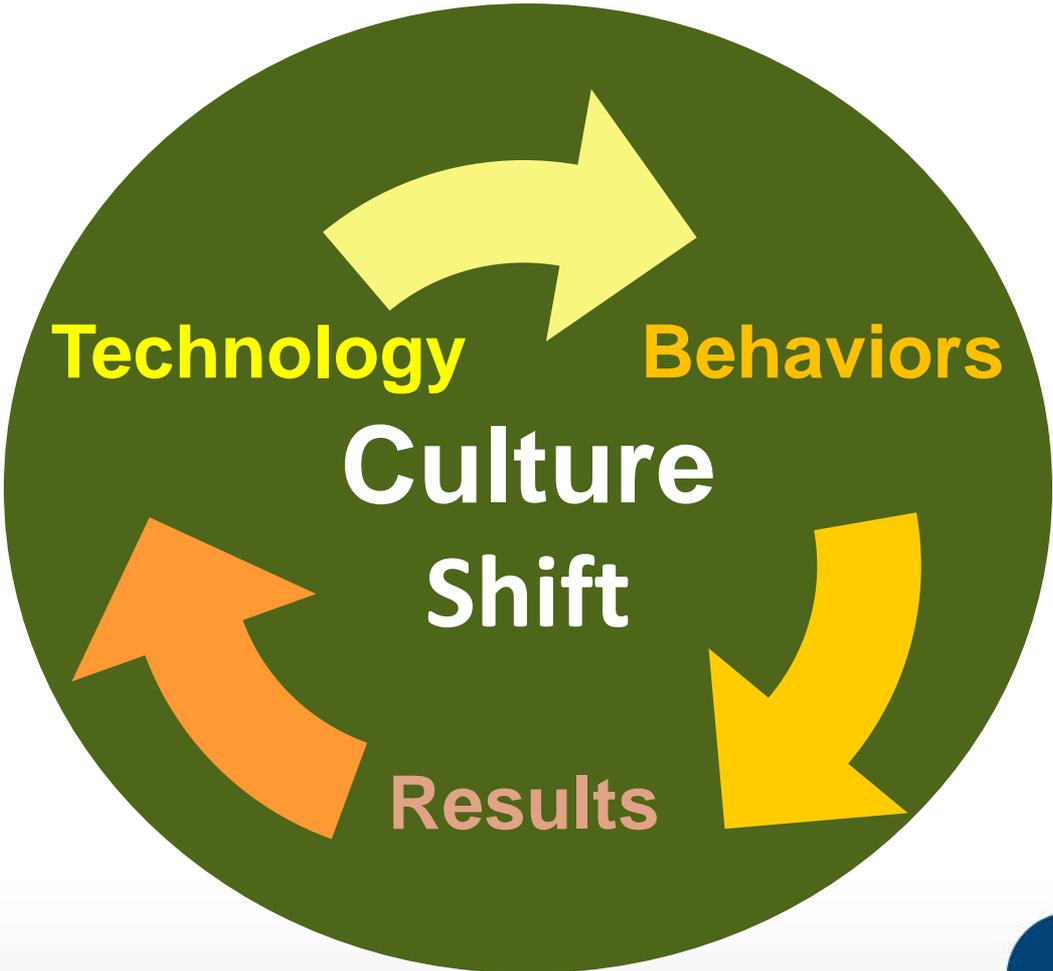
Elena M. Marks, JD, MPH

Director of Health and Environmental Policy

Mayor's Office

City of Houston

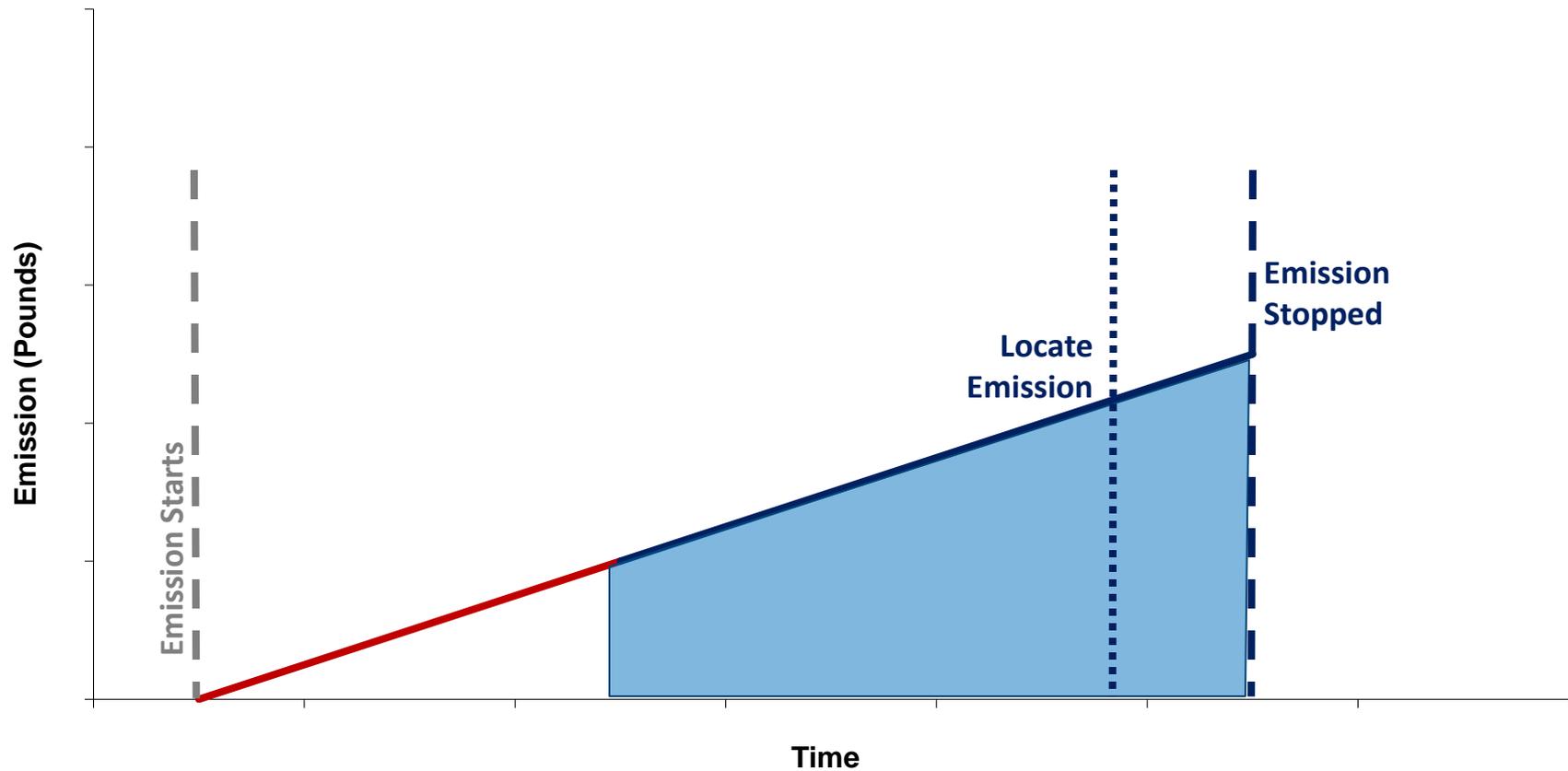
“ A lasting legacy and a true gift to the City.”



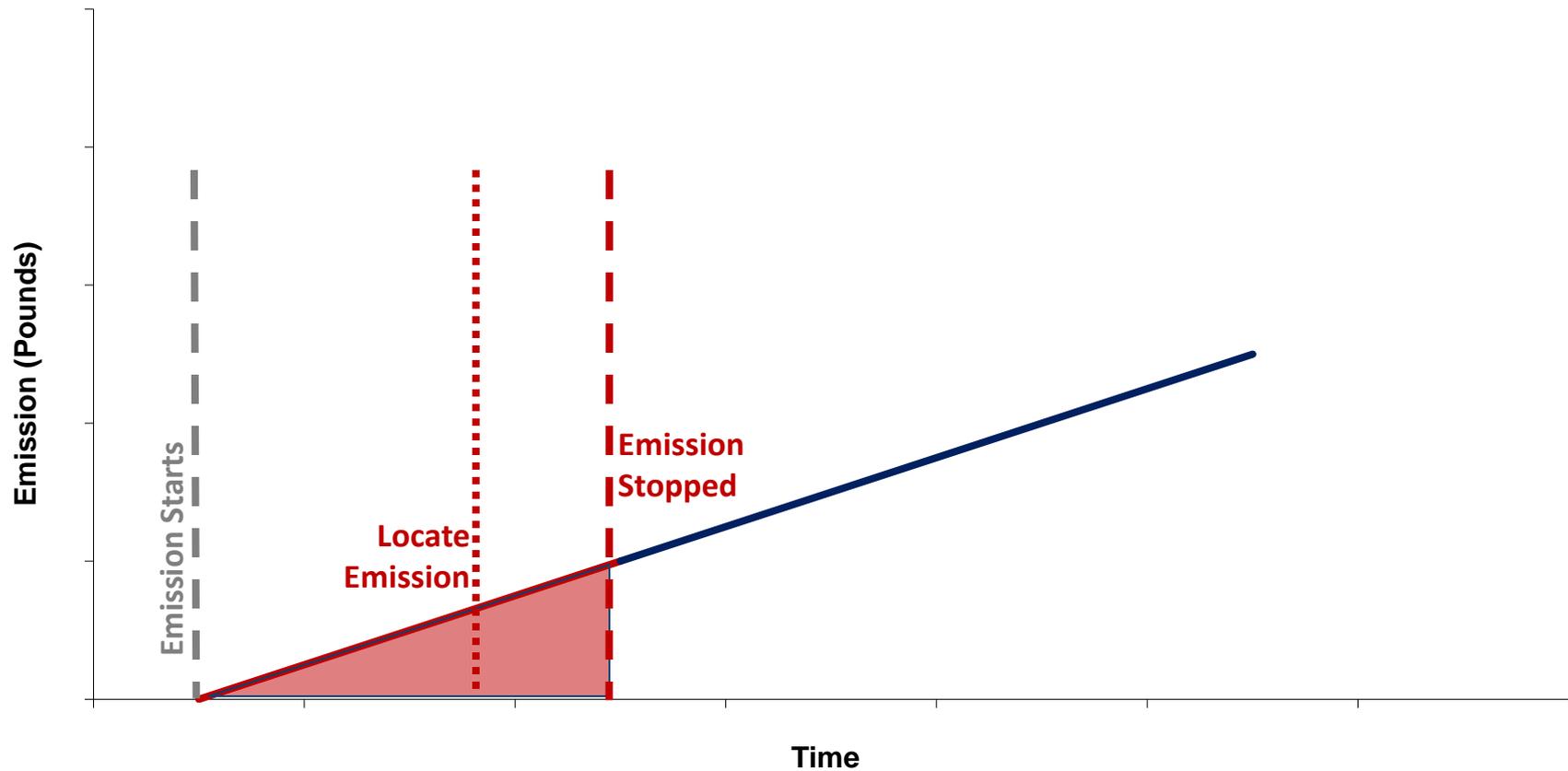
Thank you!

- » **Marise Textor**
- » **Phone 713-840-2410**
- » **Email marise.textor@tpcgrp.com**

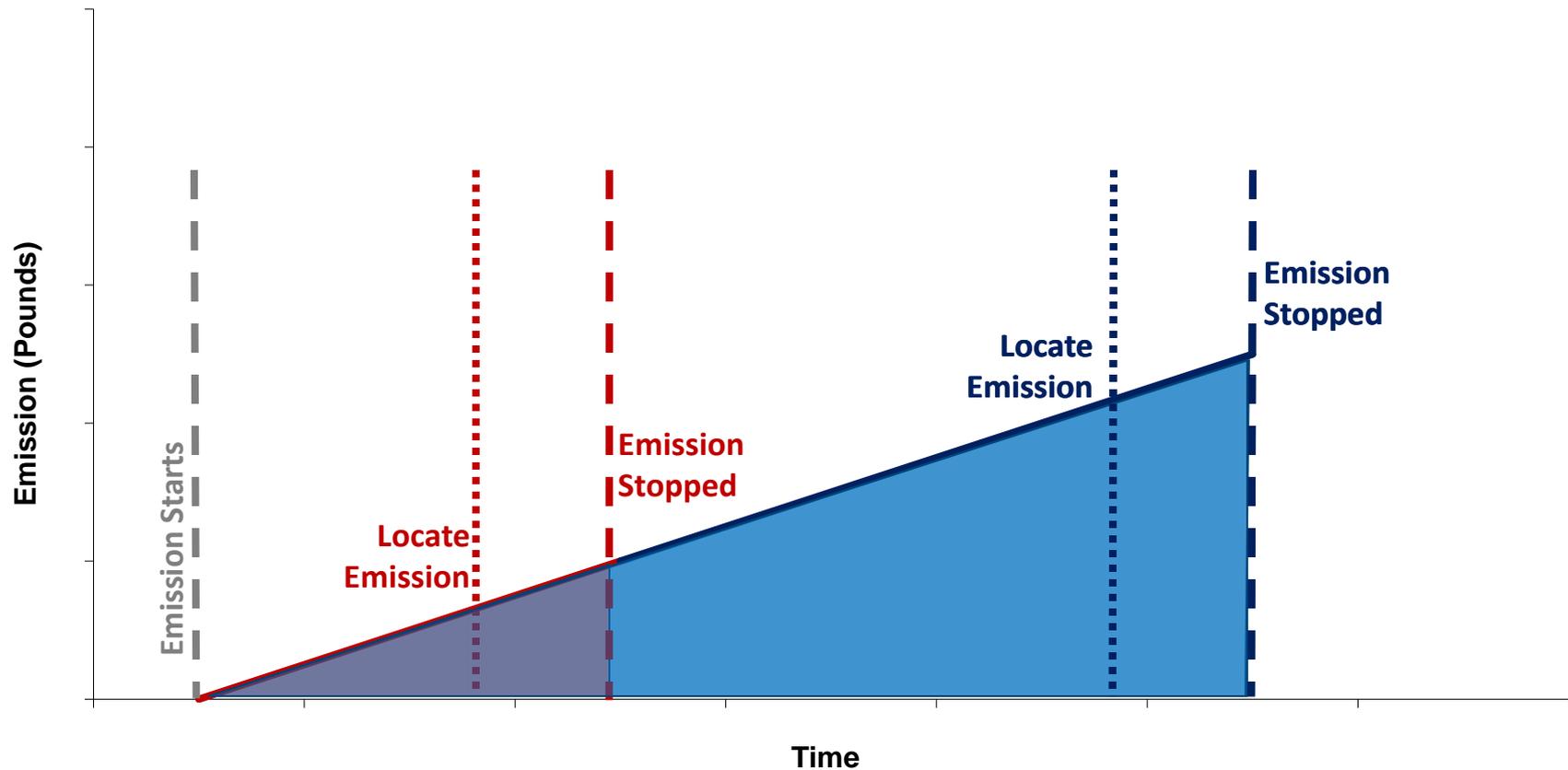
Back-Up Slides



**Locating Emission
Without Fenceline Monitors**



**Locating Emission
With Fenceline Monitors**



Fenceline Monitors Result In Shorter Duration Emissions
But Calculations Based On Longer Time Period

» Commissioner Soward:

- *I can't remember a recent agenda in which they haven't been on our agenda.*
- *Obviously, it [fenceline monitors] catches you more often than you would like*
- *I wish more of our major facilities, especially in Harris County had that [fenceline monitors]*
- *When the technology improves the ability to detect heretofore undetectable violations occurs and then we get more and more opportunities for enforcement.*
- *Where are we on getting some of these issues resolved with you all?*

» Commissioner Shaw:

- *We need to be sure, that we in our enforcement policies and penalties, that we are encouraging the kind of behavior that we want and discouraging the kind of behavior that we don't want.*
- *When a company is doing something that we want other companies to do, that adage of no good deed goes unpunished, not that you get a pass...*

» Commissioner Garcia:

- *Are you suggesting there should be some benefit because of the extra burden that is now being thrust upon you because of this technology?*

**Commissioners Acknowledged
Unintended Consequences**