



# ***Emissions Inventory Processes, Recent Research and Improvements, and The Barnett Shale Special Inventory***

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# Outline

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- Oil and Gas Emissions Inventory (EI) Development
- Oil and Gas Emissions Inventory Improvement Projects and Activities
- Barnett Shale Special Equipment and Emissions Inventory



# Oil and Gas Emissions Inventory (EI) Development

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# Types of Emissions Inventories (EIs)

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- Point sources
  - Developed from industry-reported emissions
  - Industrial sources
- Area sources
  - Texas Commission on Environmental Quality (TCEQ) developed
  - Painting, gas stations, dry cleaners, etc.
- Mobile sources
  - TCEQ developed
  - On-road and non-road
- Biogenic sources
  - TCEQ developed
  - Based on estimates of vegetation type/quantity



# Area Source Emissions Inventory

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- If emissions sources do not meet the point source EI thresholds, their emissions are developed using area source emissions inventory methodology.
- Railroad Commission of Texas (RCT) data, variables, and information:
  - Amount of gas/condensate/etc produced
  - Number of wells, sites, etc in the state
- Emissions calculators are employed to determine the quantity and composition of emissions.
- Amounts determined from point source EI are deducted to avoid double counting.



# Oil and Gas Area Source Emissions Inventory

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## Emissions Sources Included:

- Artificial Lifts
- Storage Tanks (crude oil & condensate)
- Heater-Treaters
- Tank Truck/Railcar Loading (Crude Oil & Condensate)
- Wellheads
- Equipment Leak Fugitives (Connectors, Flanges, Open-Ended Lines, Pumps, Valves, and Other)
- Natural Gas Fired Compressor Engines (2/4-Cycle, Rich/Lean Burn, & all HP ratings)
- Gas Well Heaters and Dehydrators
- Gas Well Venting & Completion (all Processes)
- Well Completion (all Processes)
- Pneumatic Devices
- Produced Water Storage Tanks



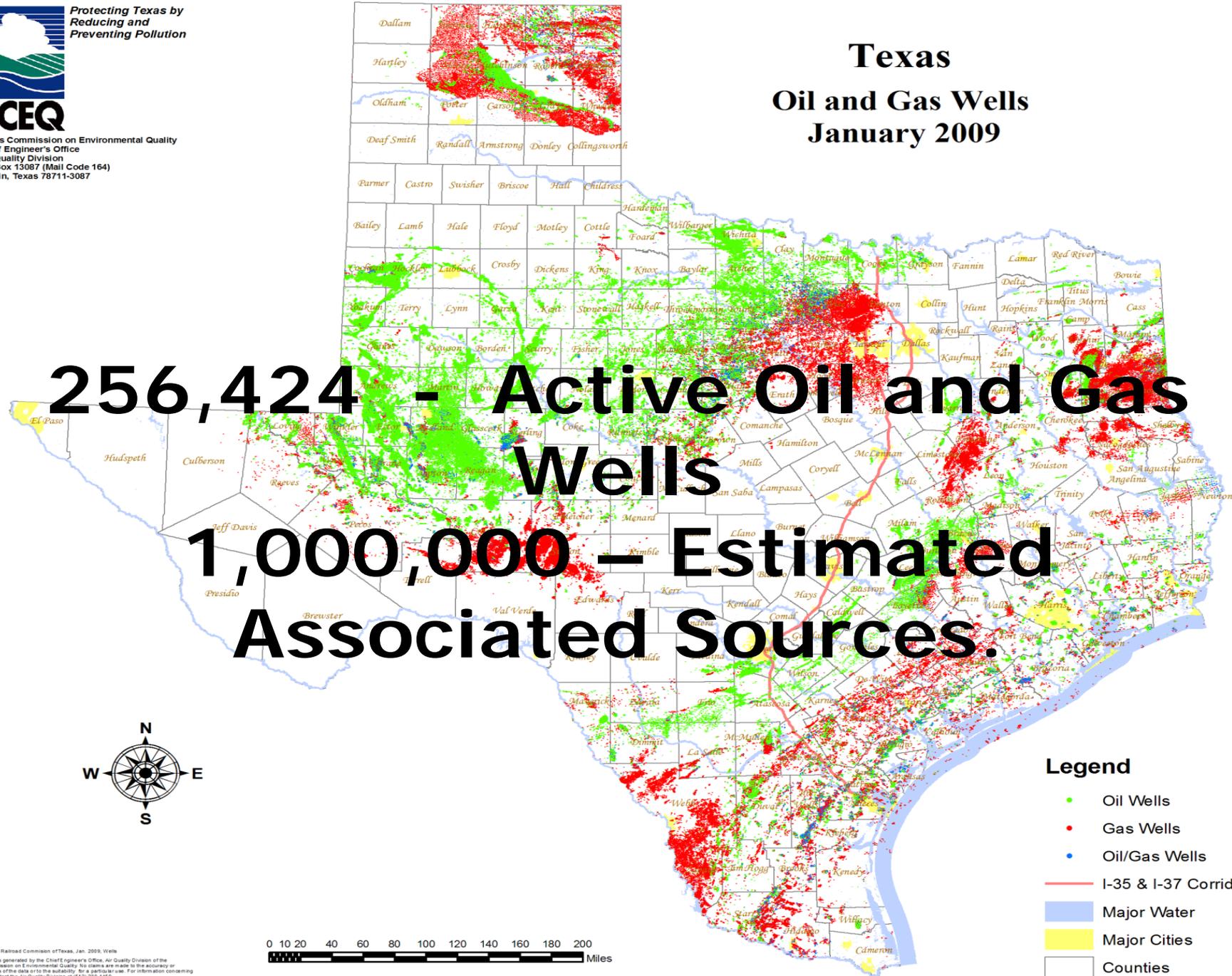
# Oil and Gas EI Improvement Projects and Activities

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# Texas

## Oil and Gas Wells

### January 2009



**256,424 - Active Oil and Gas Wells**

**1,000,000 - Estimated Associated Sources.**

#### Legend

- Oil Wells
- Gas Wells
- Oil/Gas Wells
- I-35 & I-37 Corridor
- Major Water
- Major Cities
- Counties

Source Data: Railroad Commission of Texas, Jan. 2009; Wellbore  
This map was generated by the Chief Engineer's Office, Air Quality Division of the  
Texas Commission on Environmental Quality. No claims are made to the accuracy or  
completeness of the data or to the suitability for a particular use. For information concerning  
this map, contact the Air Quality Division at (512) 239-1459.  
Ray Neidkorn (512) 239-1934 December 4, 2009



# Oil and Gas EI Improvement Activities

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- Oil and Gas Model Evaluation
  - Evaluate methods, models, and related data
  - Texas-specific calculator for area inventory development
  - Expect to be posted October 2010
- DFW Compressor Engine Project
  - Ambient measurements downwind of gas compressor engines
  - Develop typical compressor engine ambient signatures
  - Project schedule to be completed December 2010
- 2007 Engine Fleet DFW Nonattainment Area Survey
  - Information available upon request
- 2007 Southeast Texas Compressor and Dehydrator Survey
  - Information available upon request



# Oil and Gas EI Improvement Activities

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- 2005 Upstream Oil and Gas Tank Project
  - Measured emissions from oil and condensate tanks
  - Developed factor for area source emissions inventory
  - EPA approved tank testing procedure needed
  - <http://projects.tercairquality.org/AQR/H051C>
- Flash Emissions Model Evaluation
  - Evaluated different methods for calculating flash emissions from oil and condensate tanks
  - Improved agency guidance
  - [www.tceq.state.tx.us/implementation/air/airmod/project/pj\\_report\\_ei.html](http://www.tceq.state.tx.us/implementation/air/airmod/project/pj_report_ei.html)
- Produced Water Storage Tank Project
  - This area may need additional research
  - Limited available data



# Oil and Gas EI Improvement Activities

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- Drilling Rig Emissions Project
  - Activity data
  - Emissions characterization data
  - Used to develop the drilling rig emissions inventory for 2008
  - [www.tceq.state.tx.us/implementation/air/airmod/project/pj\\_report\\_ei.html](http://www.tceq.state.tx.us/implementation/air/airmod/project/pj_report_ei.html)
- Oil and Gas Platform Inventory Improvement Project
  - Oil and gas platforms in Texas water
  - Parallels federal platform inventories in Gulf of Mexico
  - [www.tceq.state.tx.us/implementation/air/airmod/project/pj\\_report\\_ei.html](http://www.tceq.state.tx.us/implementation/air/airmod/project/pj_report_ei.html)



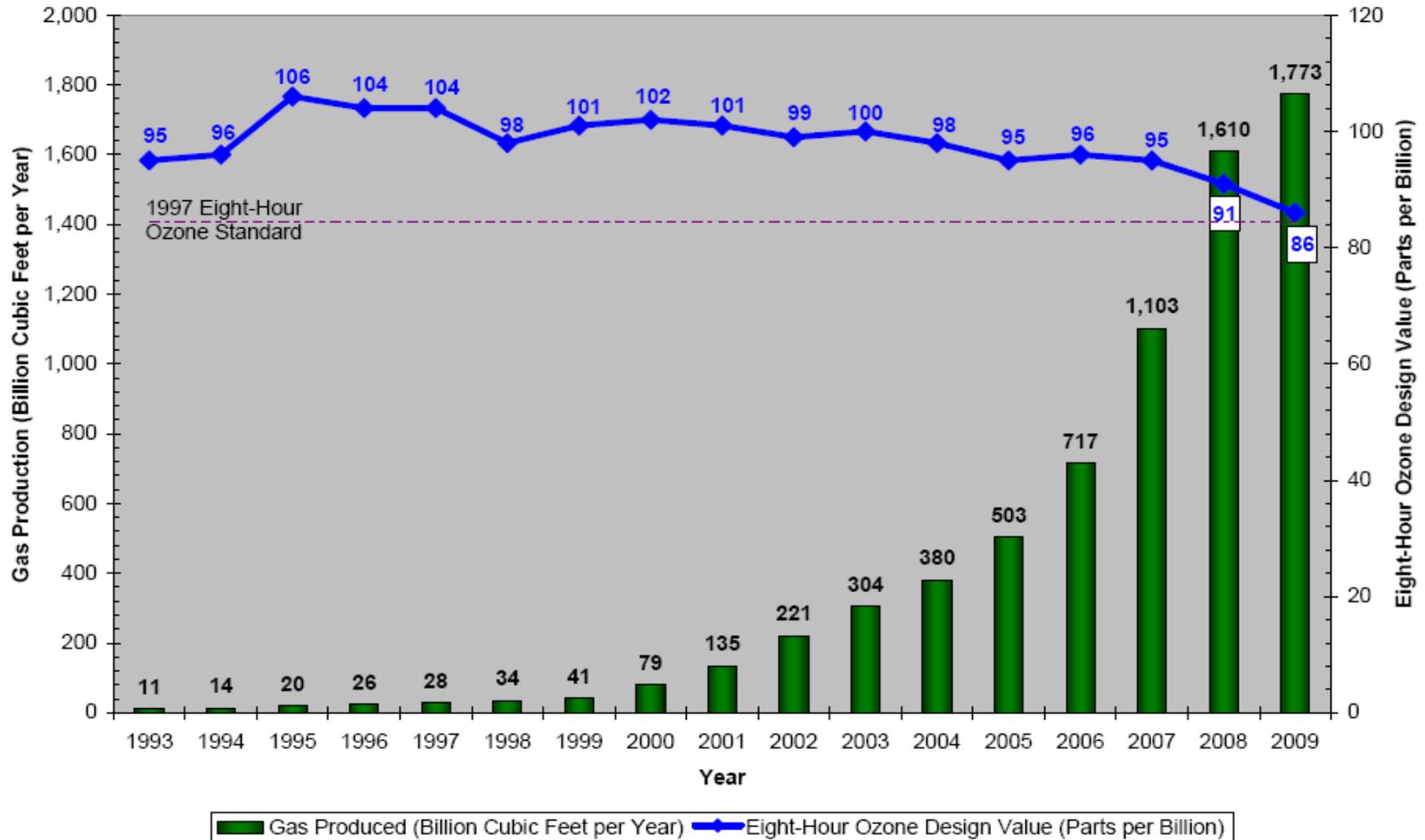
# Barnett Shale Special Equipment and Emissions Inventory

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# DFW Ozone Design Values and Barnett Shale Production

Dallas-Fort Worth Ozone Design Values Compared to Barnett Shale Natural Gas Production



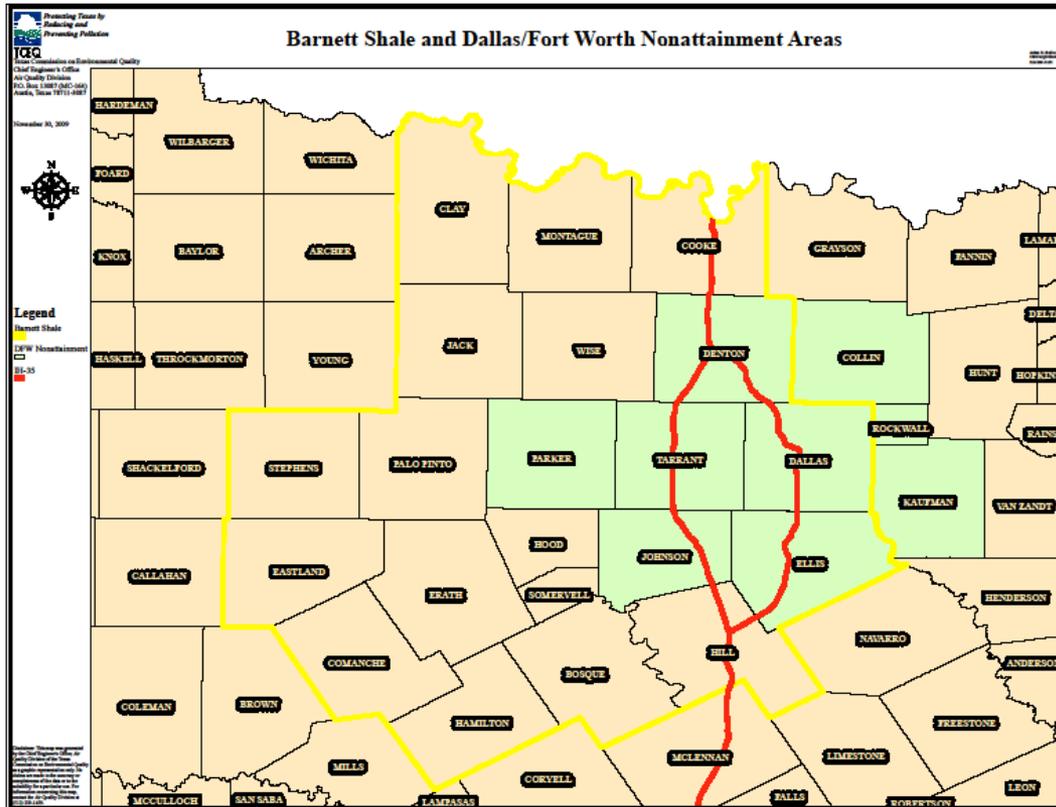




# Barnett Shale Special Inventory

## Phase One: Equipment Counts Inventory

- Determine the location, number, and type of emissions sources located at upstream and midstream oil and gas operations associated with the Barnett Shale formation.
- Equipment count at county level and more information available at: [www.tceq.state.tx.us/goto/ieas](http://www.tceq.state.tx.us/goto/ieas)





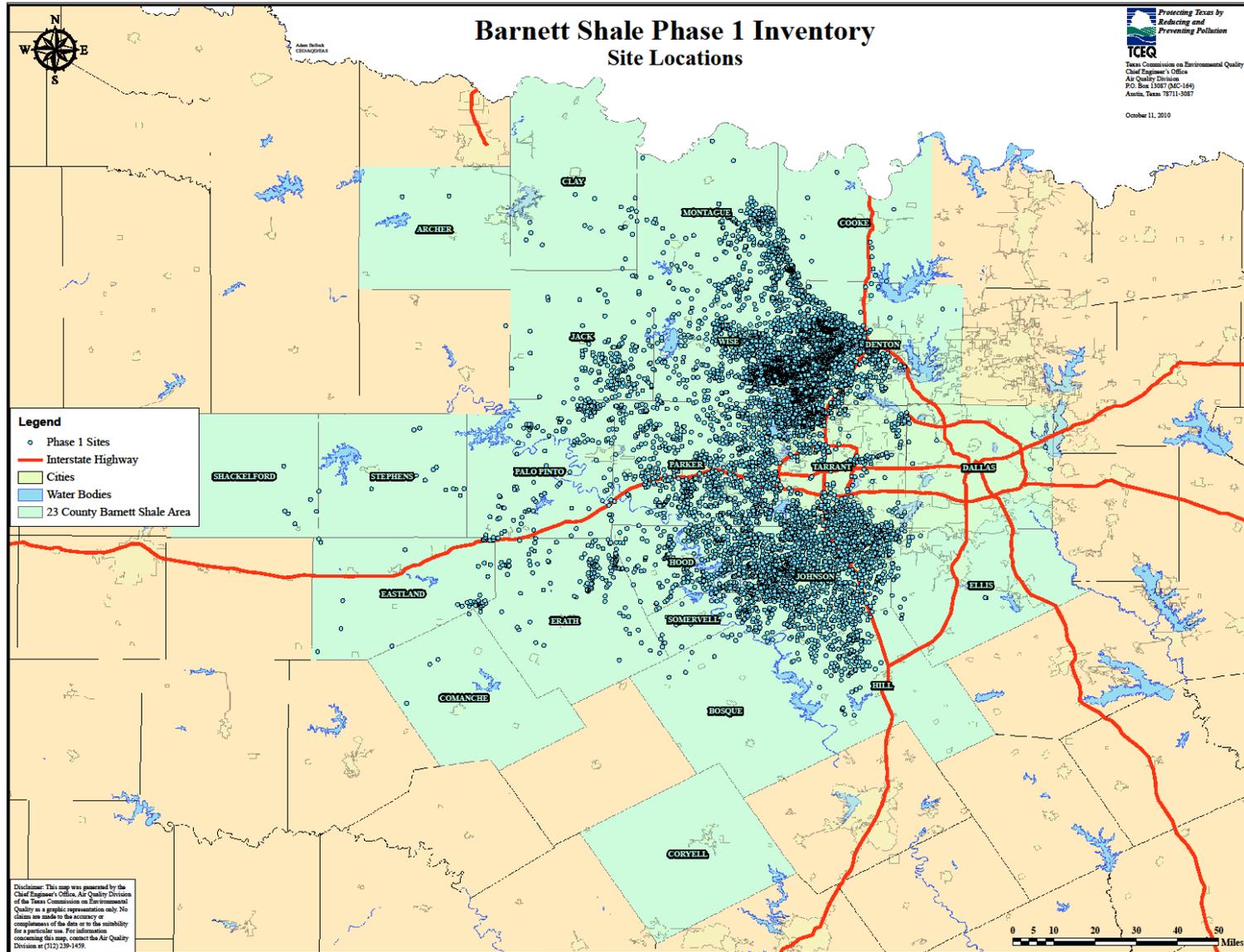
# Barnett Shale Special Inventory

Barnett Shale Equipment Totals for All Inventory Types:

Emission Source	Number of Sources
Separators Vented to Atmosphere	23
Total Storage Tanks	20,663
Uncontrolled Glycol Dehydrators	111
Controlled Glycol Dehydrators	182
Total Stationary Engines	3,547
Turbines	37
Flares	78
Frac tanks	20
Piping Component Fugitive Areas	15,820
Blowdown Vents	7,479
Process Vents	1,189
Heaters/boilers	882
Other Stationary Equipment	1,770
<b>Total Emission Sources</b>	<b>51,801</b>



# Sites/Leases Reported During Phase I of Barnett Shale EI





# Equipment Counts for Counties in DFW Nonattainment Area and Barnett Shale

Emissions Source	Dallas	Denton	Ellis	Johnson	Parker	Tarrant	Totals
Separators Vented to Atmosphere	0	2	0	1	3	0	<b>6</b>
Total Oil Storage Tanks	0	27	0	17	18	3	<b>65</b>
Total Condensate Storage Tanks	5	709	1	210	591	132	<b>1,648</b>
Total Produced Water Storage Tanks	24	2,877	91	3,861	1,083	2,926	<b>10,862</b>
Total Slop Storage Tanks	0	10	7	22	40	10	<b>89</b>
Uncontrolled Glycol Dehydrators	0	2	3	2	3	6	<b>16</b>
Controlled Glycol Dehydrators	1	14	4	31	11	35	<b>96</b>
Total Stationary Engines	2	141	18	710	317	290	<b>1,478</b>
Turbines	0	0	3	0	0	0	<b>3</b>
Flares	0	6	0	0	2	1	<b>9</b>
Frac Tanks	0	0	0	11	5	0	<b>16</b>
Piping Component Fugitive Areas	21	2,570	319	3,075	1,096	3,853	<b>10,934</b>
Process Vents	0	177	7	62	503	31	<b>780</b>
Blowdown Vents	21	748	47	2,576	677	867	<b>4,936</b>
Heaters/Boilers	0	104	5	52	37	59	<b>257</b>
Other Stationary Equipment	0	349	4	39	130	344	<b>866</b>
<b>Total Emission Sources</b>	<b>74</b>	<b>7,736</b>	<b>509</b>	<b>10,669</b>	<b>4,516</b>	<b>8,557</b>	<b>32,061</b>



# Barnett Shale EI – Phase Two

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- The inventory will collect information on:
  - equipment and production information for emission sources associated with Barnett Shale oil and gas production, transmission, processing and related activities;
  - air emissions authorizations for these sources;
  - Proximity of these sources to the nearest off-site receptor; and
  - annual 2009 emissions for NO<sub>x</sub>, VOC, and HAPs.
- Due December 31, 2010
- To view a sample letter and enclosure, download the workbook, install an emissions calculator tool, and for more information, visit:  
<http://www.tceq.state.tx.us/implementation/air/industei/psei/psei.html>



# How Will the Data be Used?

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- Air Quality Planning:
  - Establishing baseline emission levels
  - Control strategy evaluation
- Air Quality Modeling and Assessment
  - Inputs in the photochemical modeling process
- Trends analyses in State Implementation Plans (SIPs)
- Regional Offices
  - Prioritizing for future investigations
  - Source tracking of complaints
  - Possible locations for future monitoring efforts
- Permitting
  - Assist in permit reviews
  - Assessing major site modifications
  - Historical emission dispersion modeling
  - Helping with rule development
- Toxicology Reviews



# Barnett Shale EI Phase Two

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## Equipment Type and Activity Data to be Collected

- Equipment Type:
  - Loading/unloading emissions
  - Separators vented to the atmosphere (typically oil/water separators)
  - Glycol dehydrators
  - Flares
  - Compressor engines and turbines
  - Storage tanks
  - Fugitives
  - Process blowdown vents
  - Heaters/boilers
  - Frac tanks only if onsite six months or more



# Barnett Shale EI Phase Two

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## Equipment Type and Activity Data to be Collected

- Activity Data:
  - Annual throughput
  - Engine type and horsepower
  - Process temperatures
  - Control types and efficiencies
  - Liquid type and composition
  - Operating hours
  - VOC content, etc.