

**AAM/AIAM/Oil Industry Low Sulfur & Oxygenate  
Test Program  
Test Program Elements**

- **13 Vehicles, 8 Manufacturers**
  - **Mix of Production Intent and Certified TLEV/LEV/ULEV 'Tech 5' Cars and Trucks**
  - **Some (3) SFTP Intent Calibrations**
  
- **Part 1**
  - **"Zero" fuel sulfur effect**
  - **1, 30, 100 ppm Sulfur**
  - **1 ppm Sulfur Fuel Blended to CBF2 Specifications**
  
- **Part 2**
  - **Oxygenate effect**
  - **30 ppm Sulfur MTBE 'Base' Fuel**
  - **With and without 3.5 wt.% ethanol**
  - **1150 DI**
  - **RVP Matched**
  
- **Common Test Protocol**
  
- **Vehicles Tested at Manufacturer Facilities**
  
- **50k or 100k Aged Catalysts**
  
- **Independent Statistician for Data Analysis**

**AAM/AIAM/Oil Industry Low Sulfur & Oxygenate  
Test Program  
Participation**

<b><u>Manufacturer</u></b>	<b>Car</b>	<b>Truck</b>	<b>Total</b>
1. DaimlerChrysler	1	1	2
2. Ford	2	1	3
3. GM	1	1	2
4. Toyota	1	1	2
5. Nissan	1		1
6. VW	1		1
7. Honda	1		1
8. BMW	1		1
	<b>9</b>	<b>4</b>	<b>13</b>

**AAM/AIAM/Oil Industry Low Sulfur & Oxygenate  
Test Program  
Emissions Parameters**

**FTP Weighted: THC, CO, NO<sub>x</sub>, CO<sub>2</sub>, NMHC, Methane, VFE**

**Bags 1-3: THC, CO, NO<sub>x</sub>, CO<sub>2</sub>, NMHC, Methane, VFE**

**Engine-Out: THC, CO, NO<sub>x</sub>, CO<sub>2</sub>**

**Catalyst Inefficiencies: THC, CO, NO<sub>x</sub>, CO<sub>2</sub>**

**US06 Emissions: Two Vehicles Will Be Reporting**

**Speciation Data: Two Vehicles With Limited Data**

**Sulfur Reversibility: Moderate Data Set Not Analyzed**

## **Test Program Caveats:**

### **Unbalanced Data Set**

**Sulfur Series - 13 Vehicles**

**Oxygenate Series - 10 Vehicles**

**FTP Data - Some Parameters Not Reported by All**

**Bag Data - Not All Vehicles, Not All Parameters**

**Engine-Out Data - Not All Vehicles**

**Catalyst In-Efficiencies - Not All Vehicles**

**Statistical Analyses Not Available Until Late September**

**Engine/Emissions Controls Optimized for CBF2 Certification Fuel**

**No Recalibrations Evaluated**

**Impact of Fuel Property Differences Unknown**

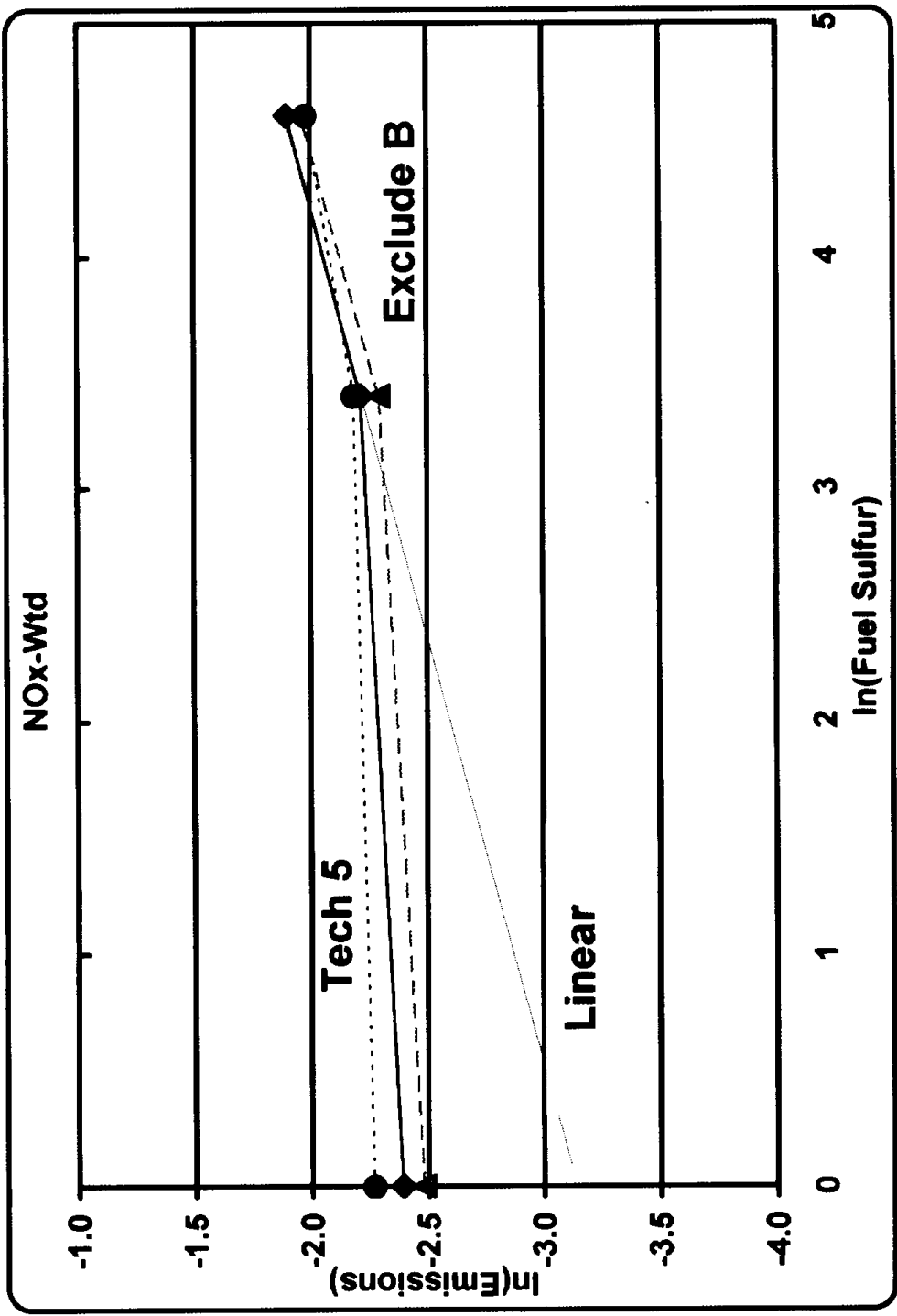
**Limited Number of Vehicles but Wide Range of Size, Type and Emissions Levels**

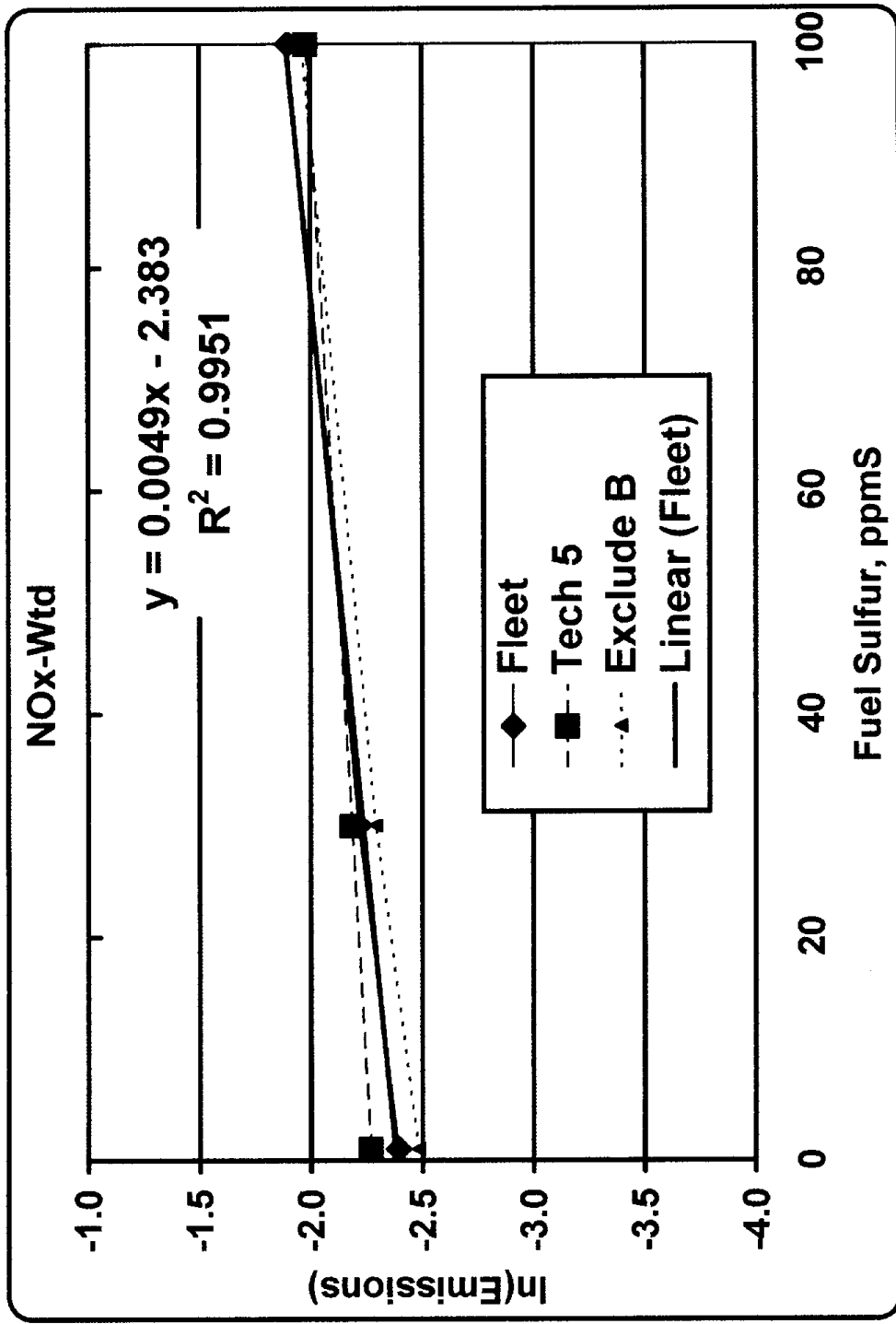
**At Least One 'Apparently Anomalous' Vehicle**

**Status of CBF3 Low  
Sulfur/Oxygenate Data  
Set as of 8/9/2000:**

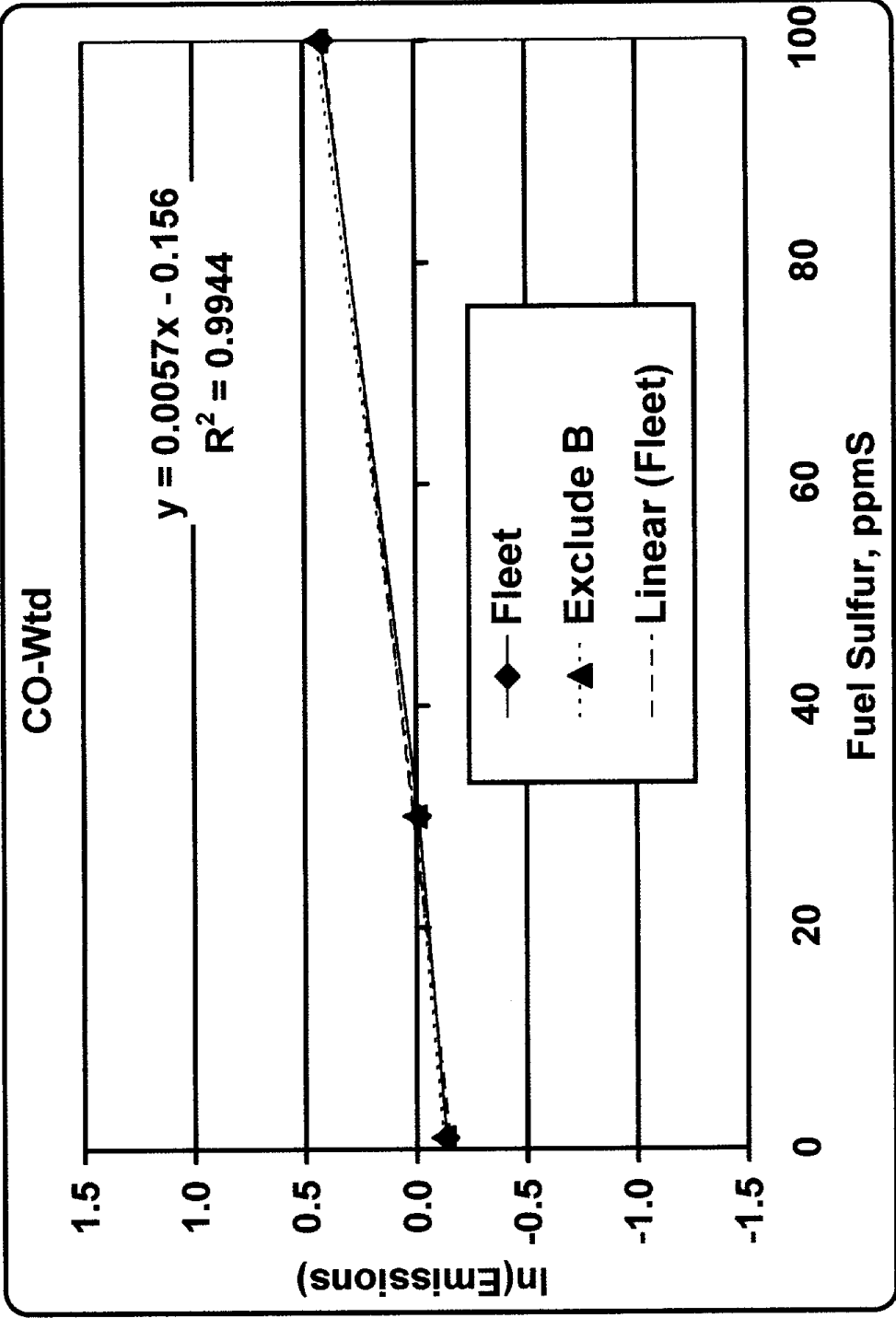
	Summary Information:		
<b>Emission Class</b>	<b>1 TLEV</b>	<b>9 LEV</b>	<b>3 ULEV</b>
<b>Vehicle Class</b>	<b>9 LDV</b>	<b>2 LDT2</b>	<b>2 MDV2</b>
<b>Body Class</b>	<b>9 PC</b>	<b>4 T</b>	
<b>SFTP Chip</b>	<b>3 Yes</b>	<b>10 No</b>	
<b>Engine-Out</b>	<b>5 Yes</b>	<b>8 No</b>	
<b>Catalyst Inefficiency</b>	<b>7 Yes</b>	<b>6 No</b>	
<b>Bags 1, 2, 3 of FTP</b>	<b>9 Yes</b>	<b>4 No</b>	
<b>Methane</b>	<b>11 Yes</b>	<b>2 No</b>	
<b>Sulfur Fuels</b>	<b>"1"</b>	<b>13 Yes</b>	
	<b>"30"</b>	<b>13 Yes</b>	
	<b>"100"</b>	<b>13 Yes</b>	
<b>Reversibility</b>	<b>Standard</b>	<b>12 Yes</b>	<b>1 No</b>
	<b>Extra</b>	<b>8 Yes</b>	<b>5 No</b>
<b>Ethanol Fuel</b>	<b>"E"</b>	<b>10 Yes</b>	<b>3 No</b>
<b>Clear Fuel</b>	<b>"C"</b>	<b>10 Yes</b>	<b>3 No</b>
<b>US06</b>	<b>"U"</b>	<b>2 Yes</b>	<b>11 No</b>
<b>Other</b>	<b>2 w Species</b>	<b>4 w/o FE</b>	

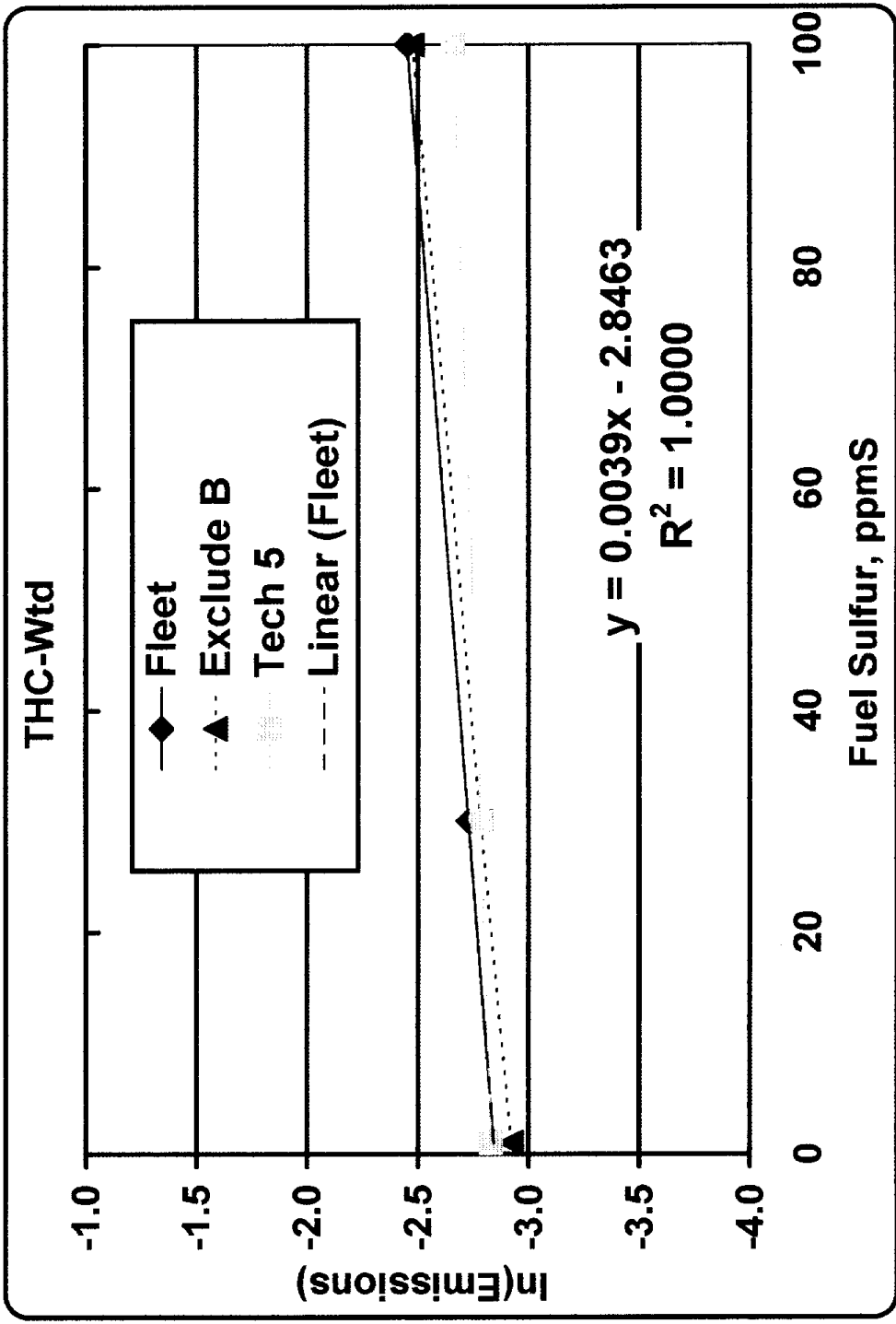
<b>Fuel Analysis Data from Oil Industry</b>			
<b>Parameter</b>	<b>MTBE</b>	<b>Clear</b>	<b>EtOH</b>
<b>T10%</b>	<b>140</b>	<b>145</b>	<b>136</b>
<b>T50%</b>	<b>202</b>	<b>210</b>	<b>205</b>
<b>T90%</b>	<b>296</b>	<b>297</b>	<b>291</b>
<b>"DI (F)"</b>	<b>1117</b>	<b>1134</b>	<b>1121</b>
<b>Reid Vapor Pressure</b>	<b>6.91</b>	<b>7.06</b>	<b>7.08</b>
<b>Sulfur</b>	<b>32</b>	<b>35</b>	<b>28</b>
<b>"Oxygen"</b>	<b>2.0</b>	<b>0.0</b>	<b>3.5</b>
<b>Oxygenate (vol%)</b>	<b>11.2</b>	<b>0.0</b>	<b>11.5</b>
<b>Composition, aromatics</b>	<b>21.7</b>	<b>24.6</b>	<b>21.6</b>
<b>Composition, olefins</b>	<b>4.0</b>	<b>4.6</b>	<b>4.1</b>
<b>Density</b>	<b>0.731</b>	<b>0.733</b>	<b>0.738</b>
<b>Research Octane Number</b>	<b>100</b>	<b>96</b>	<b>101</b>

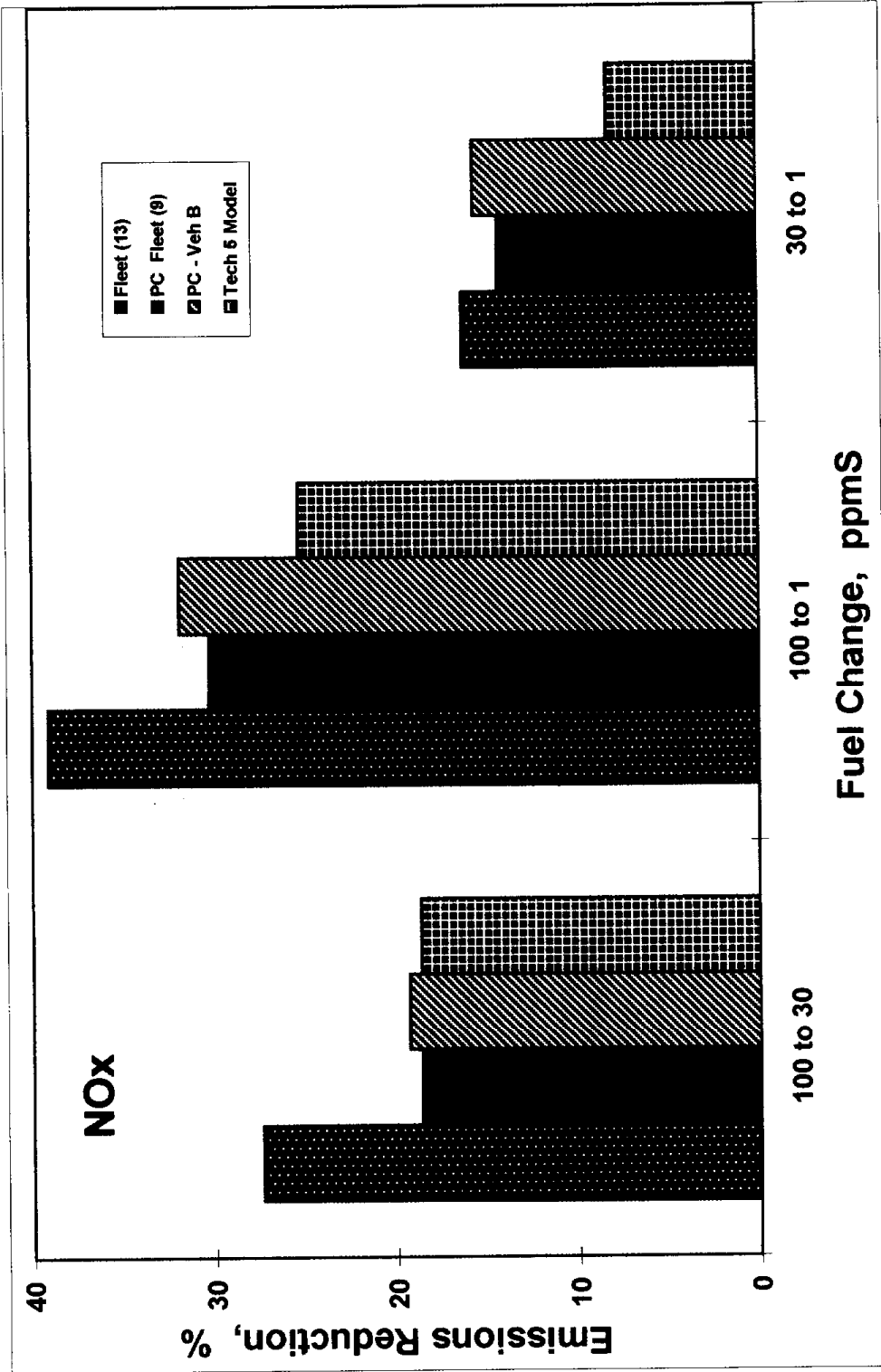




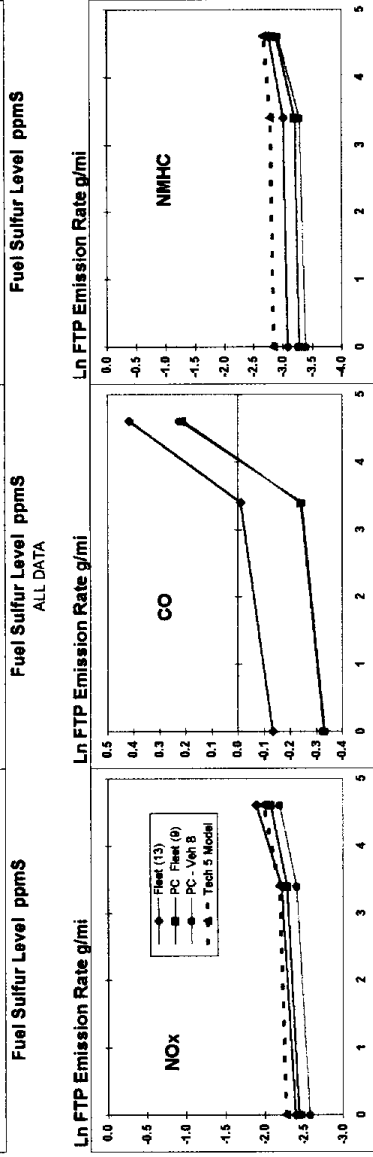
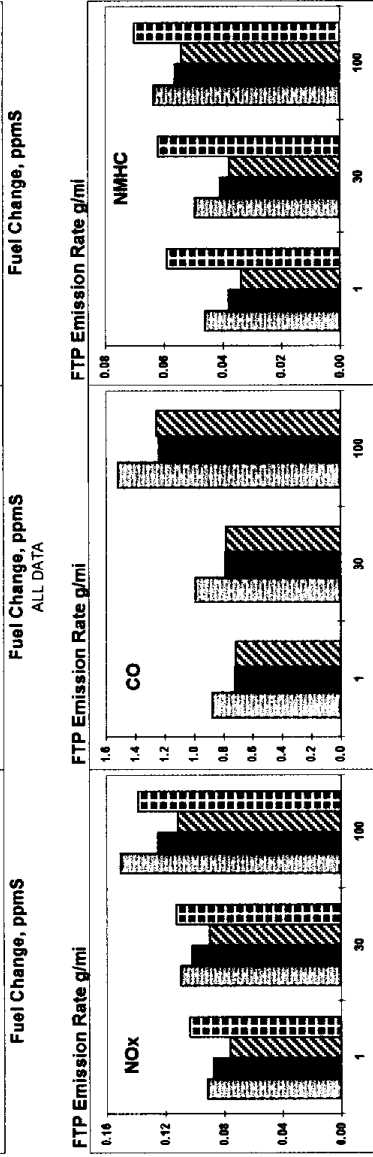
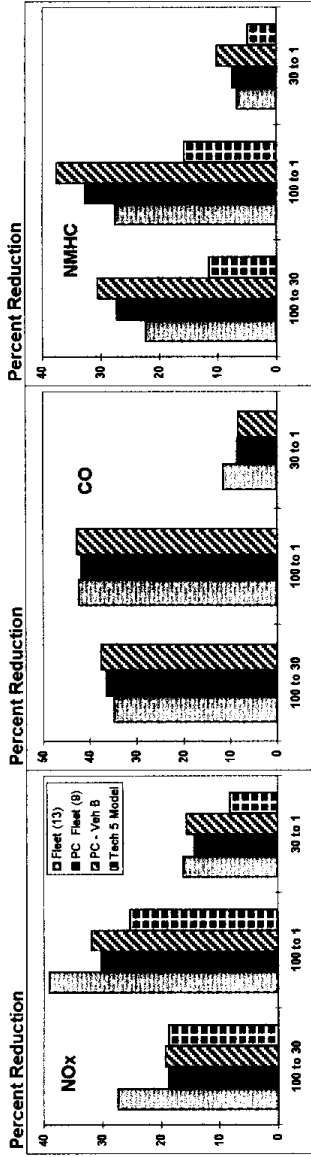


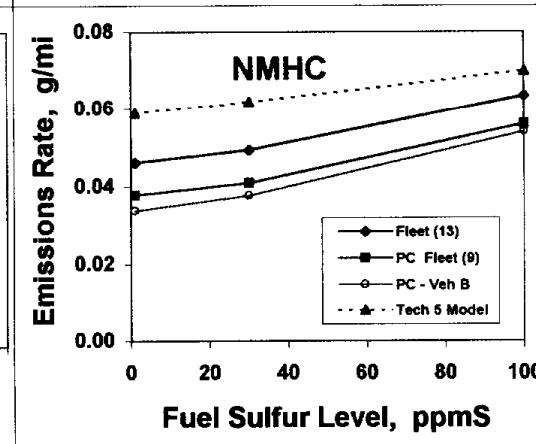
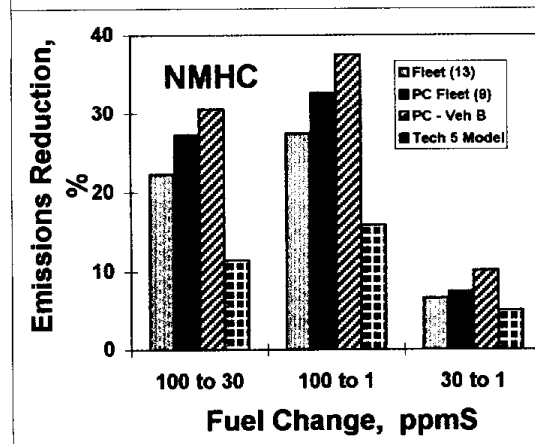
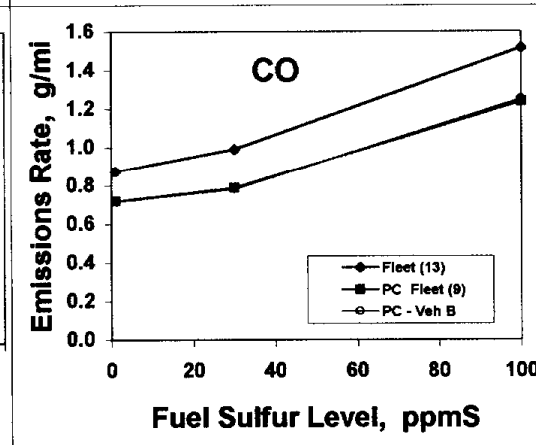
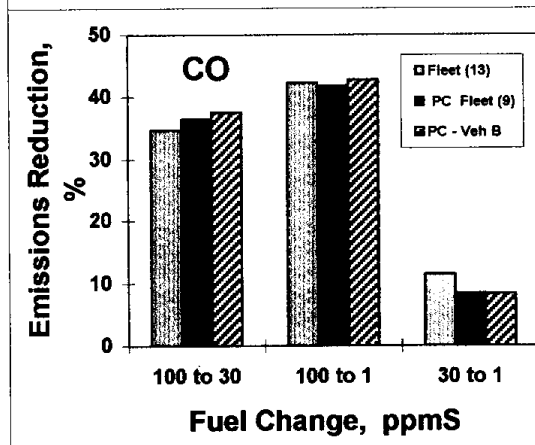
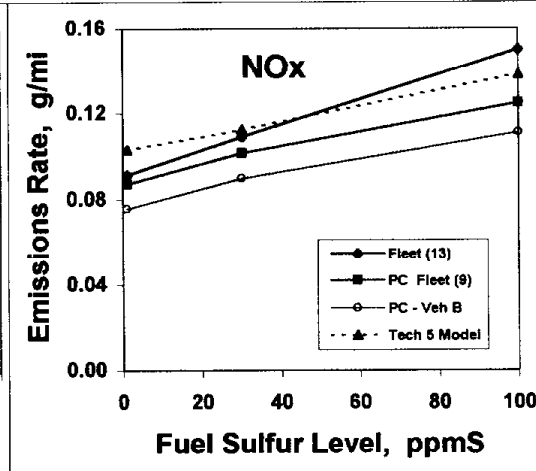
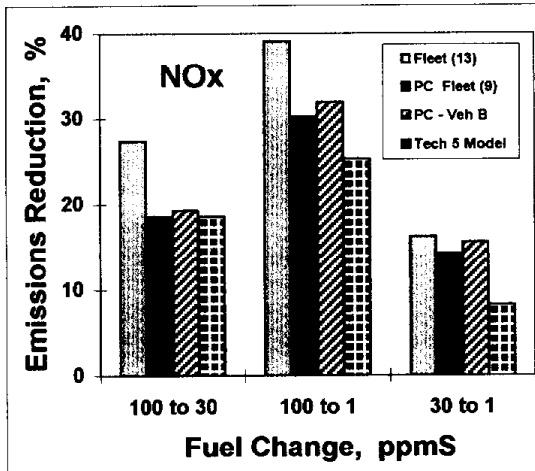






# Results for Complete 13-Vehicle Fleet Data Set

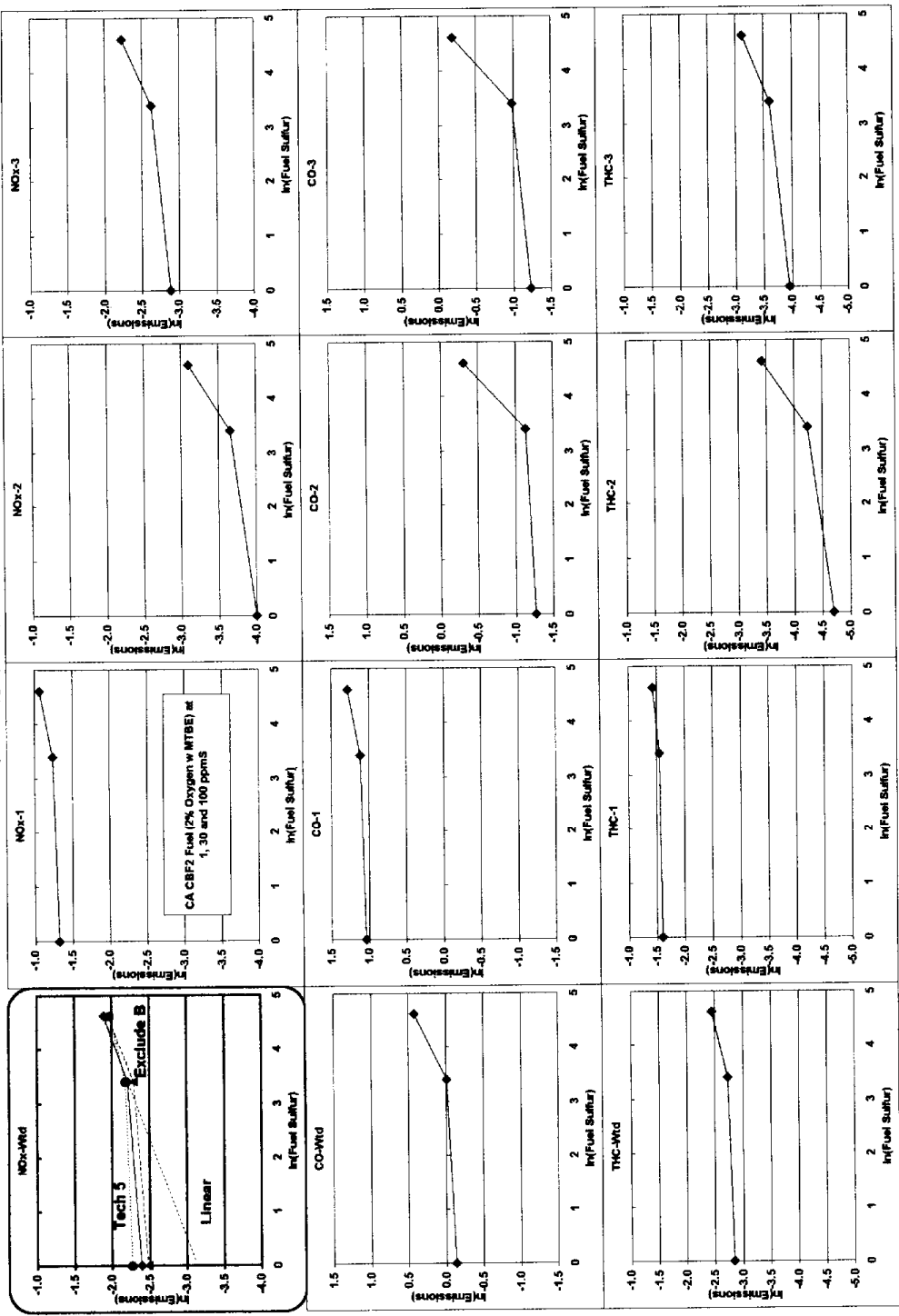




Sulfur Log-Log Plots

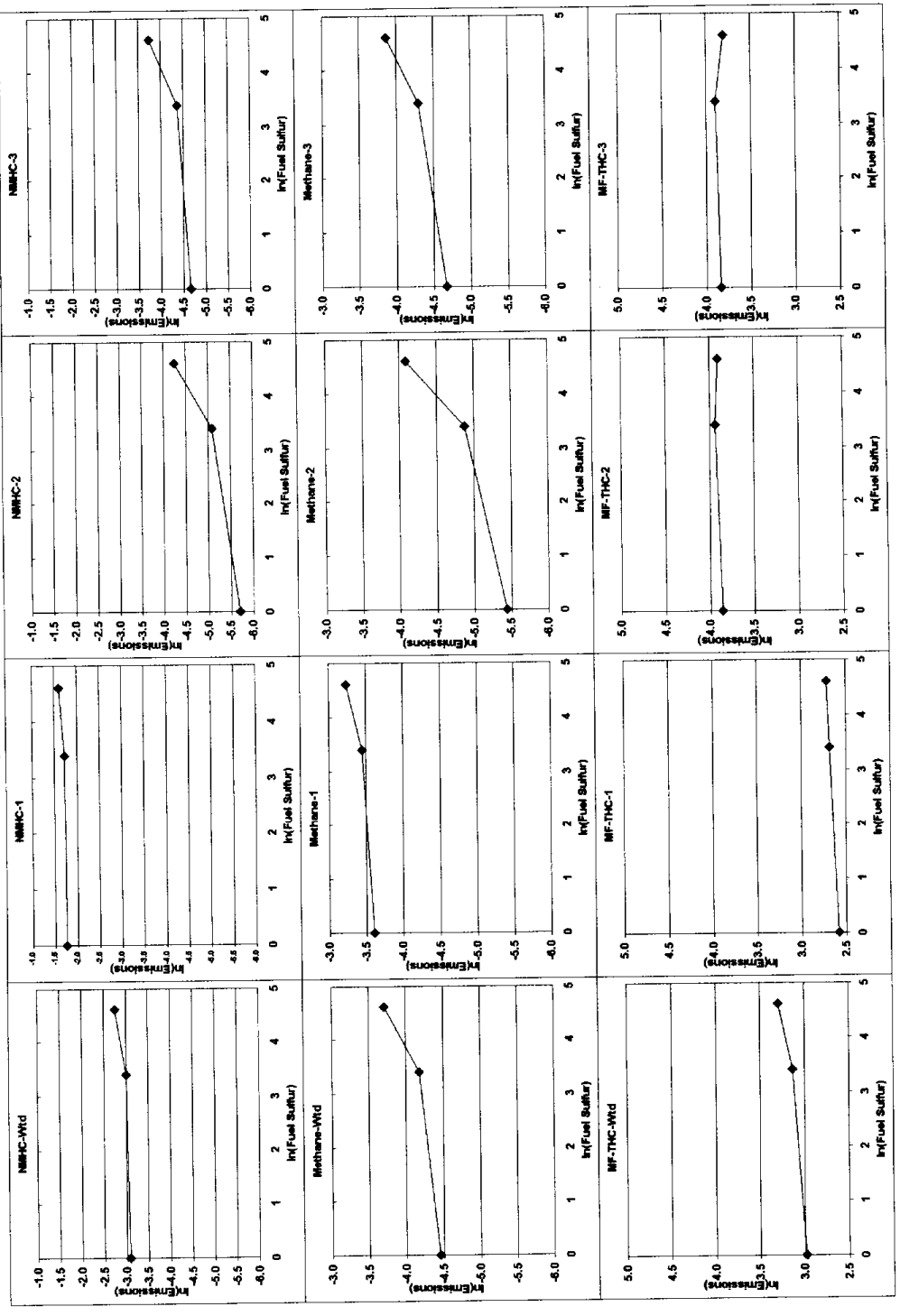
Preliminary Complete Data Set  
Fleet Emissions Response to Fuel Sulfur

In(Emissions, g/m) vs. ln(Sulfur, ppmS)



**Sulfur Log-Log Plots**

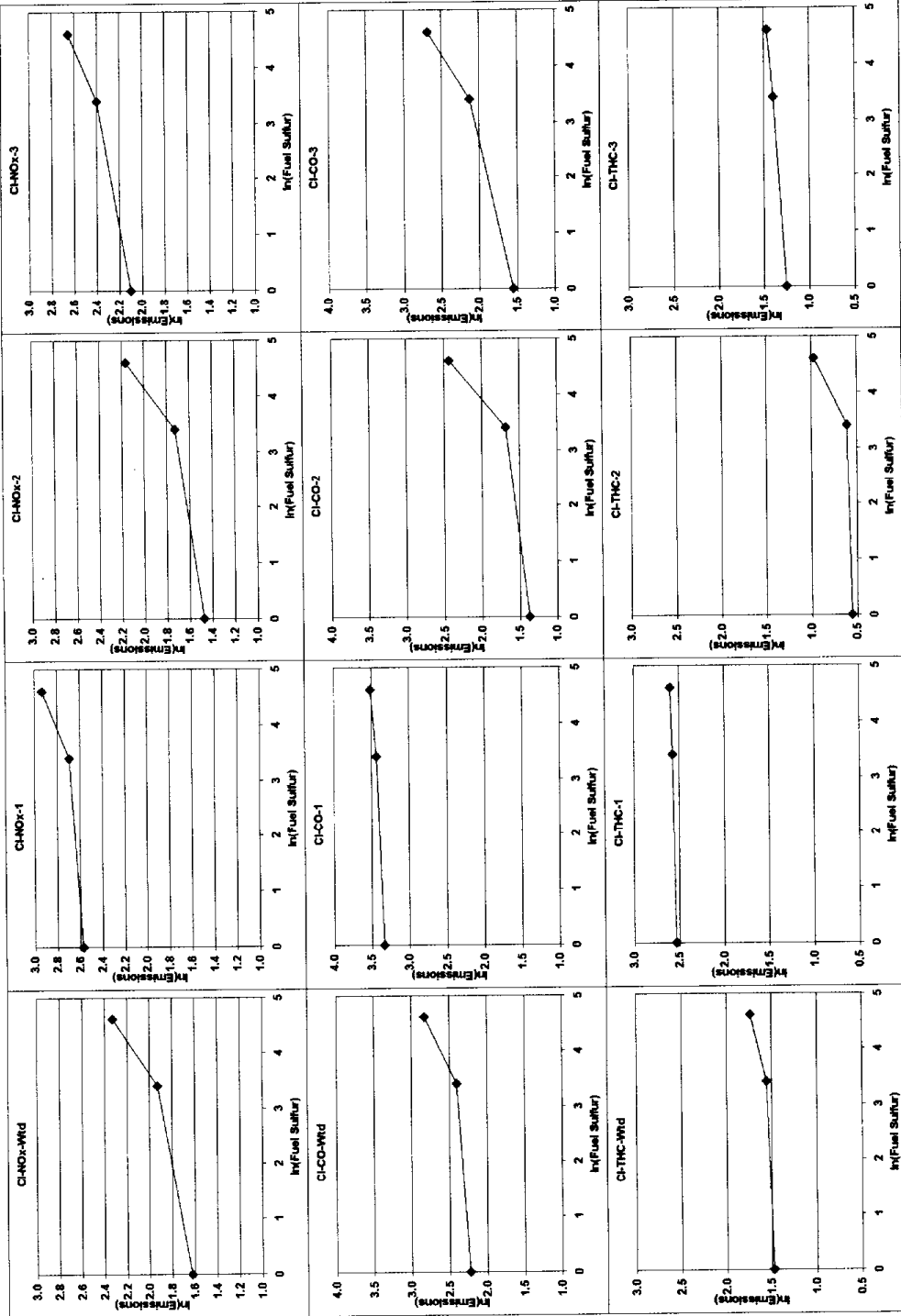
**Preliminary Complete Data Set**  
**Fleet Emissions Response to Fuel Sulfur**  
 ln(Emissions, g/mi) vs. ln(Sulfur, ppmS)



Sulfur Log-Log Plots

Preliminary Complete Data Set  
Fleet Emissions Response to Fuel Sulfur

In(Emissions, g/mi) vs. In(Fuel Sulfur, ppmS)



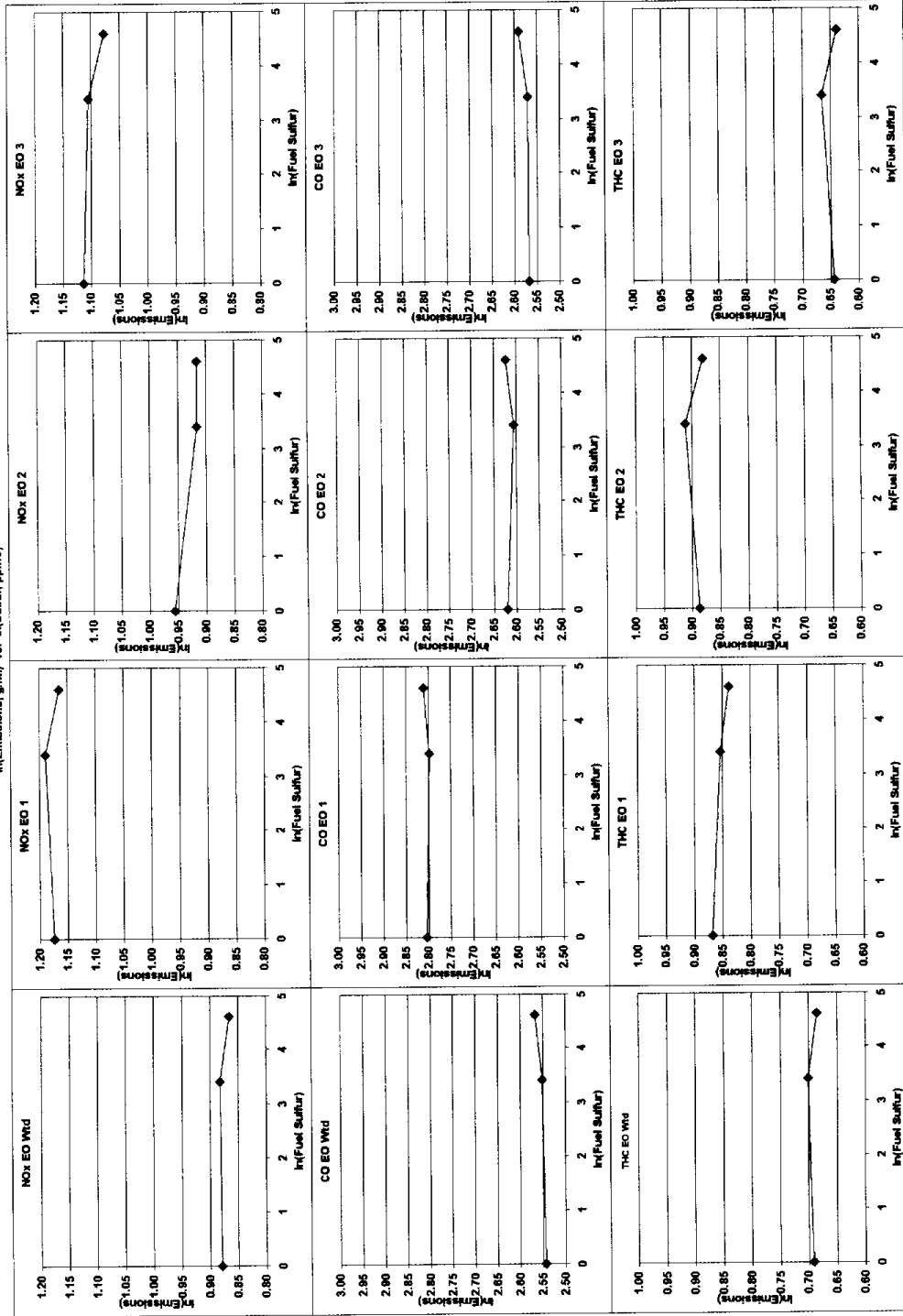


Sulfur Log-Log Plots

Preliminary Complete Data Set

Fleet Emissions Response to Fuel Sulfur

In(Emissions, g/mi) vs. In(Fuel Sulfur, ppmS)

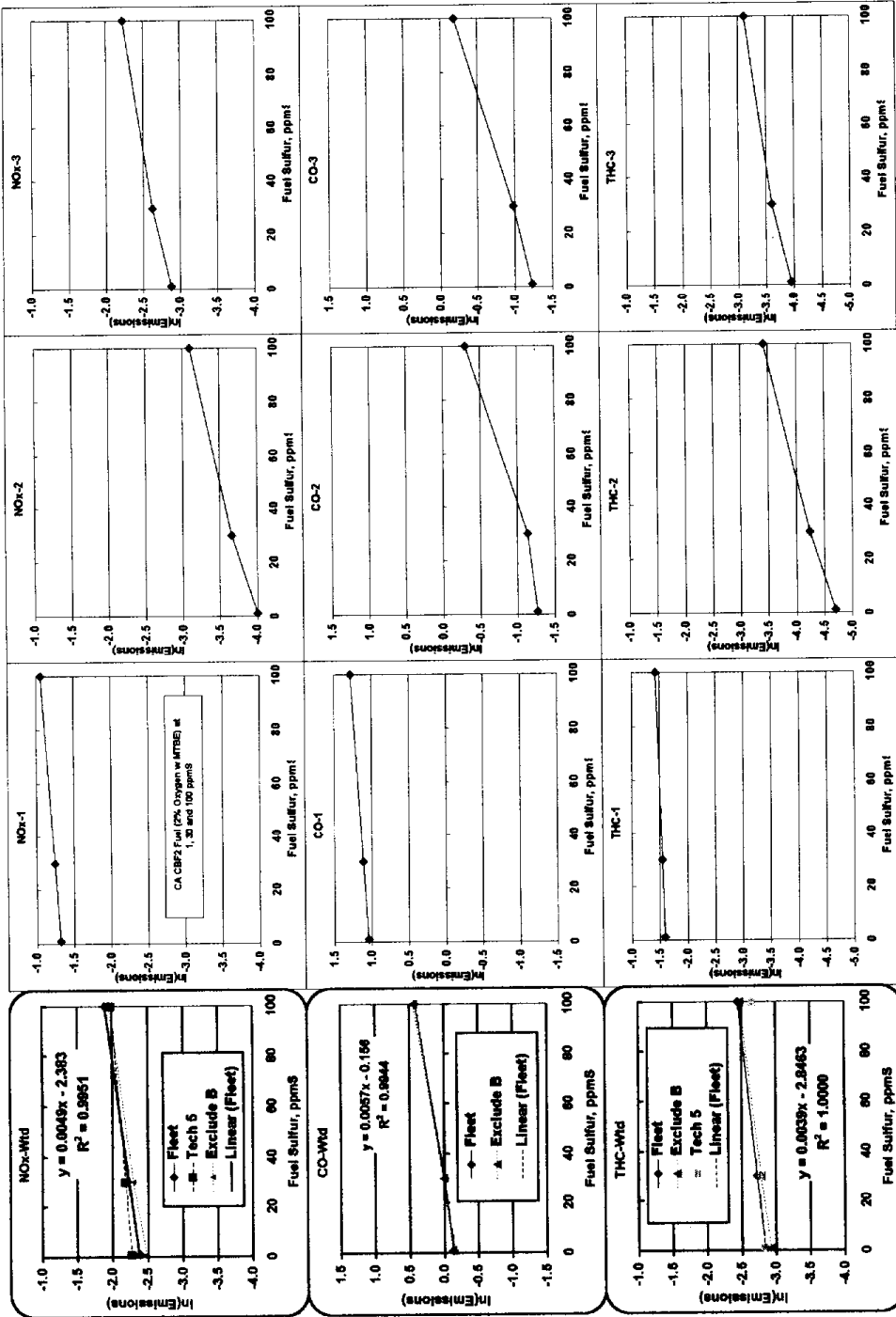


Sulfur Log-Linear Plots

Preliminary Complete Data Set

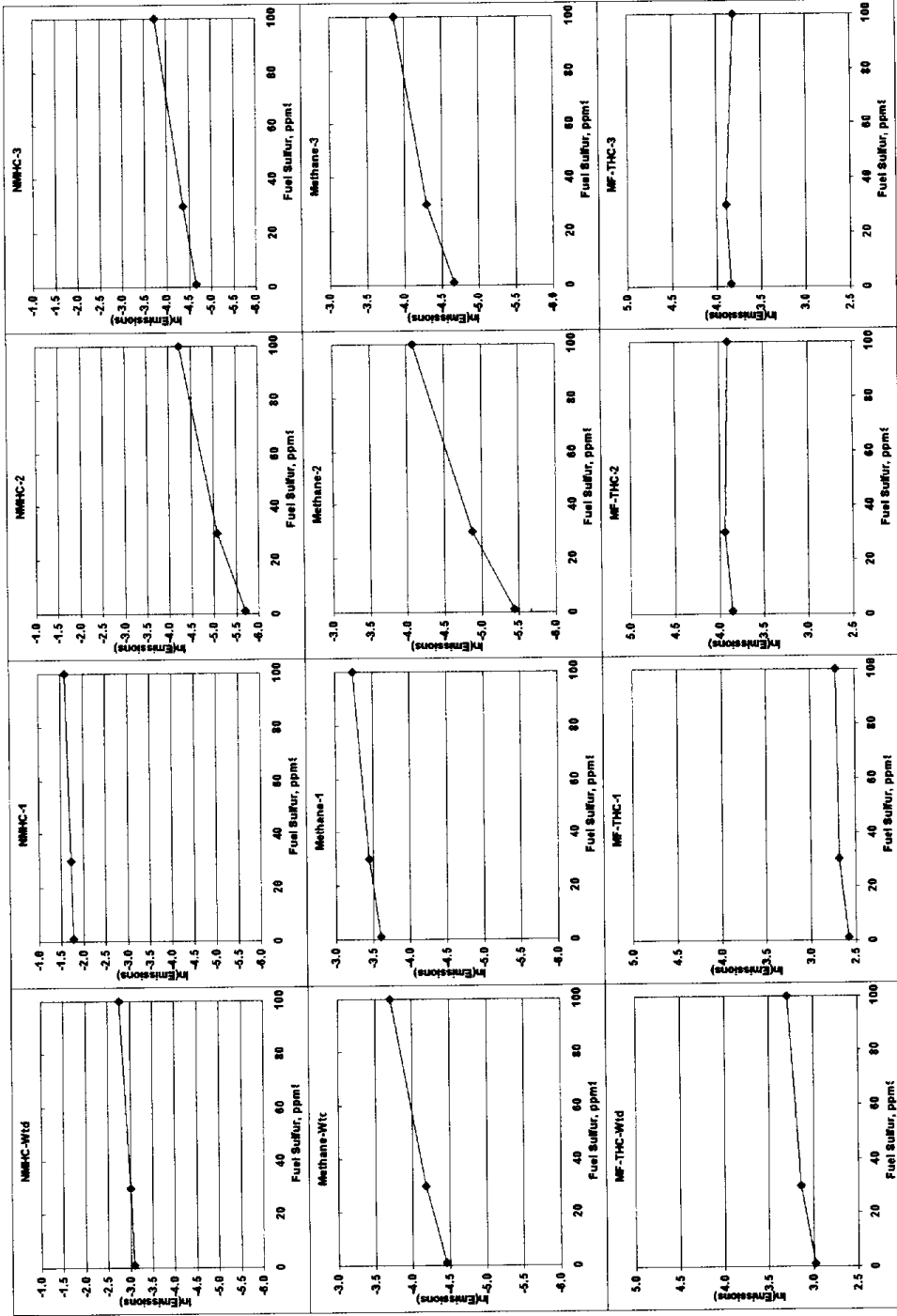
Fleet Emissions Response to Fuel Sulfur

In(Emissions, g/mi) vs. Sulfur, ppmS



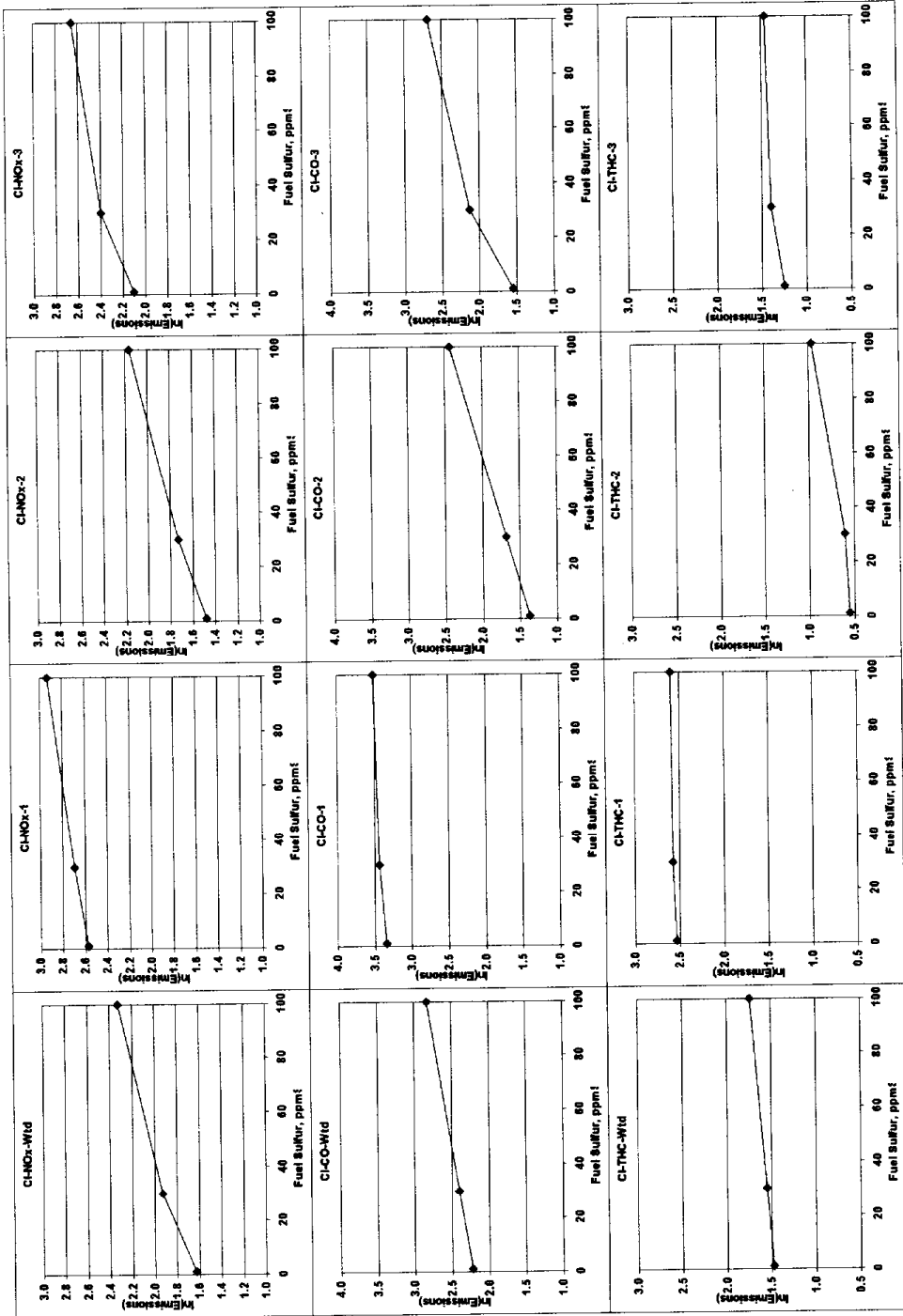
Sulfur Log-Linear Plots

Preliminary Complete Data Set  
Fleet Emissions Response to Fuel Sulfur  
ln(Emissions, g/mi) vs. Sulfur, ppmS



Sulfur Log-Linear Plots

Preliminary Complete Data Set  
Fleet Emissions Response to Fuel Sulfur  
ln(Emissions, g/mi) Vs. Sulfur, ppmS



Sulfur Log-Linear Plots

Preliminary Complete Data Set  
Fleet Emissions Response to Fuel Sulfur

ln(Emissions, g/mi) vs. sulfur, ppmS

