

## TRI Analysis

After carefully analyzing our TRI dataset for petroleum emissions, several observations stood out to us. To clarify these observations and findings, we present our summary analysis into petroleum emissions chemical makeup, emission facilities, and how they compare and contrast on a state emission vs national level emission basis.

### Chemical Points of Interest

#### Air Emissions

1. **Common Chemicals:** Ammonia, Sulfuric acid, and Hydrogen cyanide are the most emitted chemicals in the air after 'Other Chemicals', with emissions of 5,842,586.71, 5,079,506.33, and 4,847,537.38 units respectively.
2. **Least Emission:** Toluene and n-Hexane have relatively lower emissions in the air compared to other chemicals, with 2,451,944.98 and 2,880,246.6 units respectively.

#### Water Emissions

1. **Dominant Chemical:** Nitrate compounds dominate water emissions with a staggering 33,300,832.82 units, far surpassing all other chemicals.
2. **Comparison with Air:** Ammonia, which is significantly emitted in the air, has much lower emissions in water (366,618.55 units).
3. **Lesser Chemicals:** Ethylene glycol, Methanol, and Zinc compounds have comparatively minor emissions in water, ranging from 26,260.2 to 56,017.08 units.

#### Land Emissions

1. **Highest Emission:** Hydrogen sulfide is the most emitted chemical on land with 1,775,650.87 units.
2. **Ammonia Presence:** Ammonia is also significantly emitted on land (1,474,424.71 units), making it a common pollutant across all three environments.
3. **Other Chemicals:** Similar to air and water, the category 'Other Chemicals' shows substantial emissions on land with 502,272.47 units.
4. **Comparison with Other Environments:** Nitrate compounds and Toluene, significant in water and air emissions, are also present in land emissions but in much lower quantities (273,632.63 and 105,370.44 units respectively).

#### Cross-Environment Comparison

- **Ammonia** is a common pollutant across all three environments, with its highest emission in the air.

- **Other Chemicals** category is significant in all environments, suggesting a diverse range of chemical emissions.
- **Specificity of Pollutants:** Certain pollutants like Sulfuric acid, Hydrogen cyanide, and n-Hexane are specific to air emissions, while compounds like Ethylene glycol and Zinc compounds are specific to water emissions.

## Statistical Points of Interest Overall

1. **Delaware City Refinery Leads Nationally:** The Delaware City Refinery has the highest Total Releases in the petroleum category nationally, amounting to 4,893,579 pounds. This figure significantly surpasses other facilities in the U.S.
2. **Texas City as a Key Location:** In Texas, the Valero Refining Texas L.P. Houston Refinery leads with 2,057,066 pounds of Total Releases. However, the city of Texas City is notable as it has the highest total releases both in Texas and nationally, totaling 6,133,697.7 pounds.
3. **Significant Difference Between Top Emitters:** The difference in Total Releases between the Delaware City Refinery and the top emitter in Texas is substantial, at 2,836,513 pounds. The percentage difference between these two is 137.89%.
4. **Top 5 Emitters Nationally and in Texas:** Nationally, after Delaware City Refinery, the next four highest emitters are Safety-Kleen Systems Inc., USS-Clairton Plant, Phillips 66 Co-Bayway Refinery, and Wood River Refinery. In Texas, following the Valero Houston Refinery, the top emitters are Blanchard Refining Co LLC (two facilities), Phillips 66 Co Sweeny Refinery Complex, and Valero Refining-Texas LP.
5. **Low Emissions at Some Facilities:** Several facilities nationally and in Texas, like Wynnewood Refining Co and Phillips 66 Co Borger Refinery, reported zero Total Releases. This could be due to multiple reasons, potentially including emission offset or lack of reporting, and requires additional analysis.
6. **Statistics on Total Releases:** Nationally, the mean Total Release is 15,156.88 pounds, with a median of 203.38 pounds. In Texas, the mean is notably higher than the national average, pointing to a higher concentration of emissions in Texas's petroleum facilities.
7. **Top Outliers in Texas:** In Texas, the top outliers in Total Releases include facilities like Valero Refining Texas L.P. Houston Refinery and Blanchard Refining Co LLC, each having releases in the millions of pounds.

## Highest Emitting Facilities

The facility with the highest Total Releases in the 'Petroleum' category is DELAWARE CITY REFINERY with a total release amount of 4893579.0 pounds.

The facility in Texas with the highest Total Releases in the 'Petroleum' category is VALERO REFINING TEXAS L.P. HOUSTON REFINERY with a total release amount of 2057066.0 pounds.

The difference in total releases between the highest overall and highest in Texas in the Petroleum category is 2836513.0 pounds.

The highest overall facility in the Petroleum category has higher total releases.

The percentage difference between the two facilities in the 'Petroleum' category is 137.89%.

The city in Texas with the highest total releases in the 'Petroleum' category is TEXAS CITY with a total release amount of 6133697.7 pounds.

The city with the highest total releases in the 'Petroleum' category (nationally) is TEXAS CITY with a total release amount of 6133697.7 pounds.

**Top 5 highest-emitting facilities for petroleum nationally:**

	Facility name	Total Releases
18761	DELAWARE CITY REFINERY	4893579.0
72020	SAFETY-KLEEN SYSTEMS INC.	3937728.0
55476	USS-CLAIRTON PLANT	3624255.0
16718	PHILLIPS 66 CO-BAYWAY REFINERY	3375200.0
658	WOOD RIVER REFINERY	2634292.0

**Top 5 emitting facilities for petroleum in Texas:**

	Facility name	Total Releases
48565	VALERO REFINING - TEXAS L.P. HOUSTON REFINERY	2057066.0
65997	BLANCHARD REFINING CO LLC	1757100.0
53394	BLANCHARD REFINING CO LLC	1526700.0
38170	PHILLIPS 66 CO SWEENEY REFINERY COMPLEX	1387540.0
23596	VALERO REFINING-TEXAS LP	1100000.0

**Lowest 5 emitting facilities for petroleum nationally:**

	Facility name	Total Releases
0	WYNNEWOOD REFINING CO	0.0
35	WYNNEWOOD REFINING CO	0.0
66	WYNNEWOOD REFINING CO	0.0
124	ATLAS ROOFING CORP	0.0
180	WYNNEWOOD REFINING CO	0.0

**Lowest 5 emitting facilities for petroleum in Texas:**

	Facility name	Total Releases
363	PHILLIPS 66 CO BORGER REFINERY	0.0
775	ALON USA-BIG SPRING REFINERY	0.0
1501	HOUSTON REFINING LP	0.0
1535	HENRY CO	0.0

1615 PHILLIPS 66 CO BORGER REFINERY 0.0

**Bottom 10 of the top 100 emitting facilities for petroleum in Texas:**

	Facility name	Total Releases
7564	DIAMOND SHAMROCK REFINING CO LP	31021.10
25118	EXXONMOBIL OIL BEAUMONT REFINERY (PART)	31640.00
67779	DIAMOND SHAMROCK REFINING CO LP	31790.00
74559	PHILLIPS 66 CO BORGER REFINERY	32798.37
30002	MOTIVA-PORT ARTHUR REFINERY	32859.00
63972	EXXONMOBIL REFINING & SUPPLY BAYTOWN REFINERY ...	33363.01
54234	VALERO REFINING TEXAS LP CORPUS CHRISTI EAST P...	33838.65
71290	DIAMOND SHAMROCK REFINING CO LP	34505.10
59379	TOTALENERGIES PETROCHEMICALS & REFINING USA IN...	35000.00
73347	EXXONMOBIL OIL BEAUMONT REFINERY (PART)	35303.80

**Statistics for Total Releases Nationally (Petroleum facilities):**

Mean: 15156.88 pounds

Median: 203.38 pounds

There is no unique mode for total releases nationally.

**Difference in Mean Total Releases (Texas - National): 5890.42 pounds**

**Percent Difference in Mean Total Releases (Texas - National): 38.86%**

**Top 10 Outliers in Total Releases in Texas (Petroleum facilities):**

	Facility name	Total Releases
48565	VALERO REFINING - TEXAS L.P. HOUSTON REFINERY	2057066.00
65997	BLANCHARD REFINING CO LLC	1757100.00
53394	BLANCHARD REFINING CO LLC	1526700.00
38170	PHILLIPS 66 CO SWEENEY REFINERY COMPLEX	1387540.00
23596	VALERO REFINING-TEXAS LP	1100000.00
43022	EXXONMOBIL REFINING & SUPPLY BAYTOWN REFINERY ...	560000.00
20337	FLINT HILLS RESOURCES CORPUS CHRISTI LLC - WES...	542953.00
66952	DEER PARK REFINING LP	490000.00
65865	VALERO REFINING-TEXAS LP CORPUS CHRISTI WEST P...	470642.91
10124	CITGO REFINING & CHEMICALS CO LP EAST PLANT	394231.49

