

**CUMULATIVE HEALTH RISKS OF
SELECTED AIR POLLUTANTS AND
IMPLICATIONS FOR ENVIRONMENTAL
JUSTICE IN MOBILE COUNTY, ALABAMA**

**Legal Environmental Assistance Foundation, Inc.
November 4, 2005**

www.leaflaw.org

PREVIOUS PRESENTATIONS TO EMC

**Race, Poverty and Environmental
Burdens: Injustice in Alabama
Part I – Municipal Solid Waste Landfills
August 24, 2004 (Rev. Oct. 2004)**

**Race, Poverty and Environmental
Burdens: Injustice in Alabama
Part II – Toxic Air Pollution Facilities
September 13, 2004 (Rev. Oct. 2004)**

**Introduction to Cumulative
Health Risk Assessment
April 8, 2005**

ADEM REFORM COALITION RECOMMENDATIONS

- 1. Establish a Division of Environmental Justice and Health within ADEM**
- 2. Perform Community Cumulative Health Risk Assessments**
- 3. Eliminate Disparate Pollution Burdens**
- 4. Diligently Implement the Non-Discrimination Provisions of Title VI of the Civil Rights Act and 40 CFR Part 7**
- 5. Diversify the ADEM Workplace**



Welcome
to the
Risk-Screening Environmental Indicators Model
RSEI

You can quickly answer some of your questions concerning toxic chemicals in the nation and in your community using Easy RSEI. Many more questions can be answered using Advanced RSEI. We recommend that you use the RSEI Tutorial to learn how to use Advanced RSEI.



Easy RSEI

Select this mode if you are unfamiliar with the RSEI model



Advanced RSEI

Select this mode if you are experienced with the RSEI model



RSEI Tutorial



Quit

In the future, start RSEI in Advanced Mode

<http://www.epa.gov/opptintr/rsei/>

RSEI METHODS

AIR EMISSIONS INVENTORY SOURCE:

TOXIC RELEASE INVENTORY

AIR DISPERSION MODELING:

INDUSTRIAL SOURCE COMPLEX LONG TERM MODEL

RSEI RISK CONCEPTS

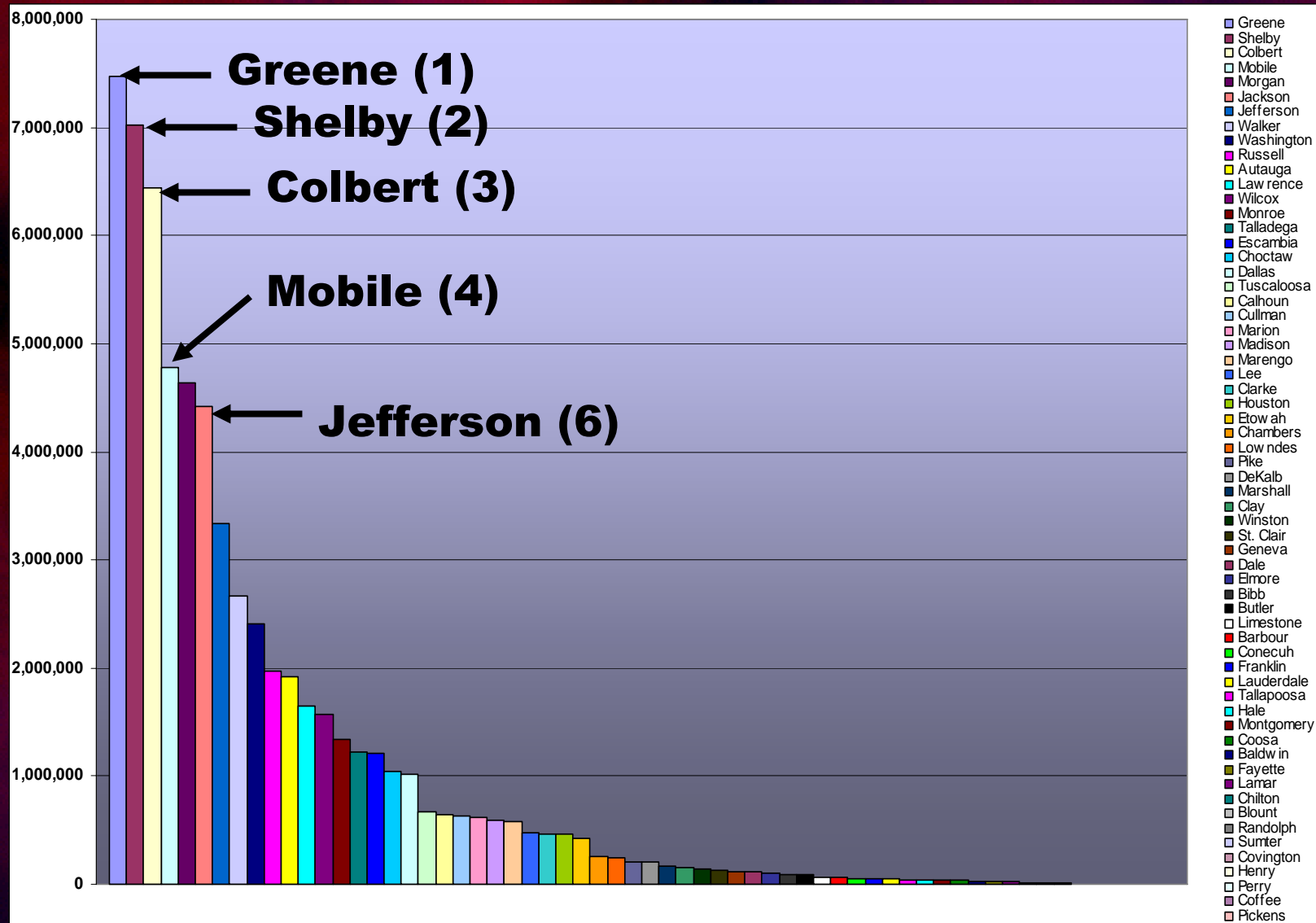
**COMPARATIVE RISKS OF CHEMICALS
AND FACILITIES BASED ON:**

QUANTITY = POUNDS/YEAR

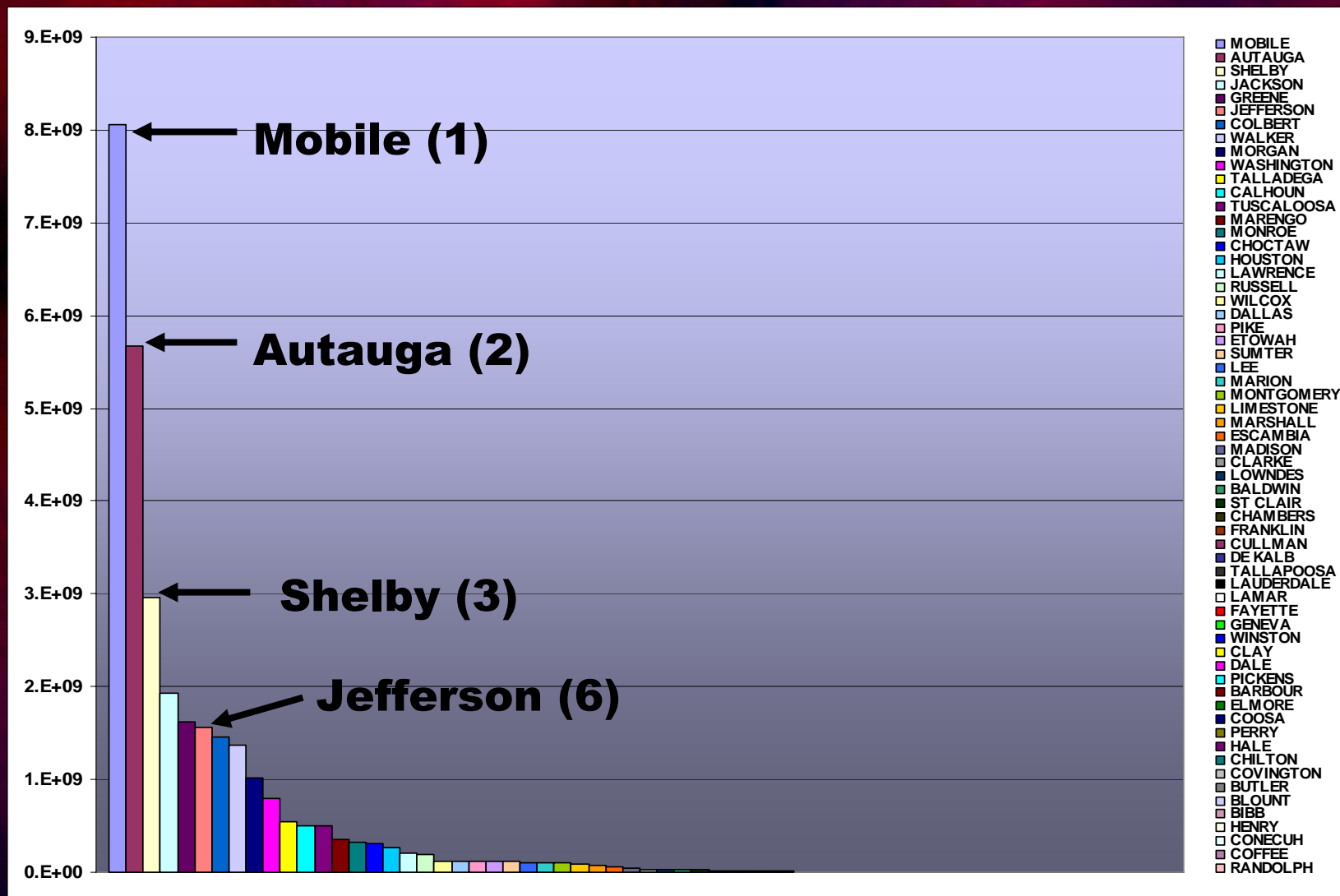
HAZARD = POUNDS*TOXICITY

RISK = DOSE*TOXICITY*POPULATION

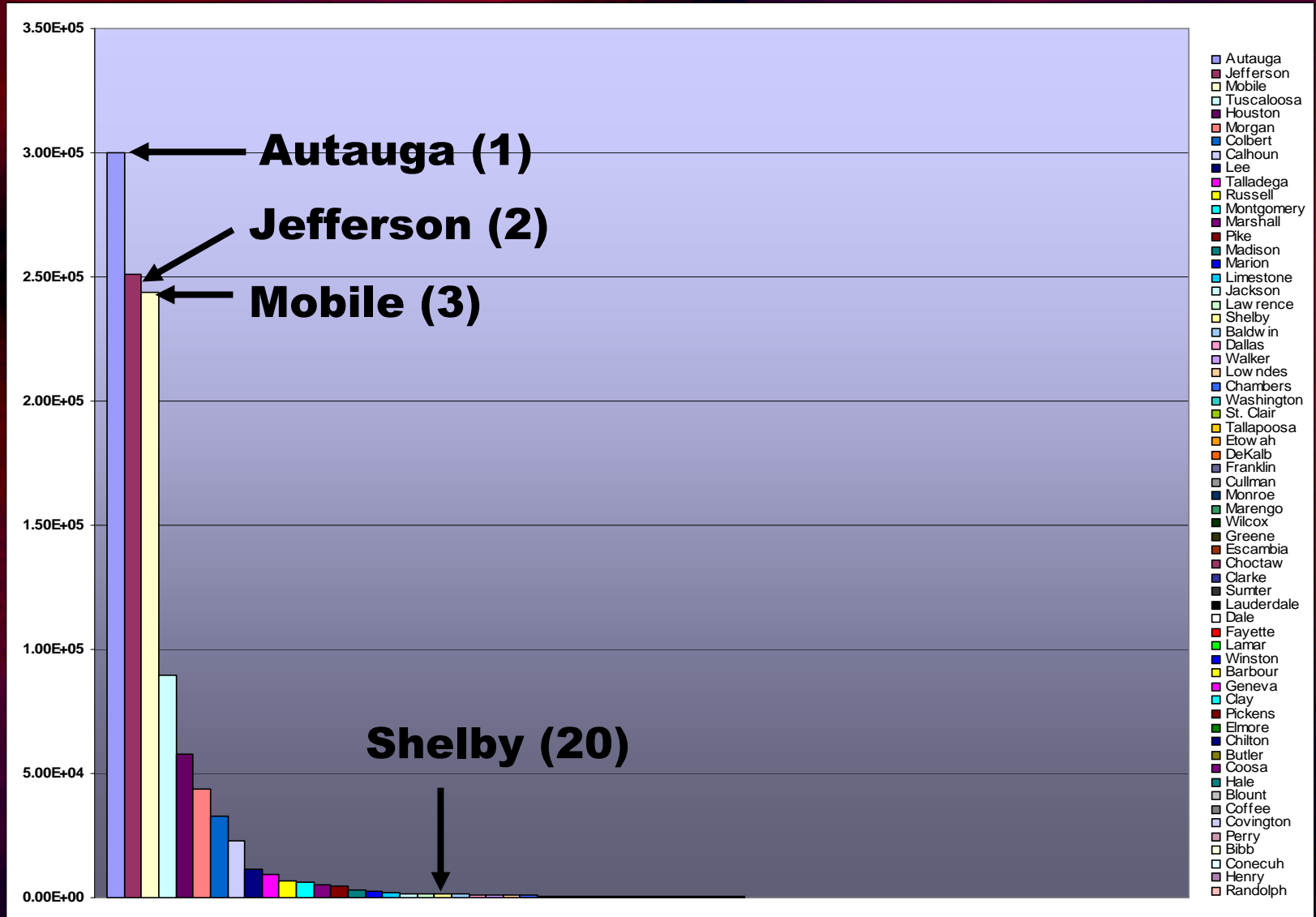
RANKING OF ALABAMA COUNTIES BY TOXIC CHEMICALS RELEASED TO AIR: QUANTITY (LBS/YR 2002)



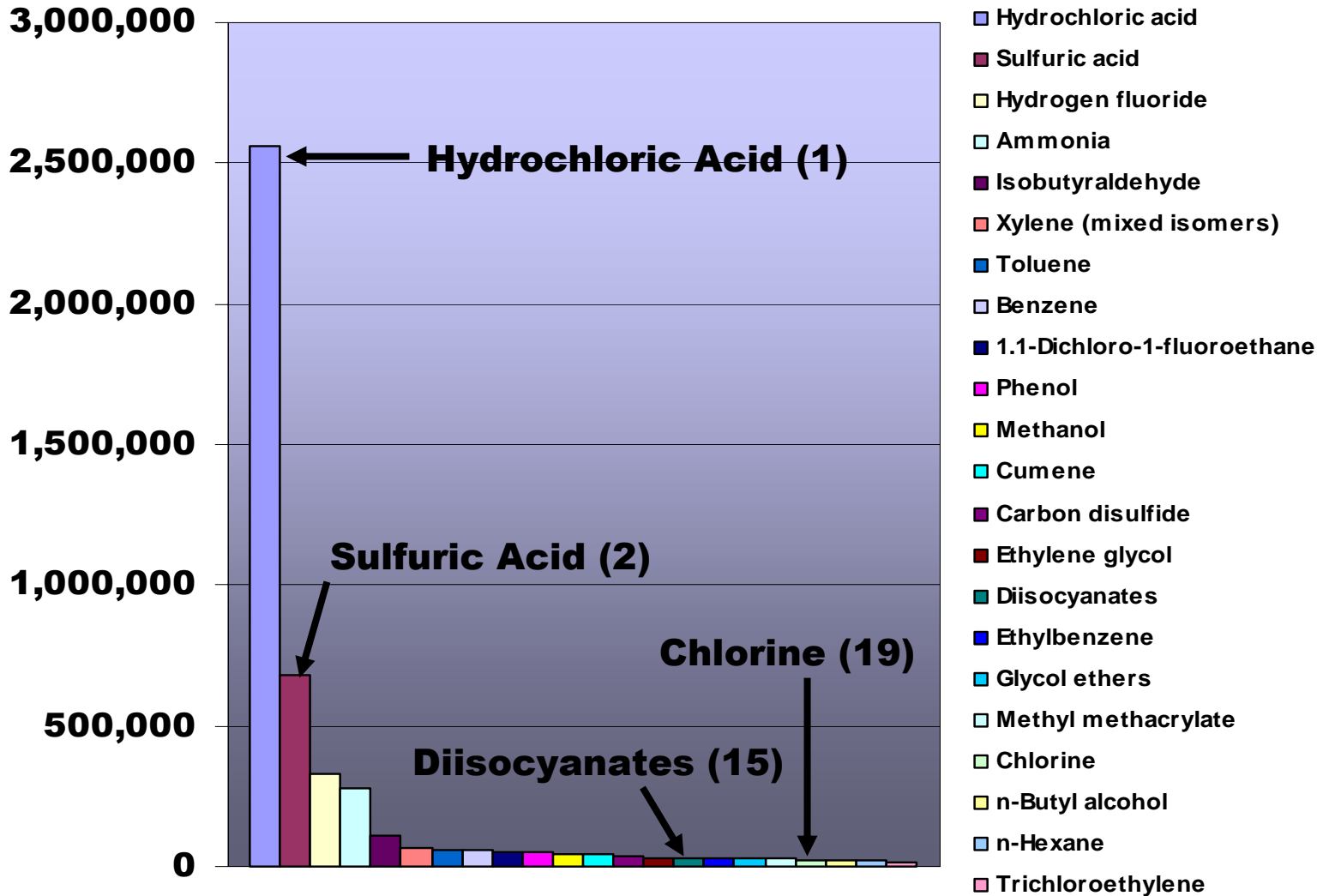
RANKING OF ALABAMA COUNTIES BY TOXIC CHEMICALS RELEASED TO AIR: HAZARD (LBS*TOX 2002)



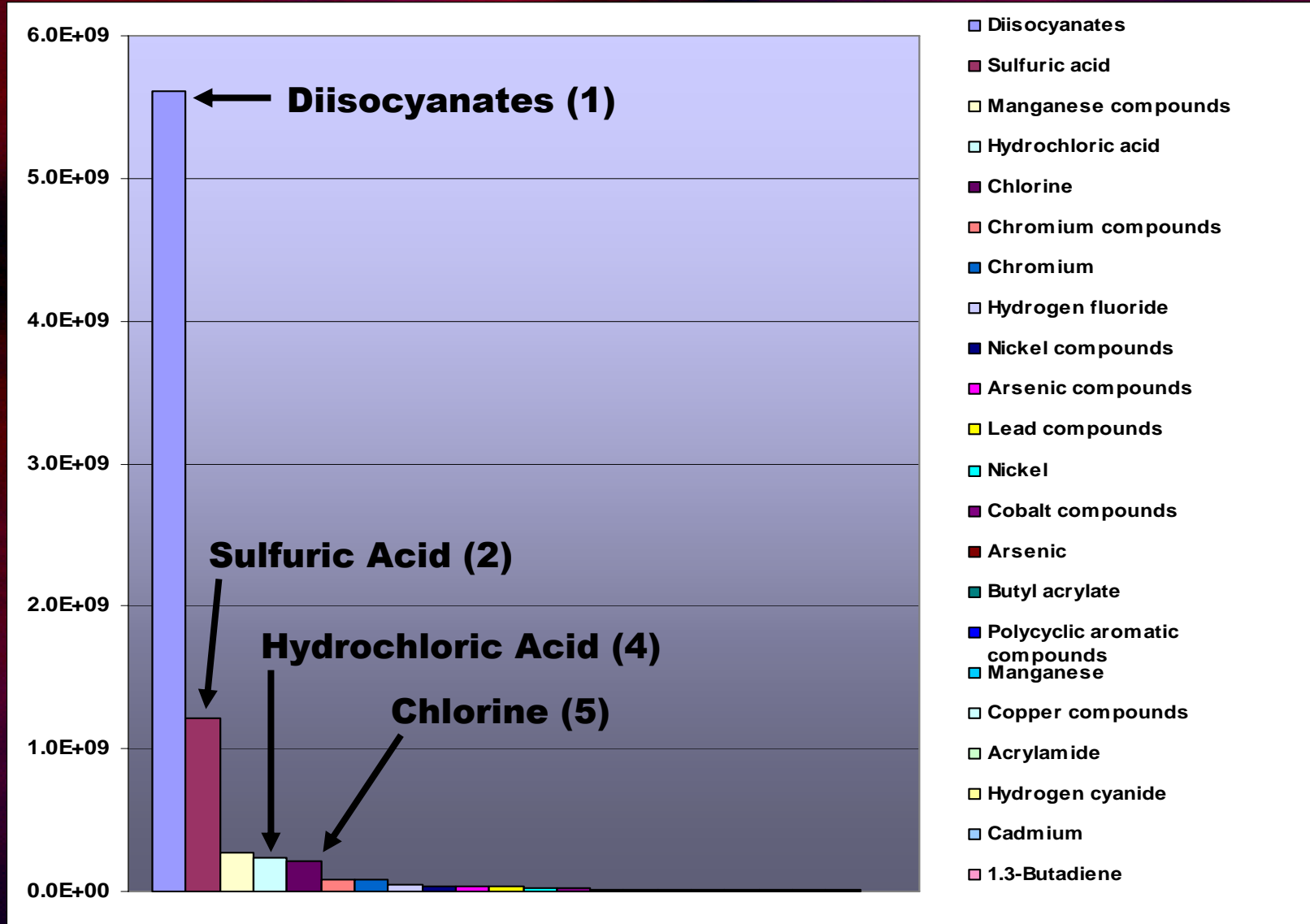
RANKING OF ALABAMA COUNTIES BY TOXIC CHEMICALS RELEASED TO AIR: RISK (DOSE*TOX*POP 2002)



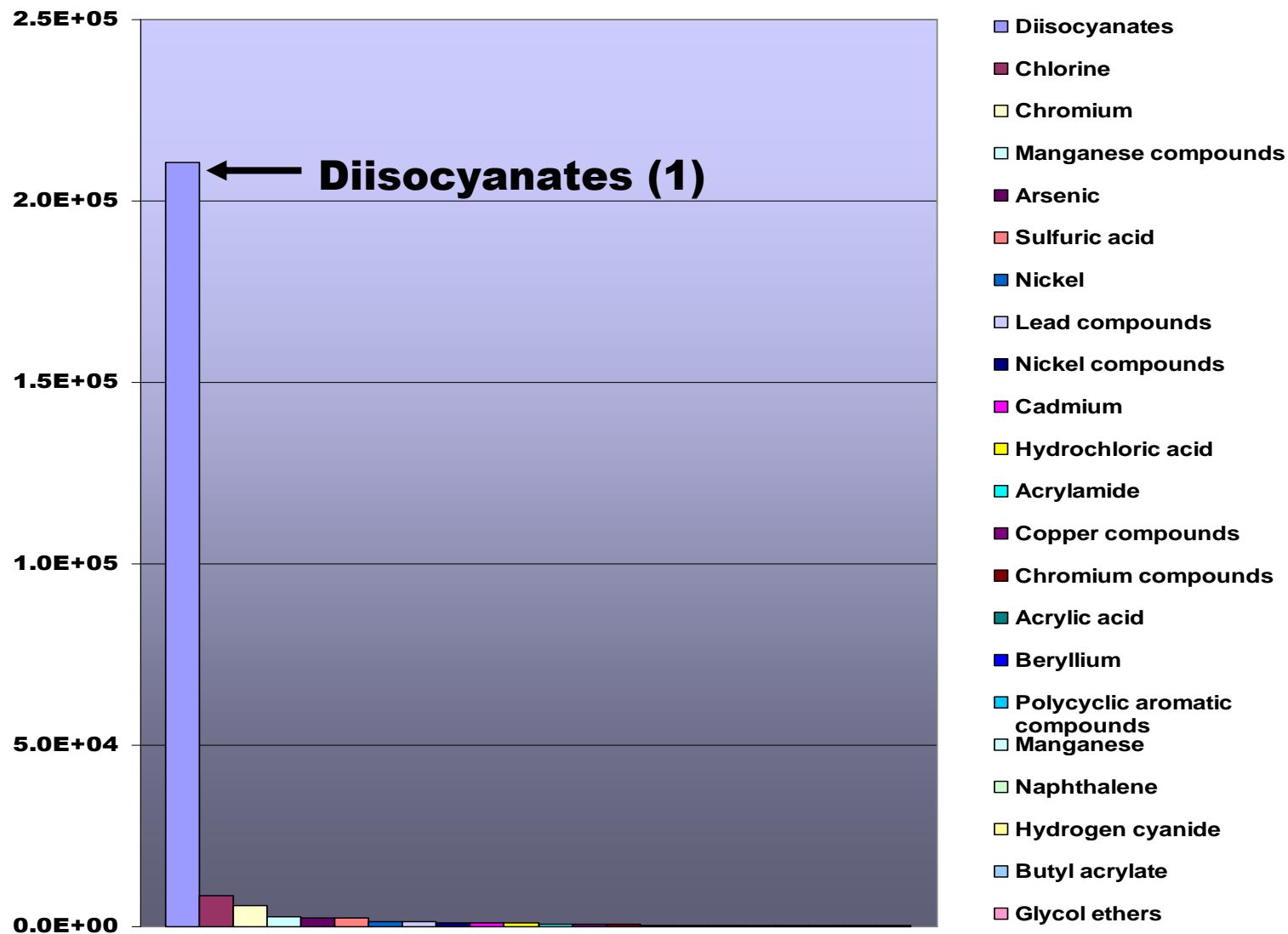
RANKING OF 22 TOXIC CHEMICALS RELEASED TO AIR IN MOBILE COUNTY: QUANTITY (LBS/YR 2002)



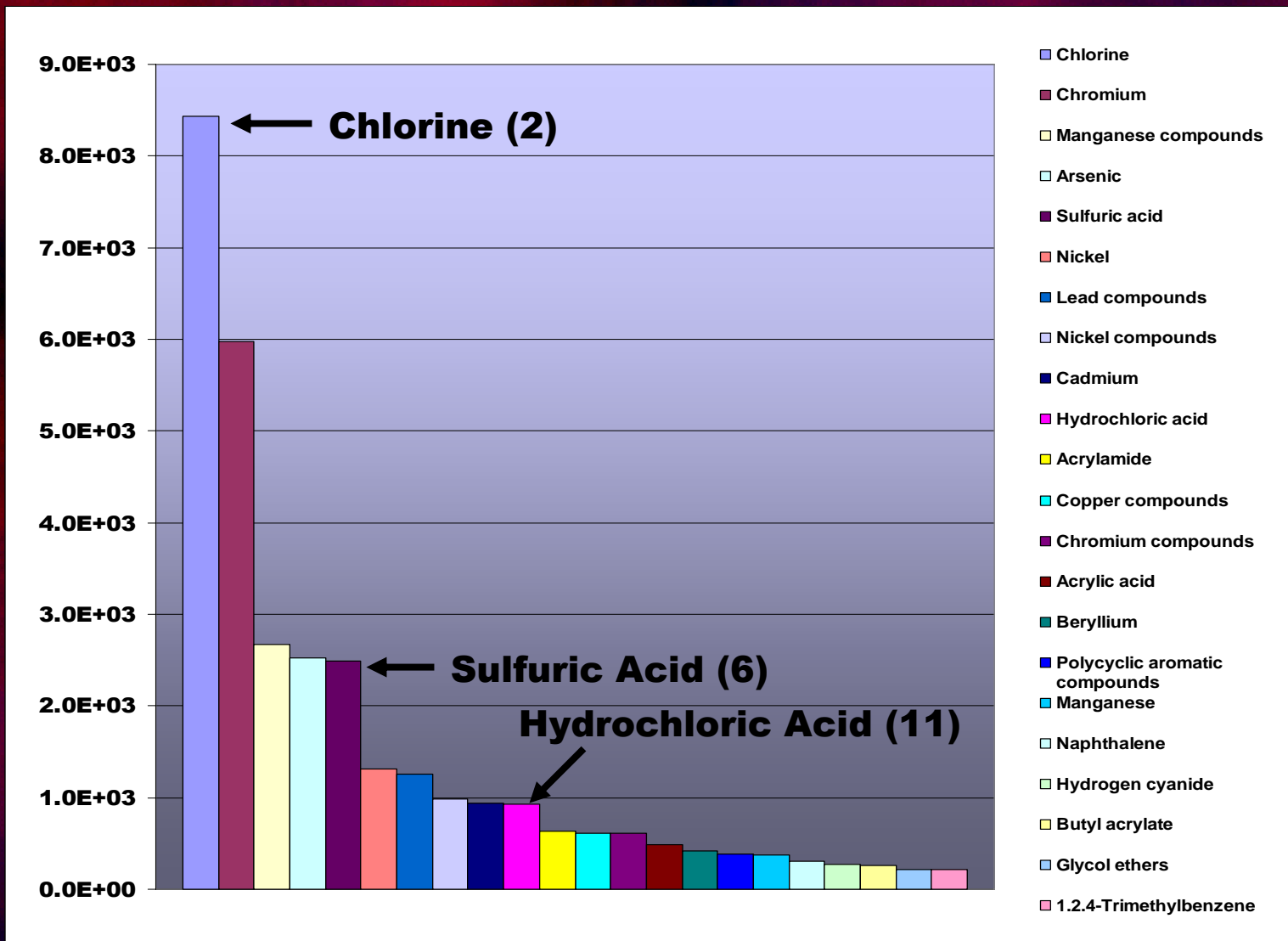
RANKING OF 22 TOXIC CHEMICALS RELEASED TO AIR IN MOBILE COUNTY: HAZARD (LBS*TOX 2002)



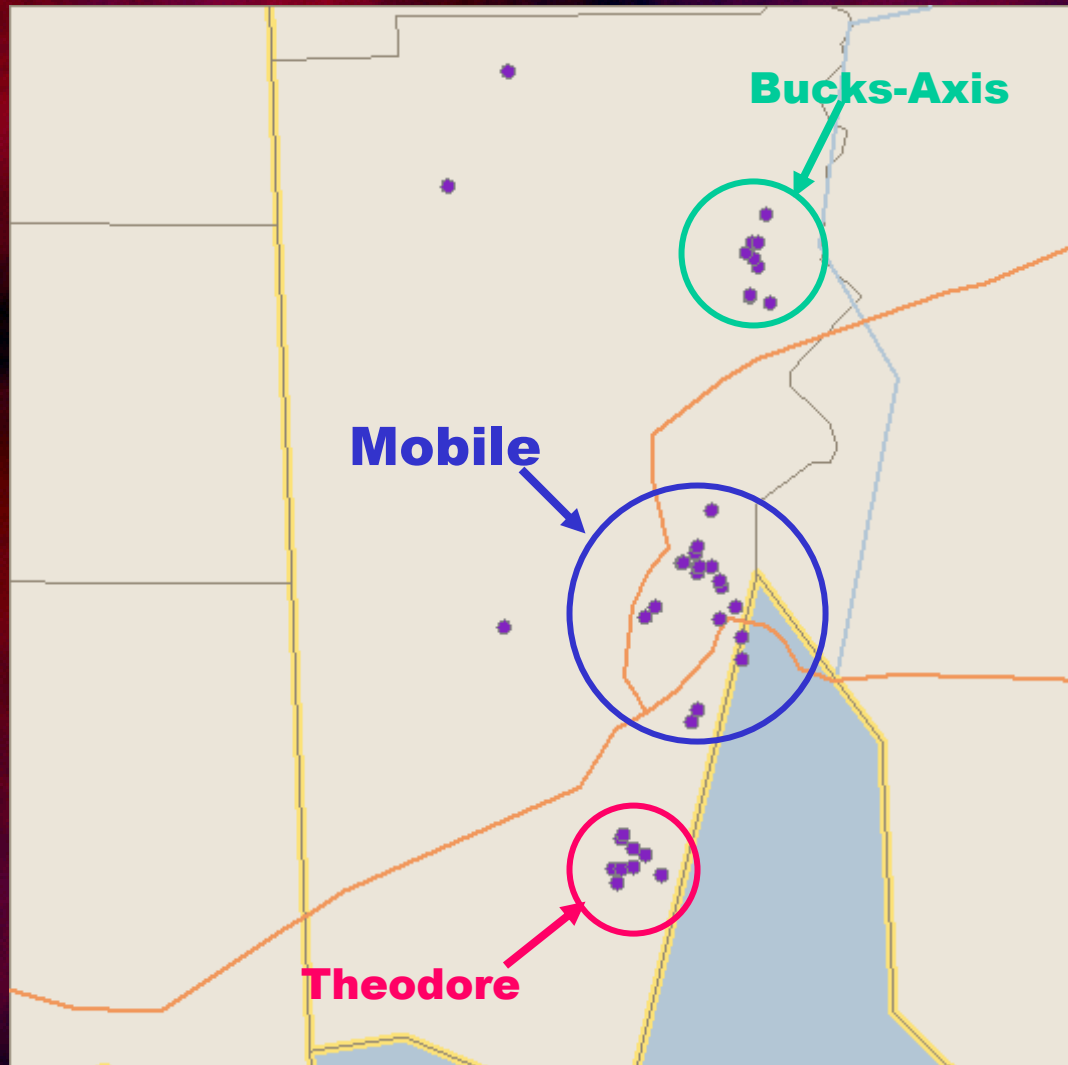
RANKING OF 22 TOXIC CHEMICALS RELEASED TO AIR IN MOBILE COUNTY: RISK (DOSE*TOX*POP 2002)



RANKING OF 22 TOXIC CHEMICALS (EXCLUDING DIISOCYANATES) RELEASED TO AIR IN MOBILE COUNTY: RISK (DOSE*TOX*POP 2002)



40 TRI FACILITIES RELEASING TOXIC CHEMICALS TO AIR IN MOBILE COUNTY (2002)



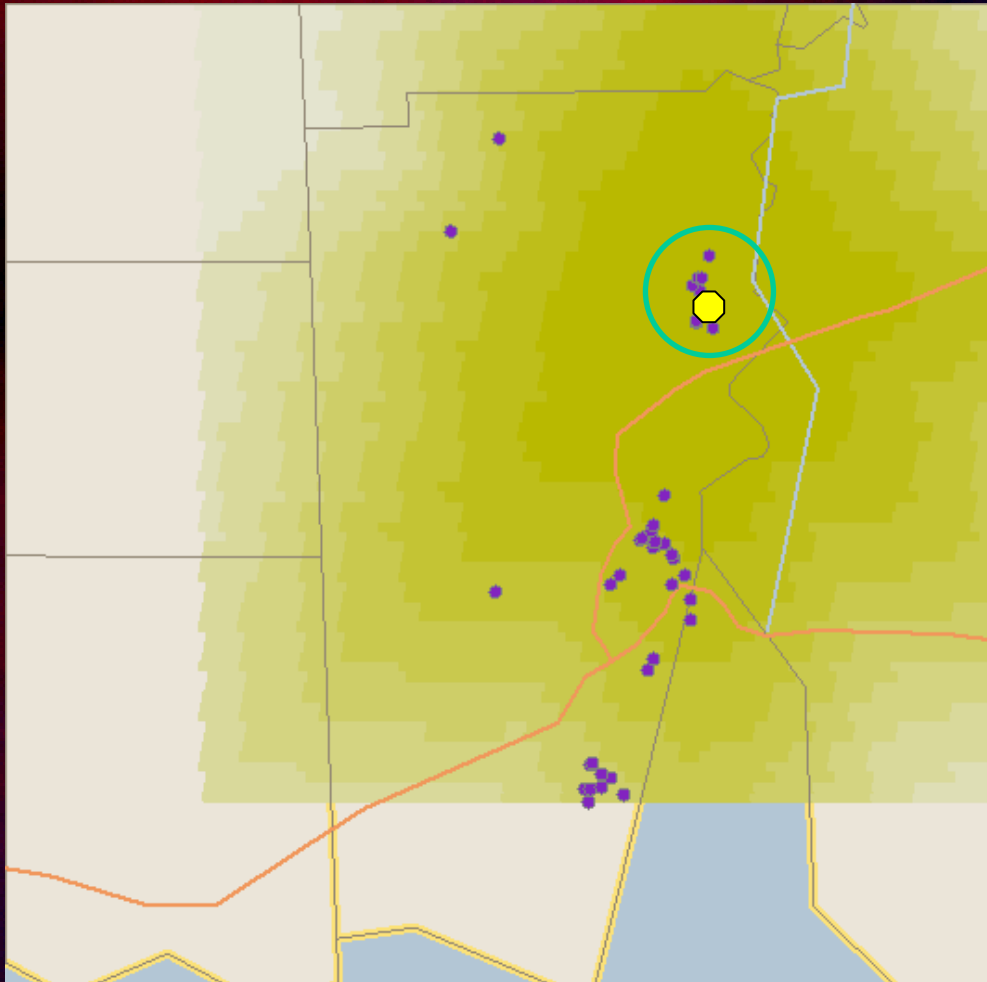
CHLORINE (Cl)

HEALTH EFFECTS

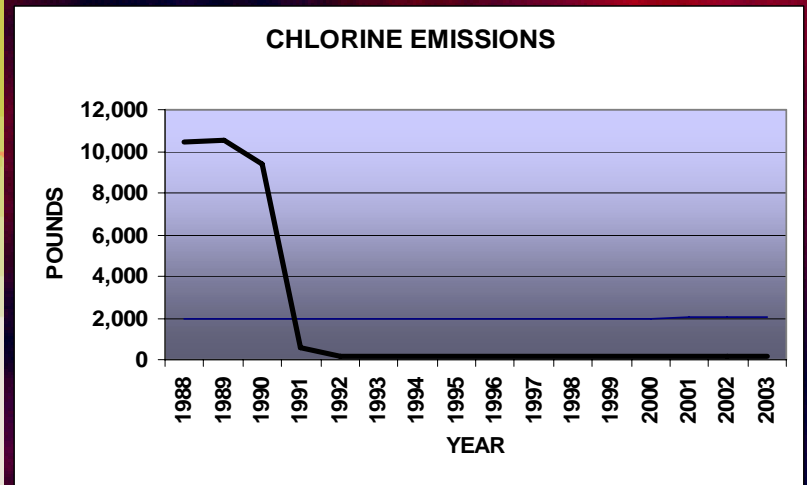
Irritation of the eyes, nasal passages, throat, lungs, and skin.

Respiratory problems, such as bronchitis, cough, phlegm, shortness of breath.

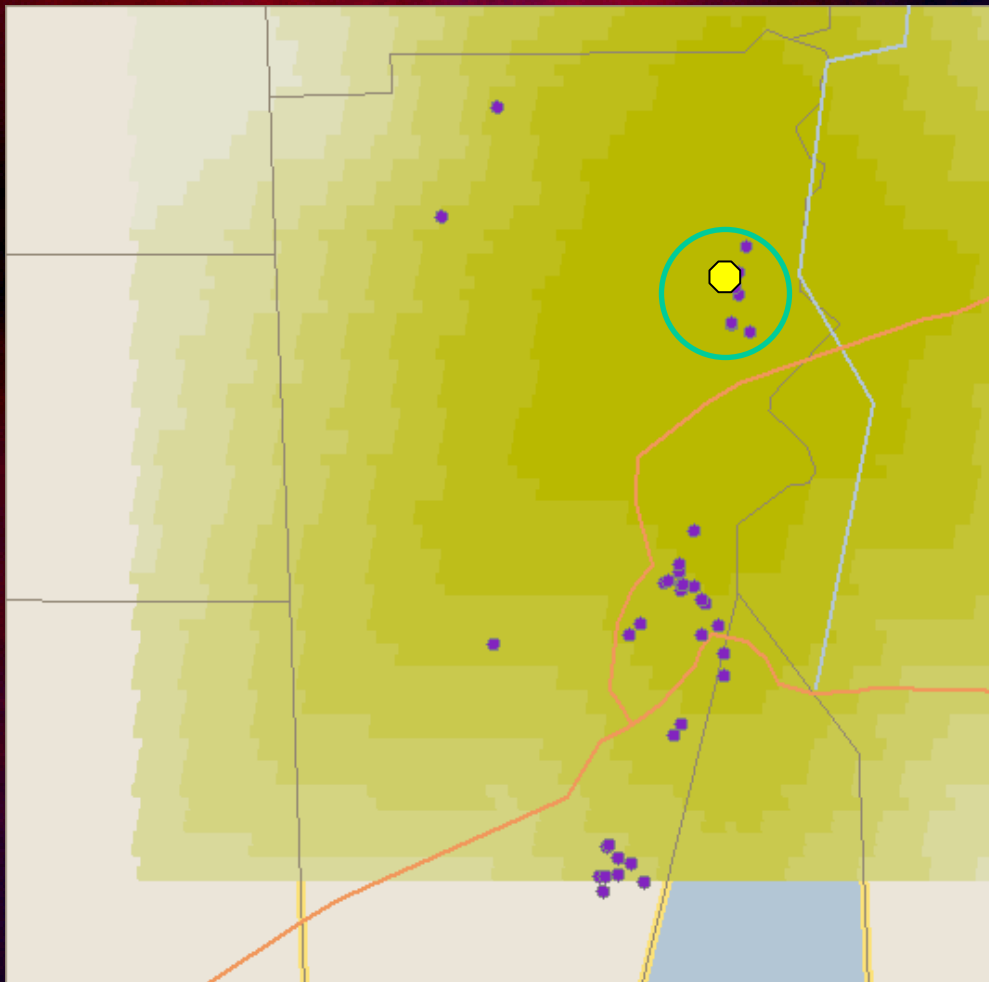
CHLORINE PLUME FROM AKZO NOBEL FUNCTIONAL CHEMICALS



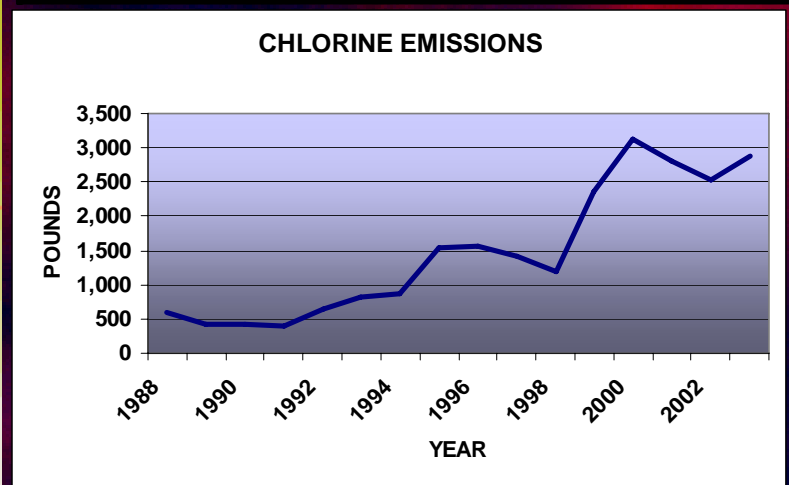
Source	Minimum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²	Maximum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²
Fugitive	0.0000045658	0.0347
Stack	0.0	0.0
Total	0.0000045658	0.0347



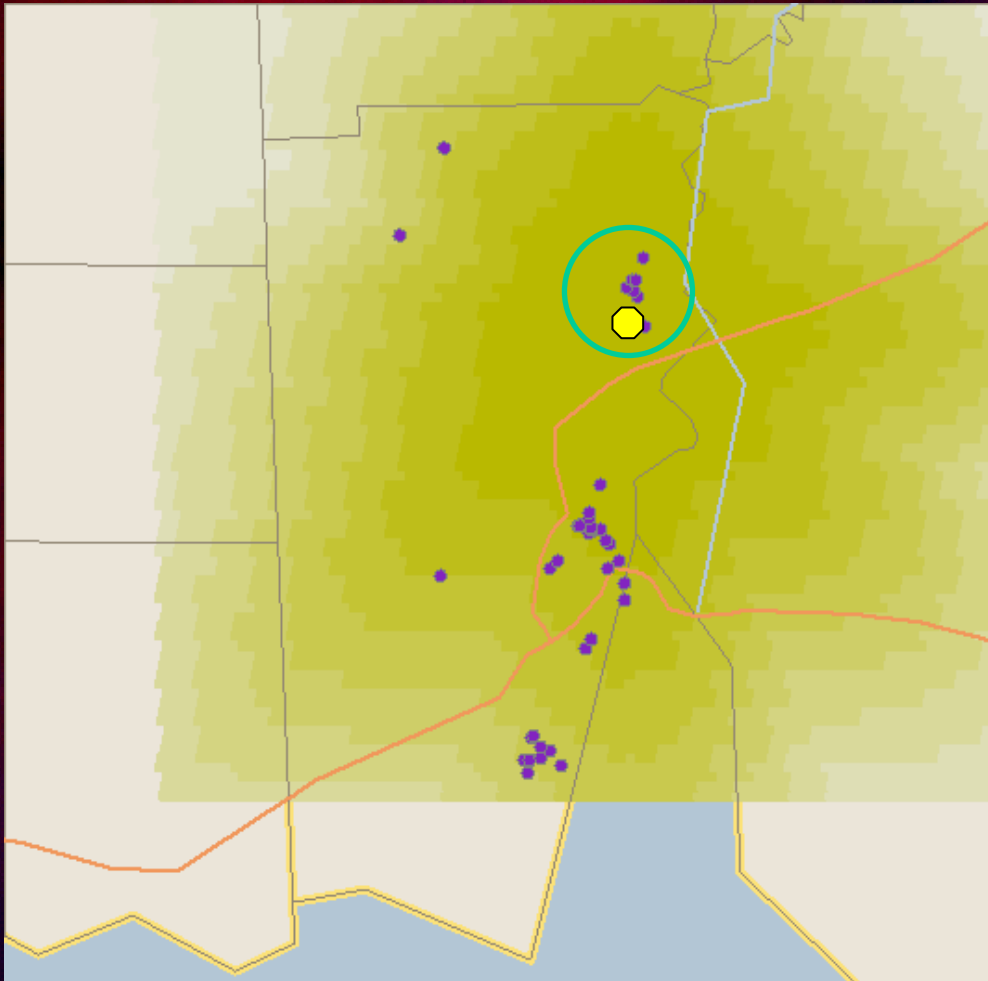
CHLORINE PLUME FROM ATOFINA CHEMICALS, INC. (ARKEMA)



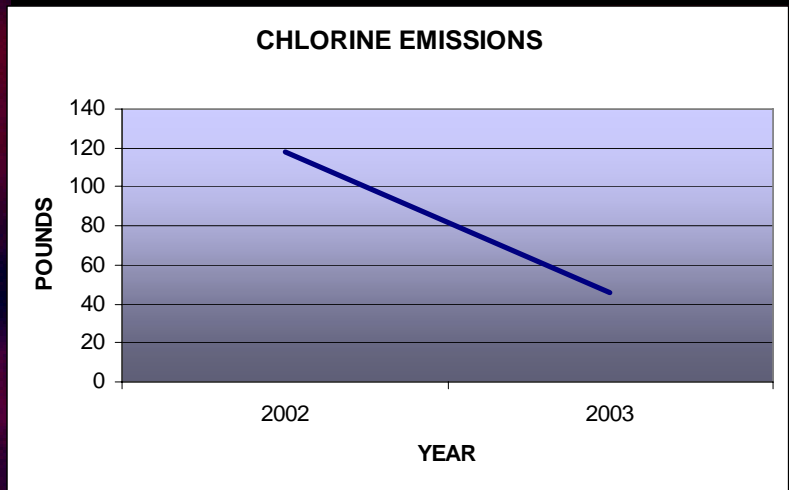
Source	Minimum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²	Maximum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²
Fugitive	0.000081166	0.61749
Stack	0.0000078954	0.014743
Total	0.0000890614	0.632233



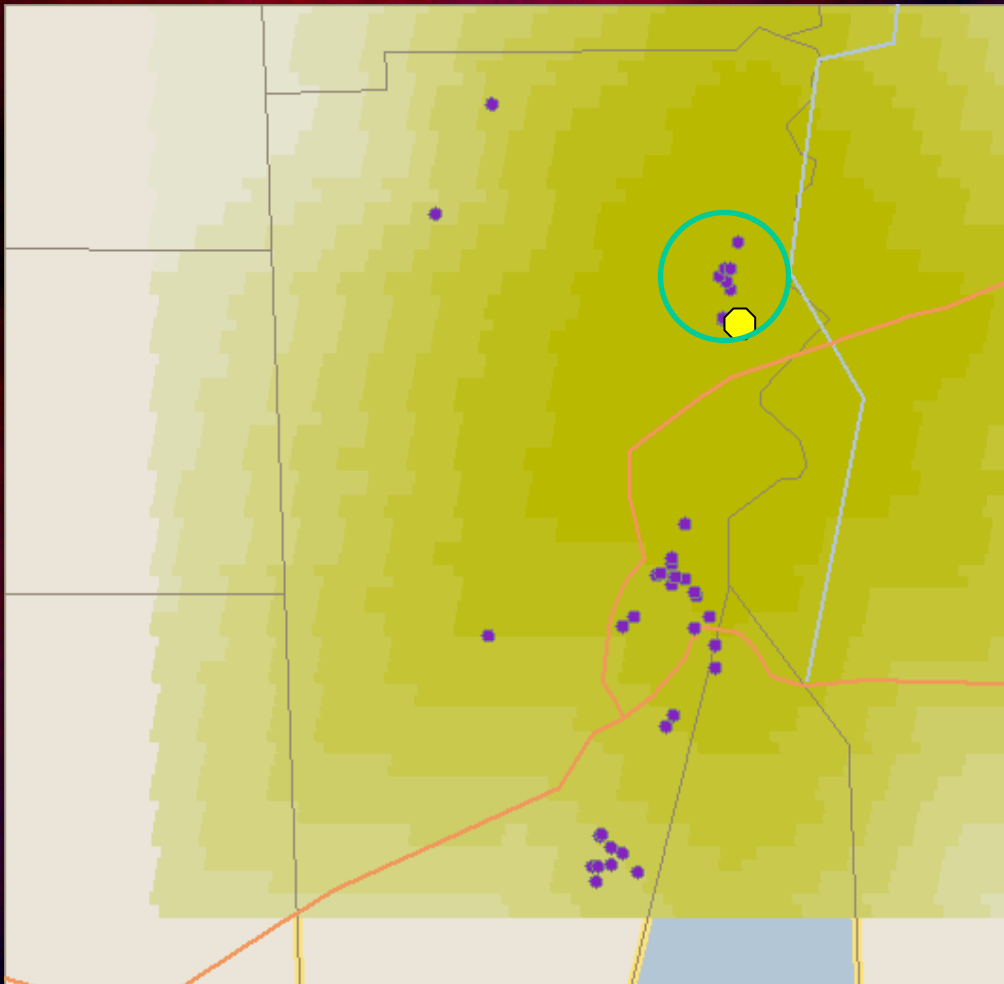
CHLORINE PLUME FROM AMVAC CHEMICAL CORP.



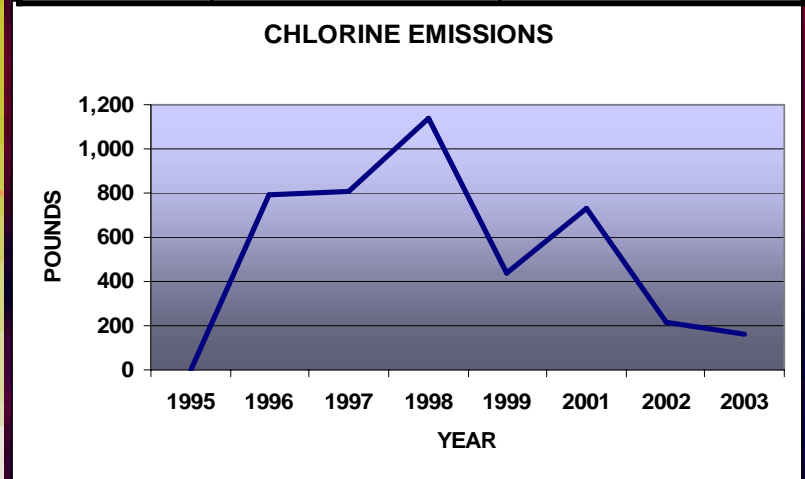
Source	Minimum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²	Maximum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²
Fugitive	0.00000017561	0.001336
Stack	0.0000030984	0.0039768
Total	0.00000327401	0.0053128



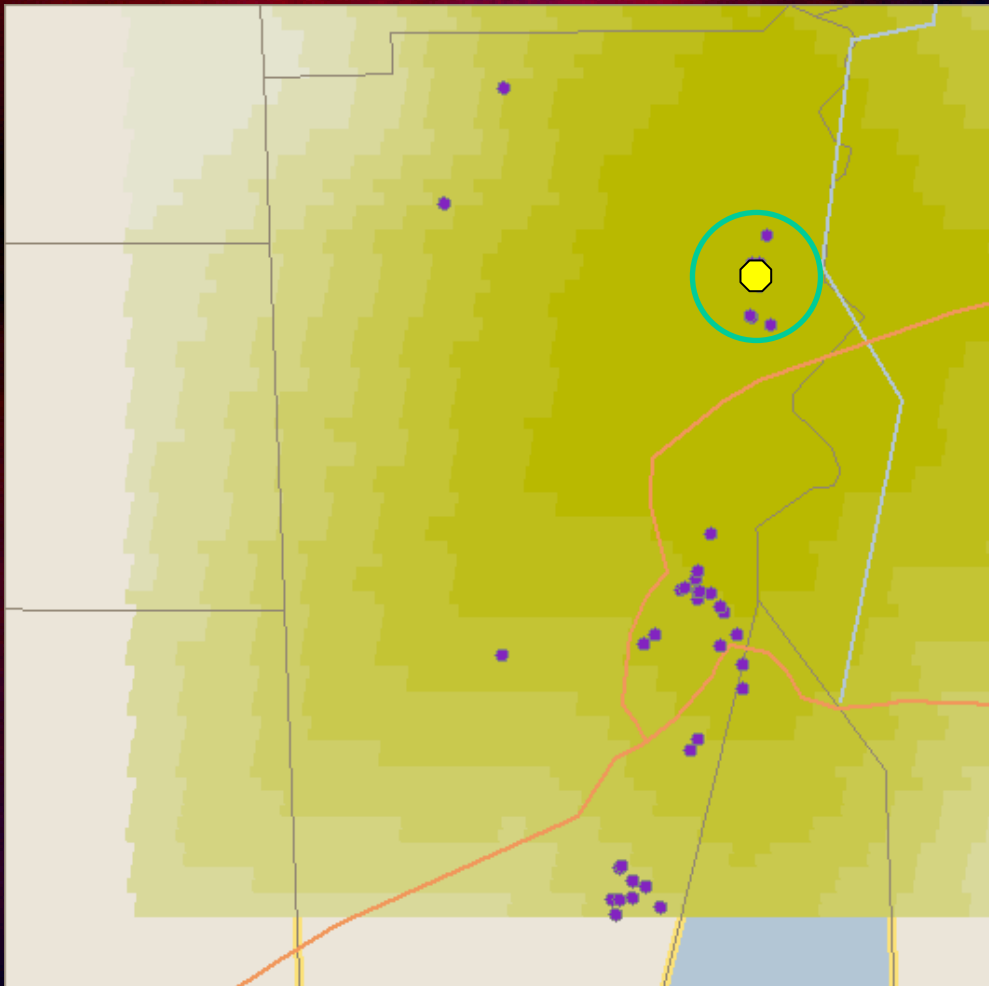
CHLORINE PLUME FROM E.I. DUPONT DE NEMOURS



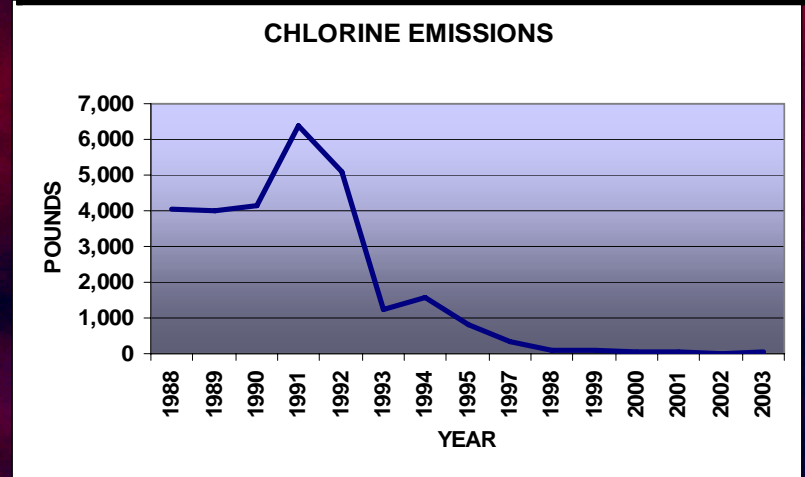
Source	Minimum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²	Maximum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²
Fugitive	0.0000061814	0.047026
Stack	0.0000011516	0.0014781
Total	0.000007333	0.0485041



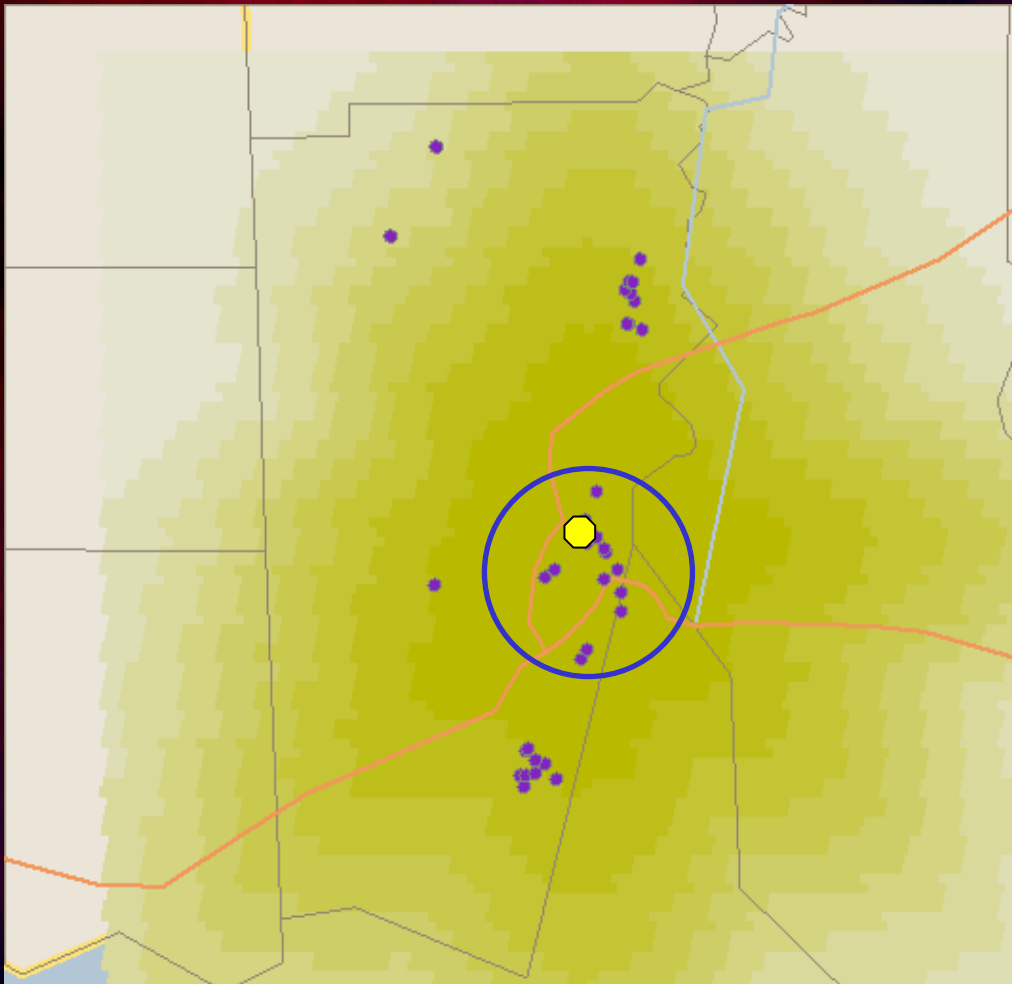
CHLORINE PLUME FROM SYNGENTA CROP PROTECTION, INC.



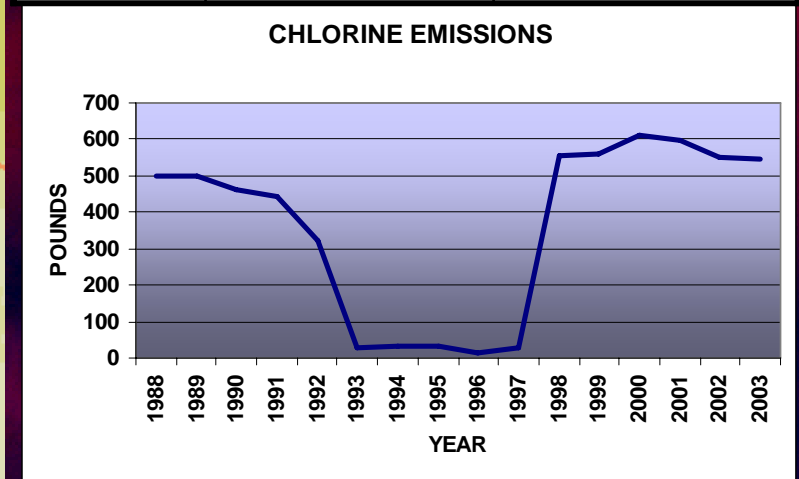
Source	Minimum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²	Maximum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²
Fugitive	0.00000073755	0.0056111
Stack	0.0	0.0
Total	0.00000073755	0.0056111



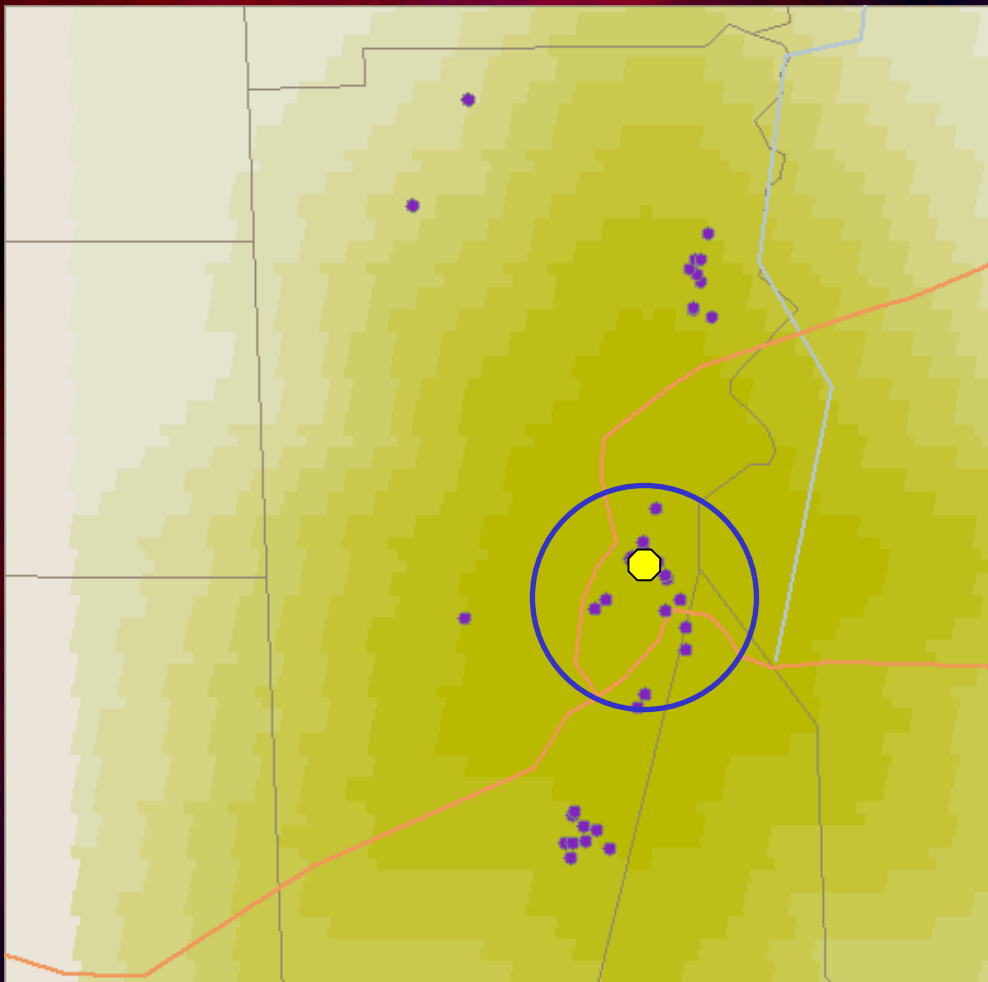
CHLORINE PLUME FROM DPC ENTERPRISES



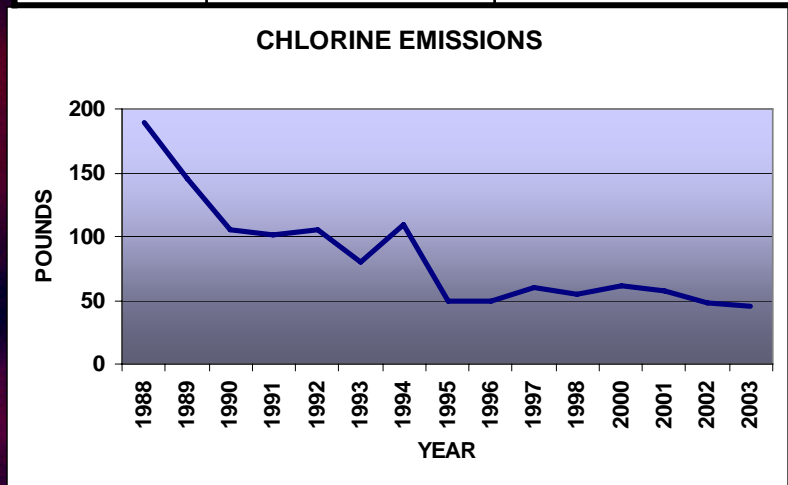
Source	Minimum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²	Maximum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²
Fugitive	0.00001879	0.14295
Stack	0.00000054307	0.0008836
Total	0.0000193307	0.1438336



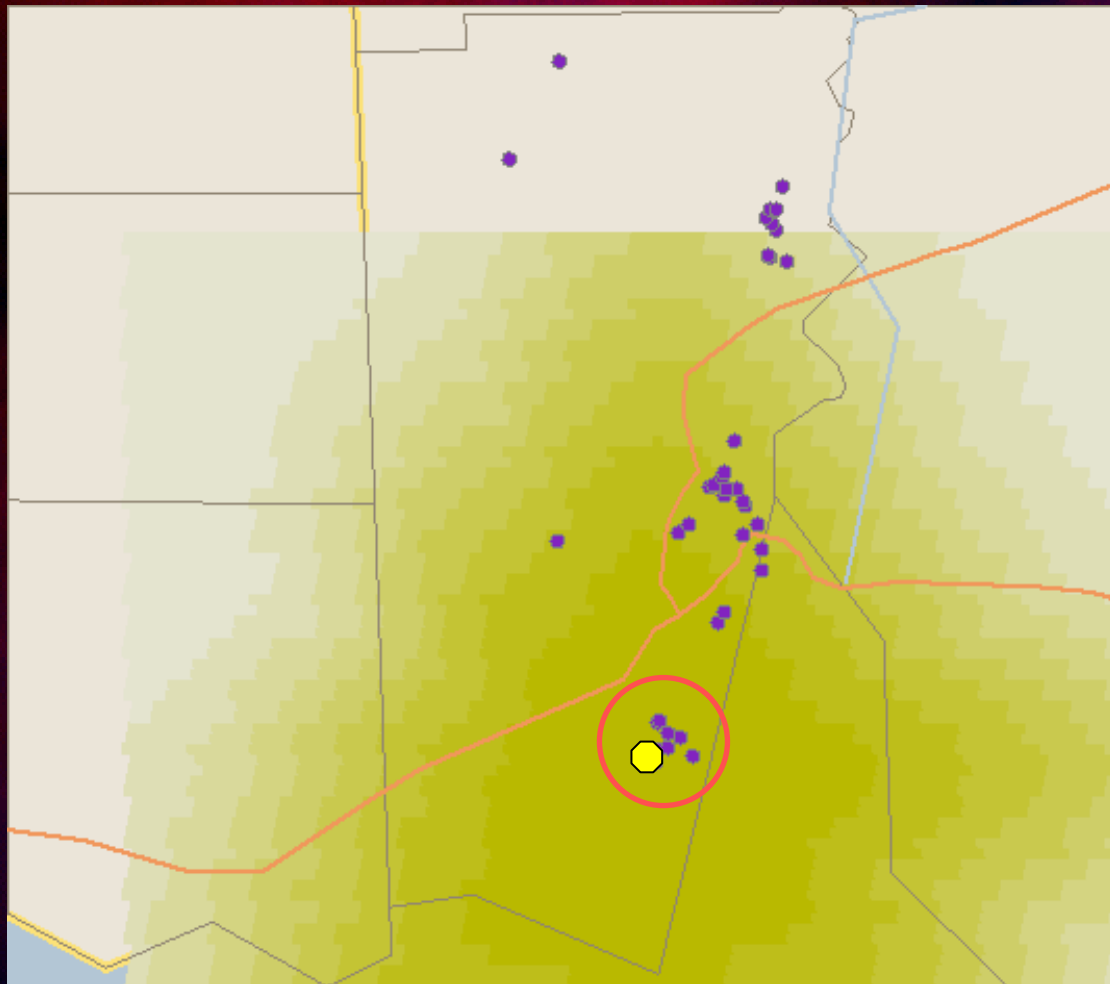
CHLORINE PLUME FROM OCCIDENTAL CHEMICAL CORP.



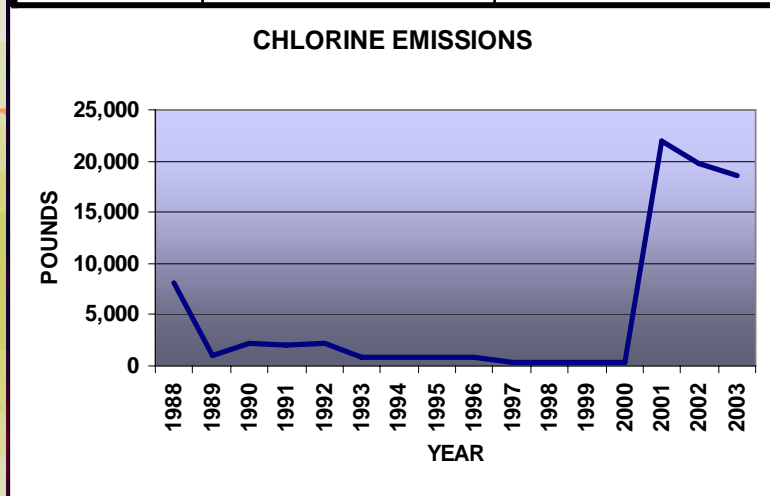
Source	Minimum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²	Maximum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²
Fugitive	0.0000016858	0.012825
Stack	0.0	0.0
Total	0.0000016858	0.012825



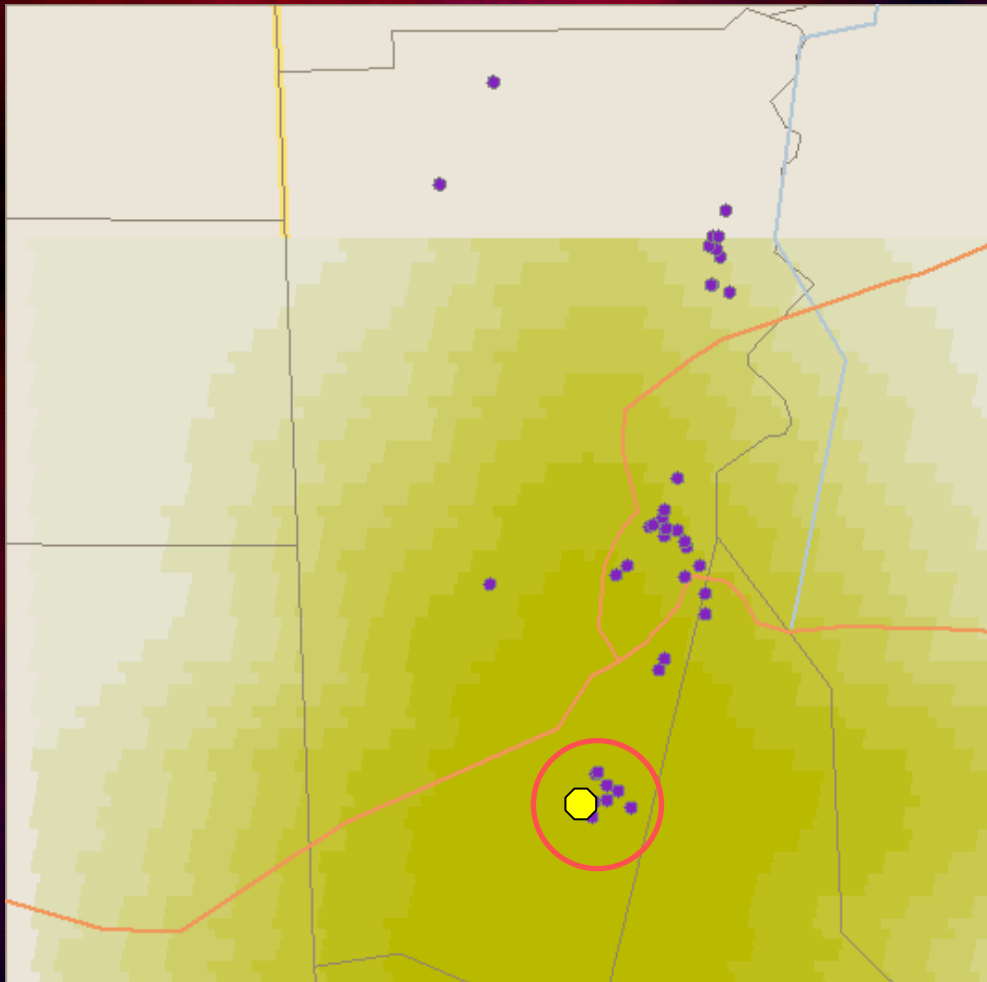
CHLORINE PLUME FROM DEGUSSA CORP.



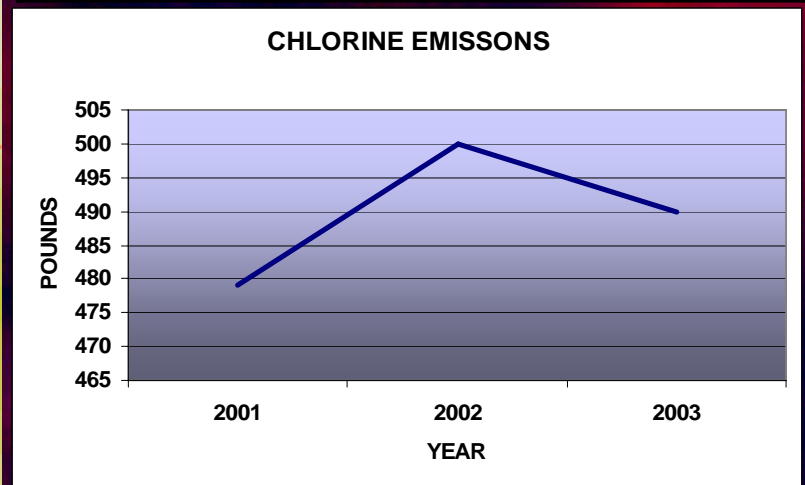
Source	Minimum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²	Maximum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²
Fugitive	0.000010396	0.07909
Stack	0.0006736	1.2578
Total	0.000683996	1.33689



CHLORINE PLUME FROM MITSUBISHI POLYCRYSTALLINE SILICON



Source	Minimum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²	Maximum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²
Fugitive	0.00001598	0.12157
Stack	0.00000098594	0.0016424
Total	0.00001696594	0.1232124



CHLORINE (Cl)

SAFE EXPOSURE CONCENTRATION:

0.2 $\mu\text{g}/\text{m}^3$

MODELED MAXIMUM AMBIENT CONCENTRATION BY FACILITY

AKZO NOBEL	0.0347 $\mu\text{g}/\text{m}^3$	
ATOFINA CHEM	0.6322 $\mu\text{g}/\text{m}^3$	
AMVAC CHEM	0.0053 $\mu\text{g}/\text{m}^3$	
DUPONT	0.0485 $\mu\text{g}/\text{m}^3$	
Total (Bucks-Axis)		0.7207 $\mu\text{g}/\text{m}^3$
SYNGENTA	0.0056 $\mu\text{g}/\text{m}^3$	
DPC	0.1438 $\mu\text{g}/\text{m}^3$	
OCCIDENTAL CHEM	0.0128 $\mu\text{g}/\text{m}^3$	
Total (Mobile)		0.1622 $\mu\text{g}/\text{m}^3$
DEGUSSA	1.3369 $\mu\text{g}/\text{m}^3$	
MITSUBISHI	0.1232 $\mu\text{g}/\text{m}^3$	
Total (Theodore)		1.4601 $\mu\text{g}/\text{m}^3$

SULFURIC ACID (H₂SO₄)

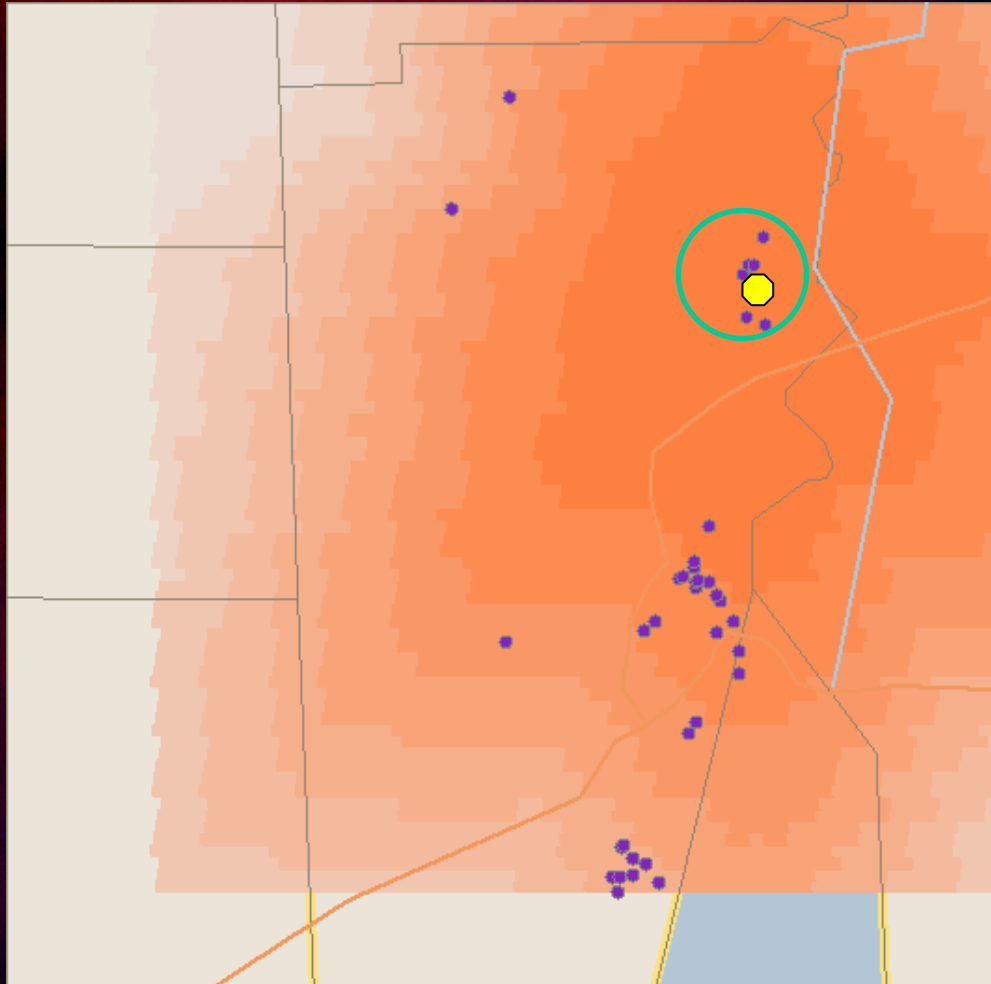
HEALTH EFFECTS

Irritation of the eyes, nasal passages, throat, lungs, and skin.

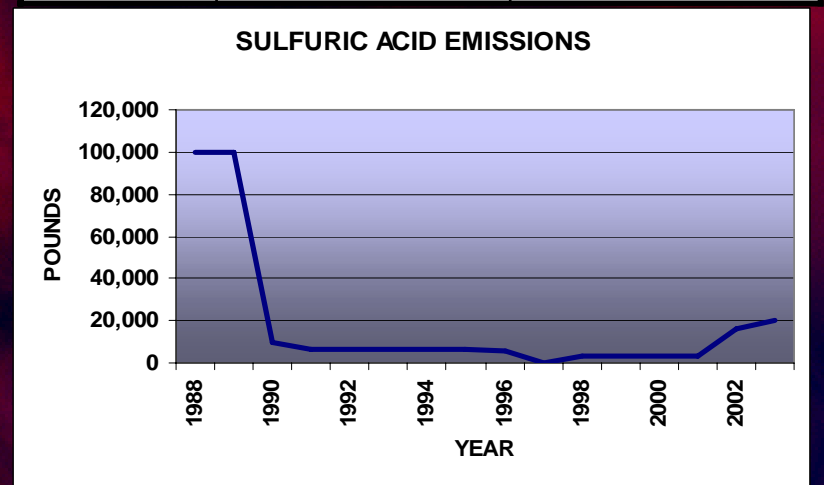
Respiratory problems, such as bronchitis, cough, phlegm, shortness of breath.

Dental discoloration and erosion.

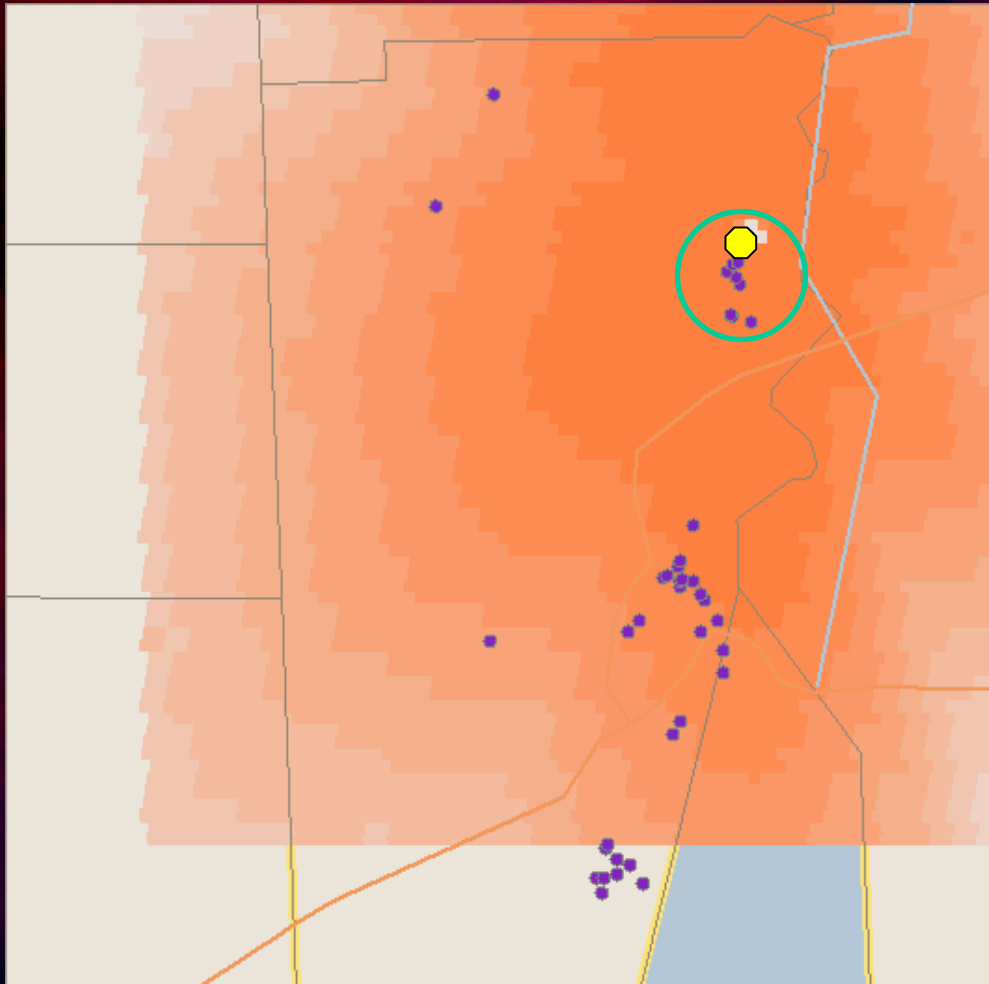
SULFURIC ACID PLUME FROM AKZO NOBEL FUNCTIONAL CHEMICALS



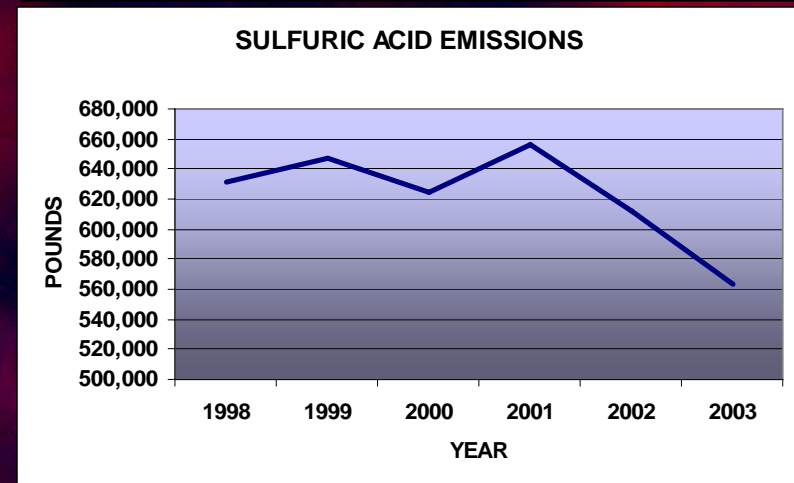
Source	Minimum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²	Maximum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²
Fugitive	0.000000069796	0.00053438
Stack	0.00055055	1.0346
Total	0.000550619796	1.03513438



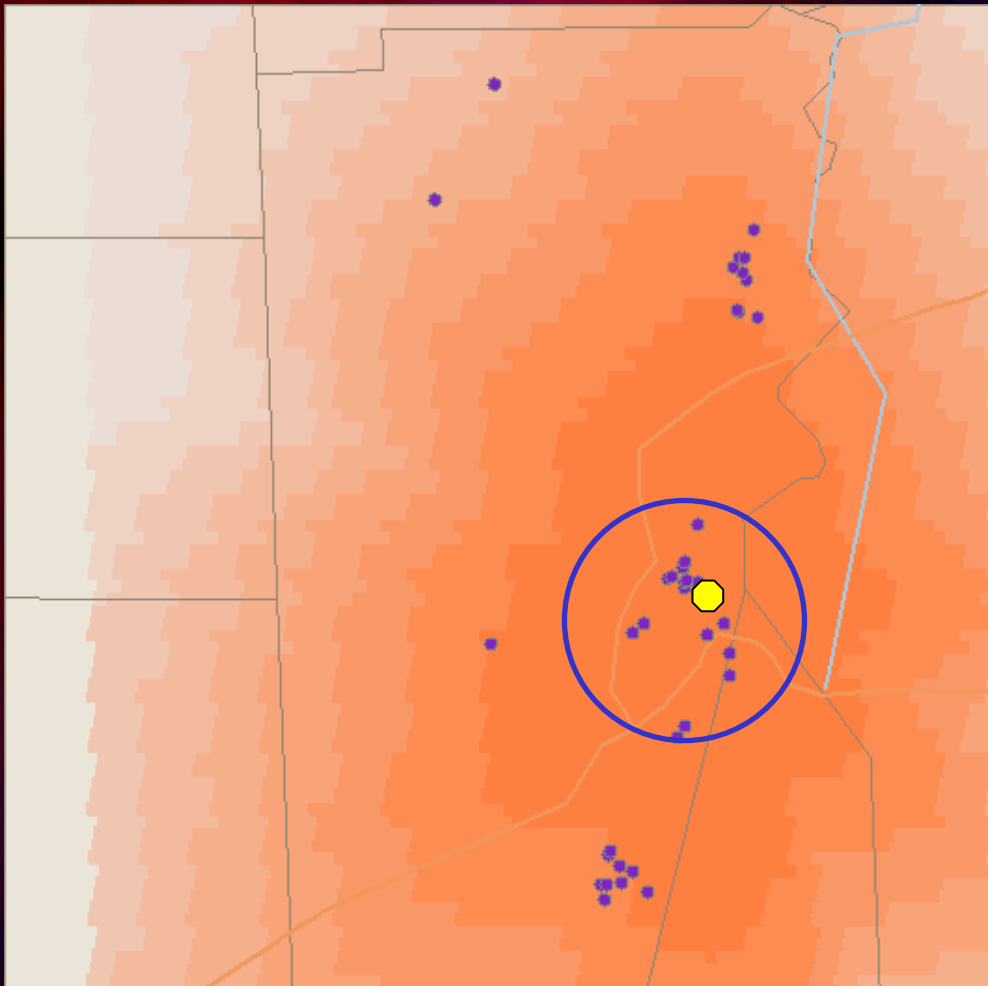
SULFURIC ACID PLUME FROM ALABAMA POWER CO. (SOUTHERN CO.)



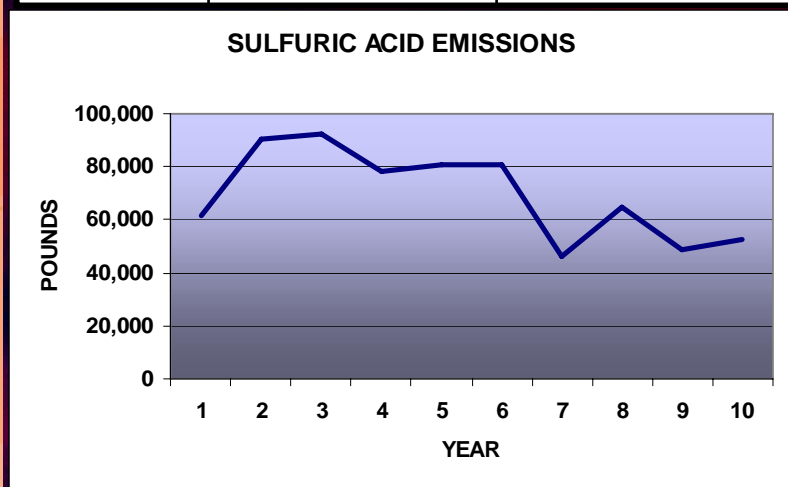
Source	Minimum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²	Maximum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²
Fugitive	0.0	0.0
Stack	0.00034977	0.049038
Total	0.00034977	0.049038



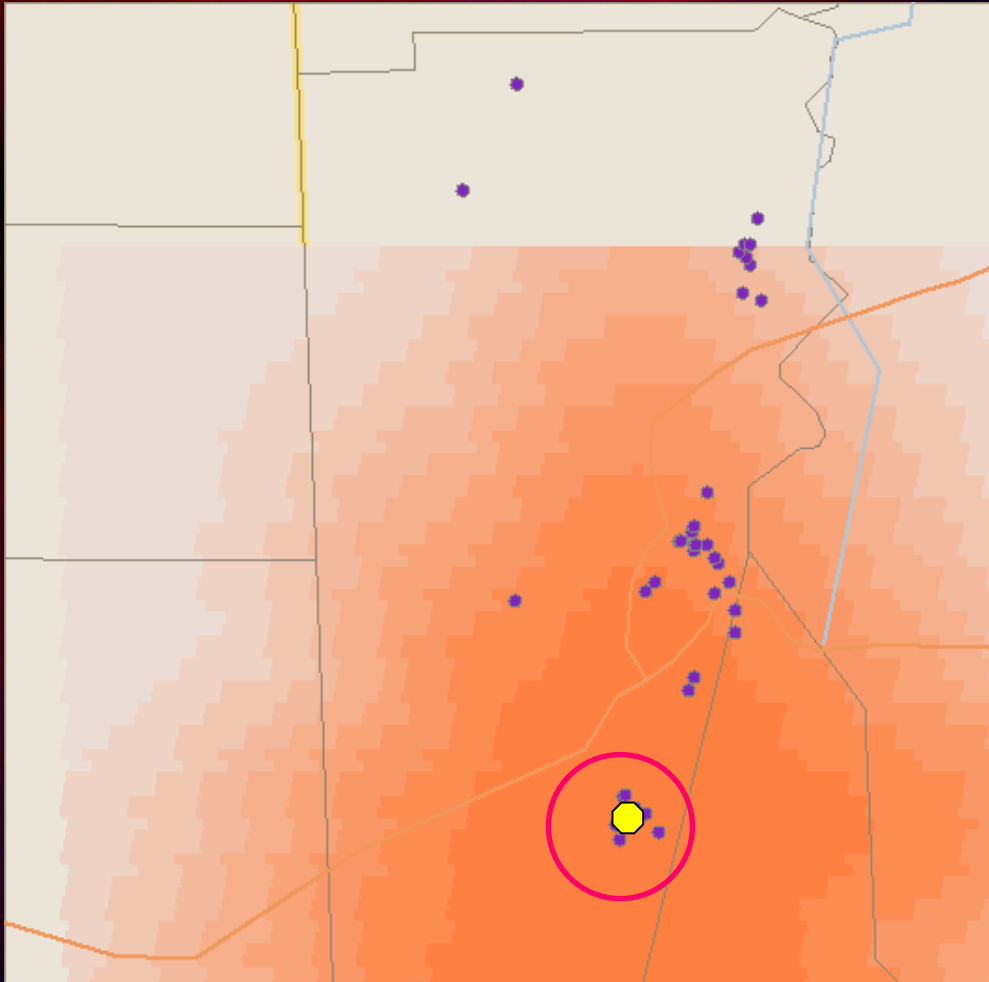
SULFURIC ACID PLUME FROM MOBILE ENERGY SERVICES



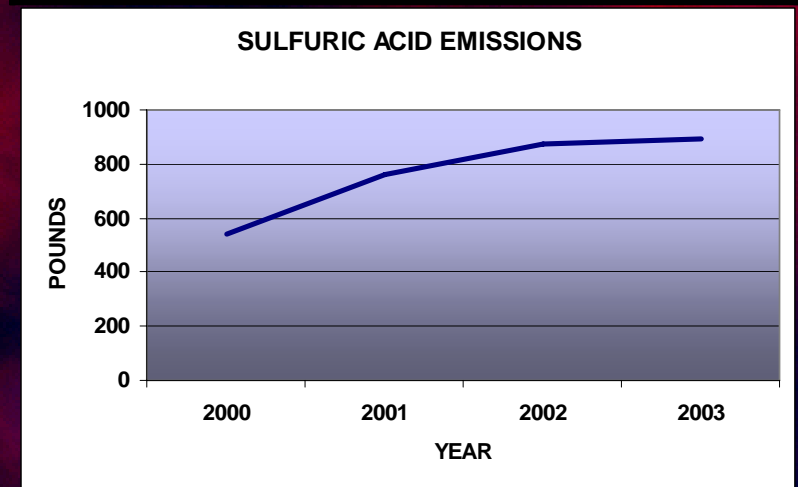
Source	Minimum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²	Maximum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²
Fugitive	0.0	0.0
Stack	0.0002743	0.035886
Total	0.0002743	0.035886



SULFURIC ACID PLUME FROM INEOS PHENOL, INC.



Source	Minimum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²	Maximum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²
Fugitive	0.000001845	0.014428
Stack	0.0000273	0.037058
Total	0.000029145	0.051486



SULFURIC ACID (H₂SO₄)

SAFE EXPOSURE CONCENTRATION:

1.0 µg/m³

MODELED MAXIMUM AMBIENT CONCENTRATION BY FACILITY

AKZO NOBEL	1.0351 µg/m³	
ALABAMA POWER	0.0490 µg/m³	
Total (Bucks-Axis)		1.0841 µg/m³
MOBILE ENERGY	0.0359 µg/m³	
Total (Mobile)		0.0359 µg/m³
INEOS PHENOL	0.0515 µg/m³	
Total (Theodore)		0.0515 µg/m³

HYDROCHLORIC ACID (HCl)

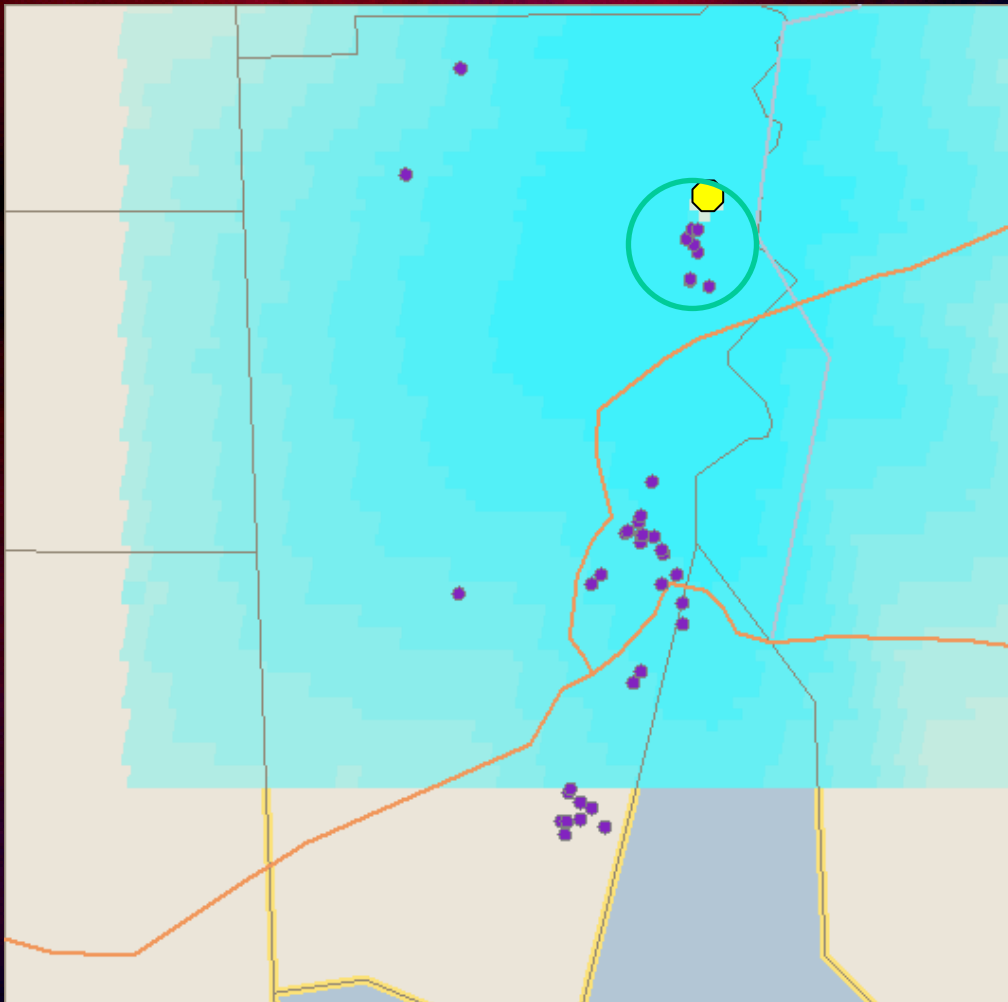
HEALTH EFFECTS

Irritation of the eyes, nasal passages, throat, lungs, and skin.

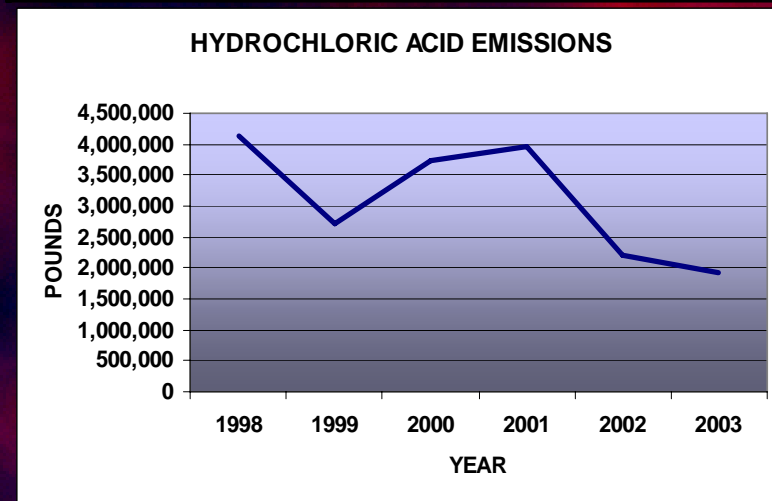
Respiratory problems, such as bronchitis, cough, phlegm, shortness of breath.

Dental discoloration and erosion.

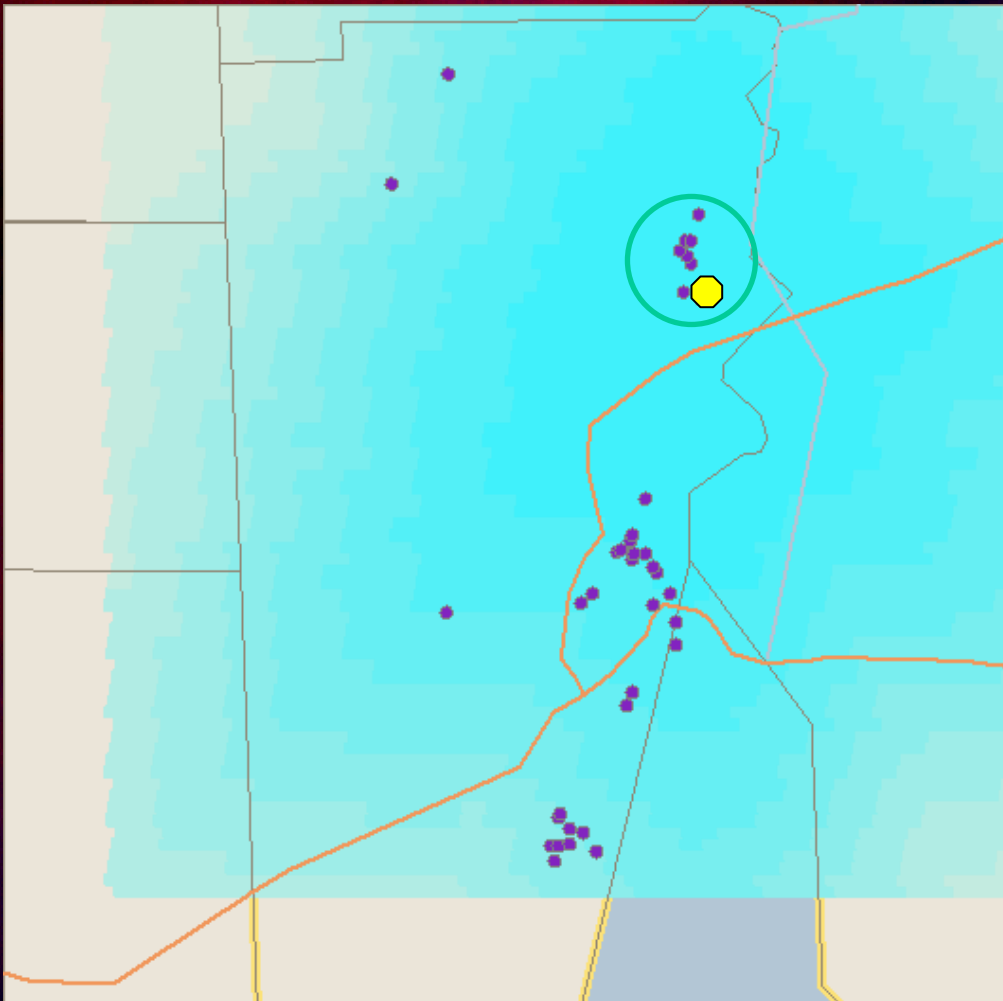
HYDROCHLORIC ACID PLUME FROM ALABAMA POWER CO. (SOUTHERN CO.)



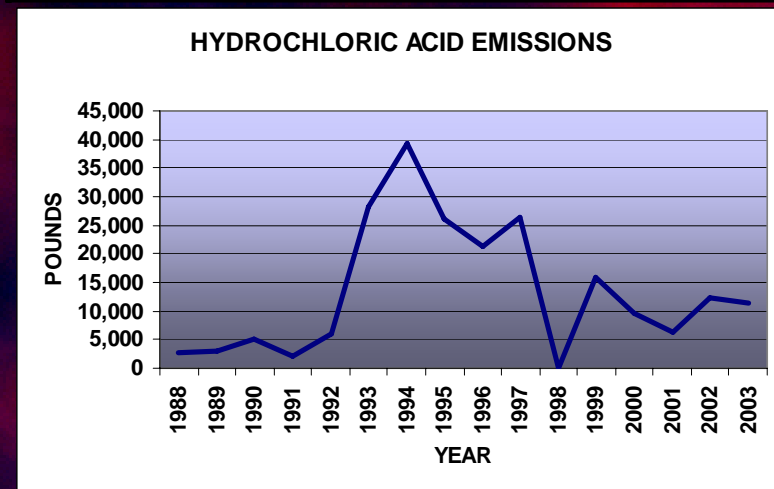
Source	Minimum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²	Maximum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²
Fugitive	0.0	0.0
Stack	0.0012541	0.17583
Total	0.0012541	0.17583



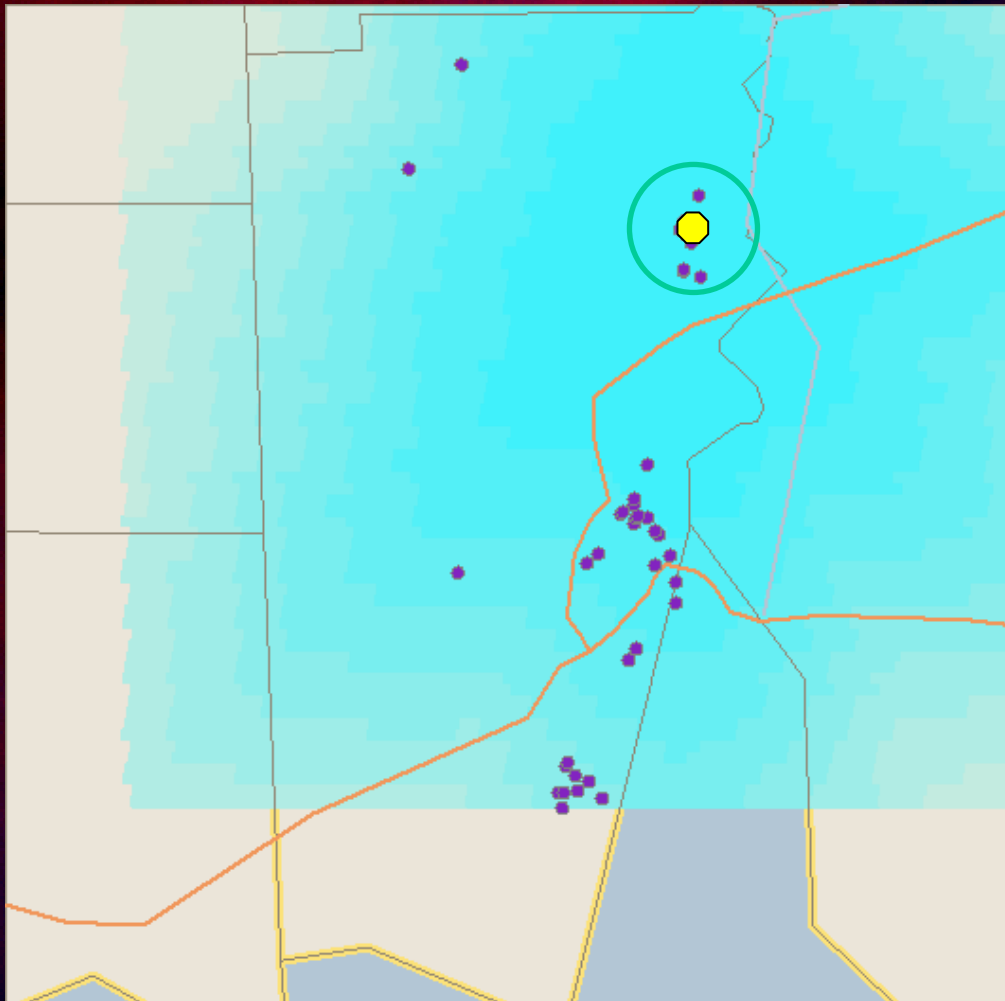
HYDROCHLORIC ACID PLUME FROM E.I. DUPONT DE NEMOURS



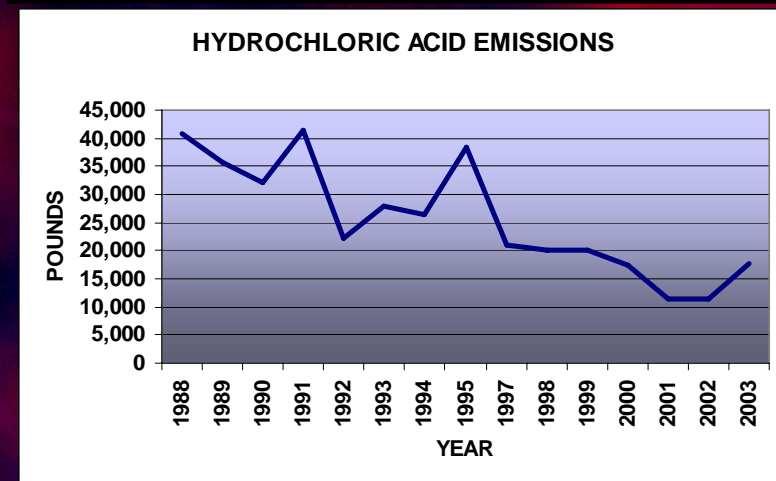
Source	Minimum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²	Maximum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²
Fugitive	0.000038142	0.29017
Stack	0.00030836	0.39578
Total	0.000346502	0.68595



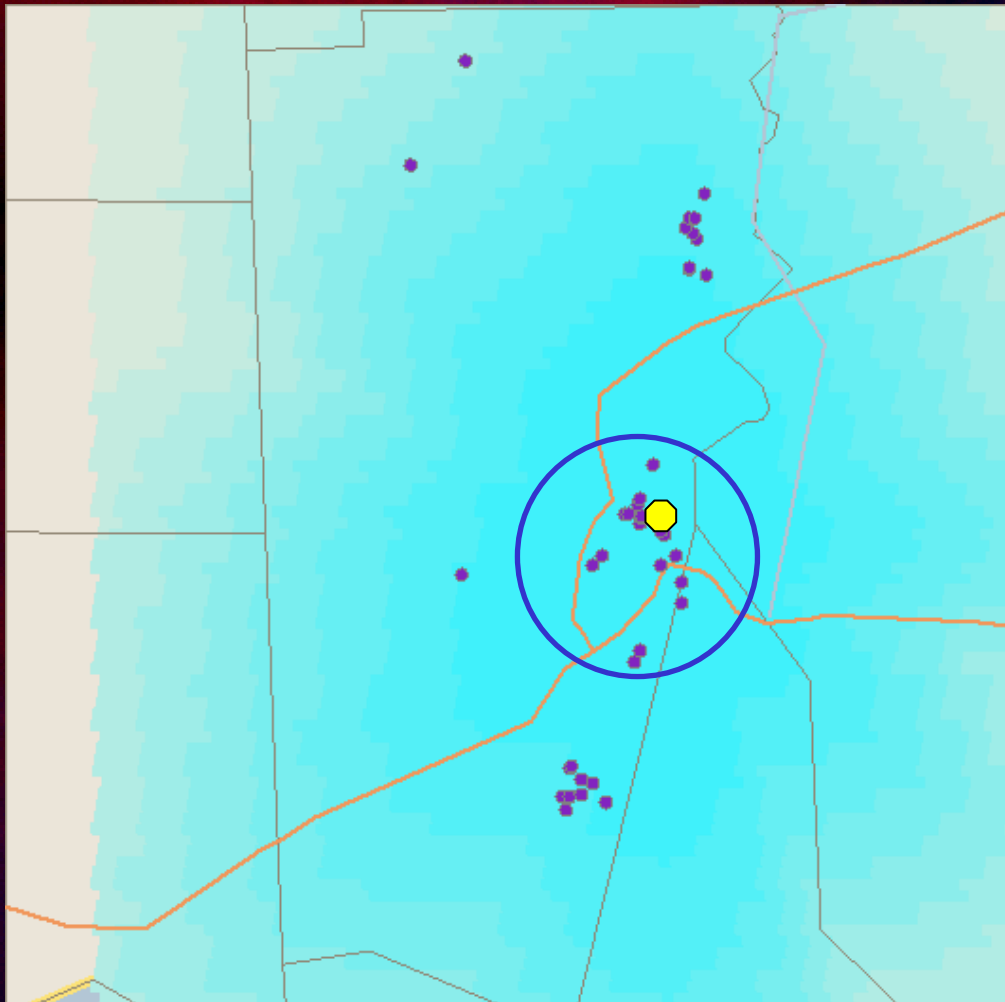
HYDROCHLORIC ACID PLUME FROM SYNGENTA CROP PROTECTION, INC.



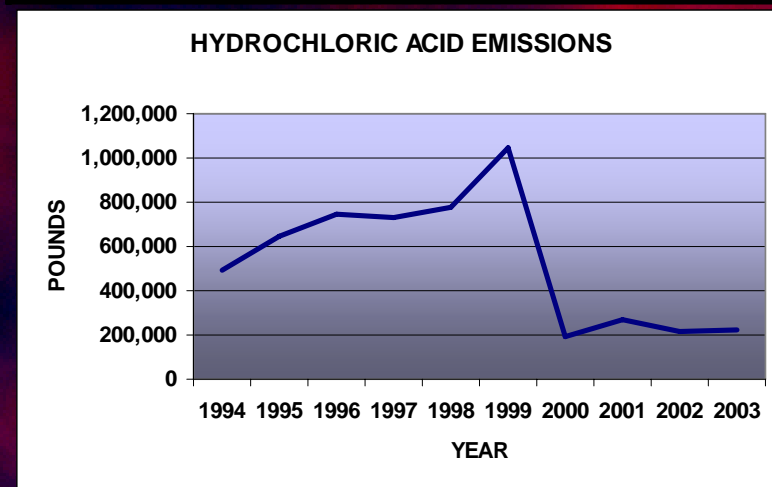
Source	Minimum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²	Maximum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²
Fugitive	0.000067293	0.51195
Stack	0.00031544	0.4255
Total	0.000382733	0.93745



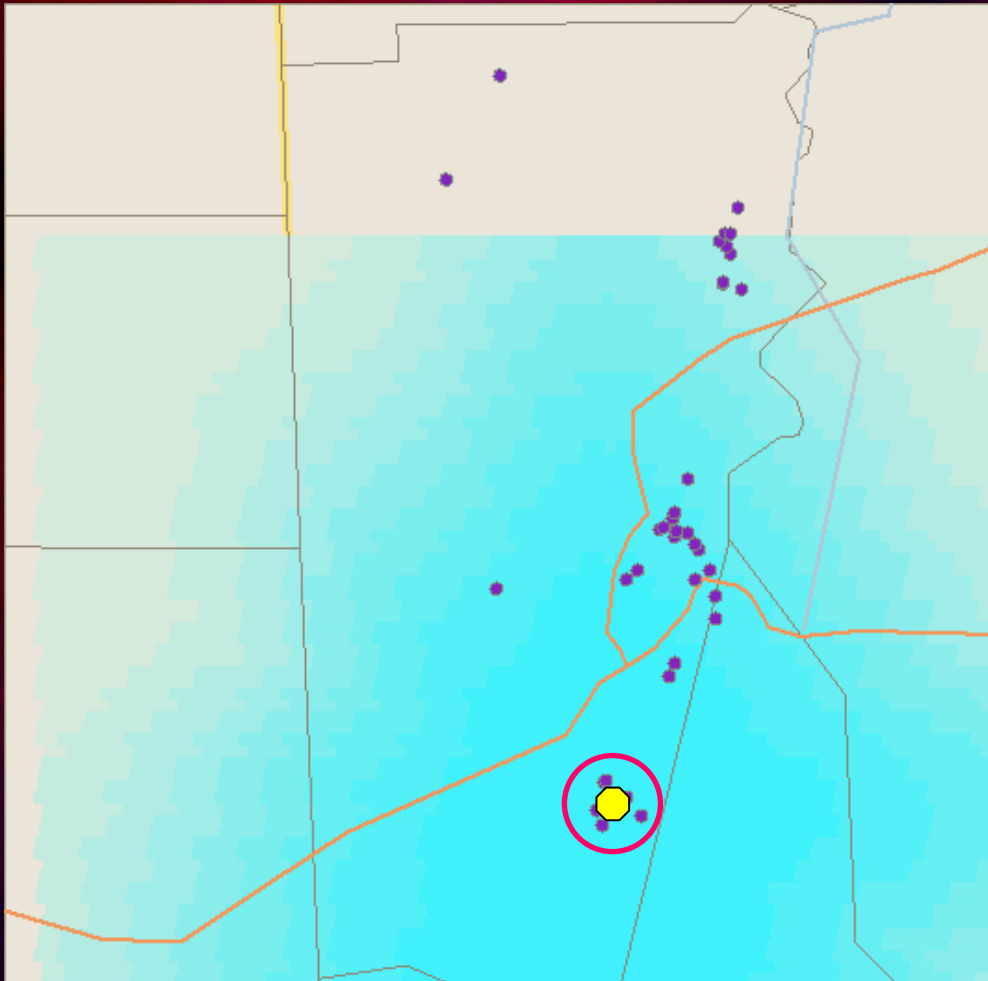
HYDROCHLORIC ACID PLUME FROM MOBILE ENERGY SERVICES LLC



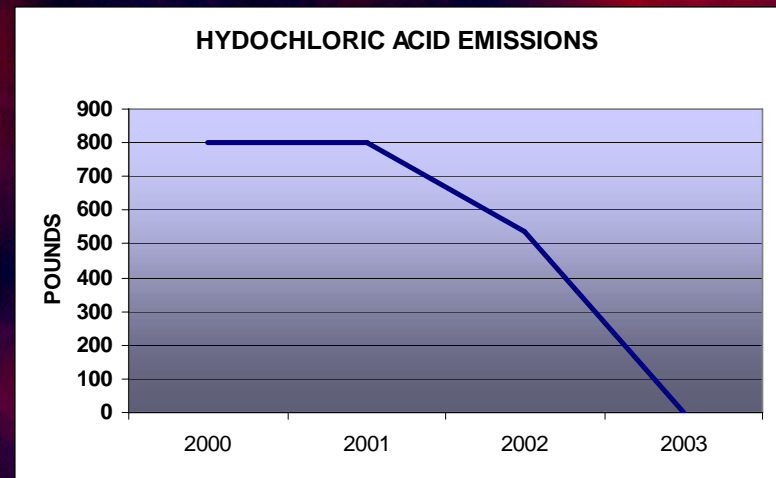
Source	Minimum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²	Maximum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²
Fugitive	0.0	0.0
Stack	0.0012113	0.15821
Total	0.0012113	0.15821



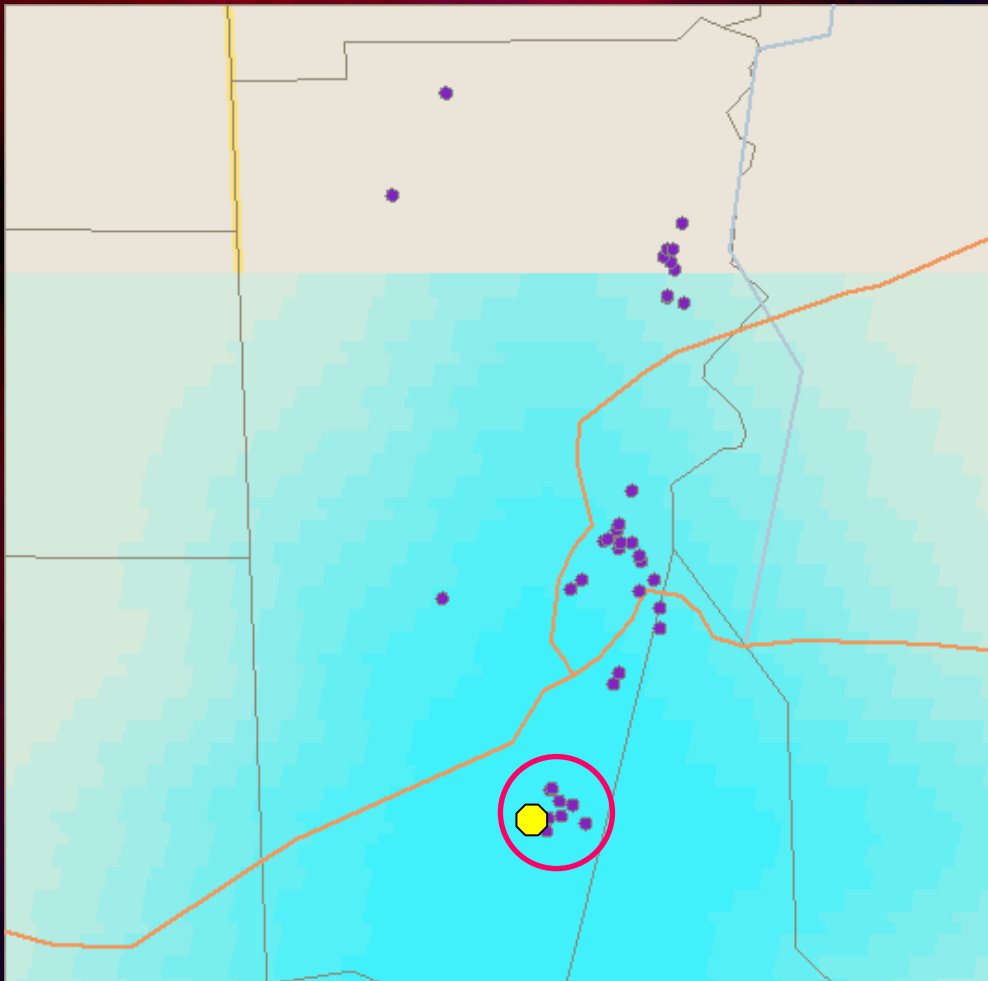
HYDROCHLORIC ACID PLUME FROM BASF PERFORMANCE COPOLYMERS LLC



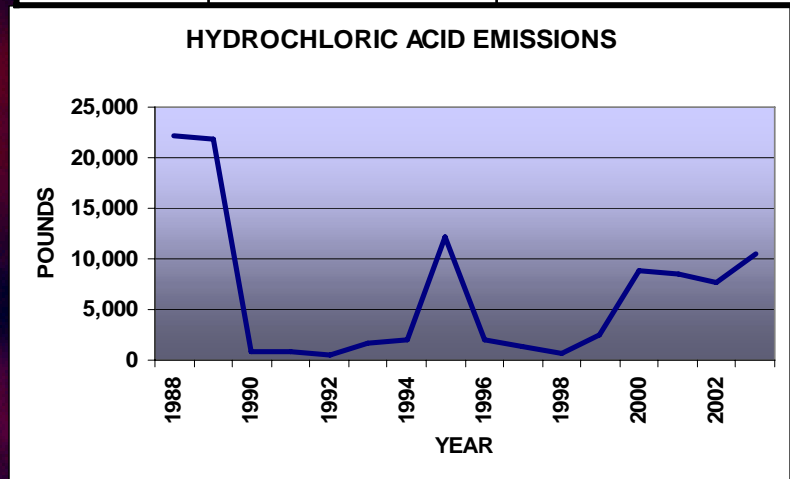
Source	Minimum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²	Maximum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²
Fugitive	0.0	0.0
Stack	0.000016508	0.022483
Total	0.000016508	0.022483



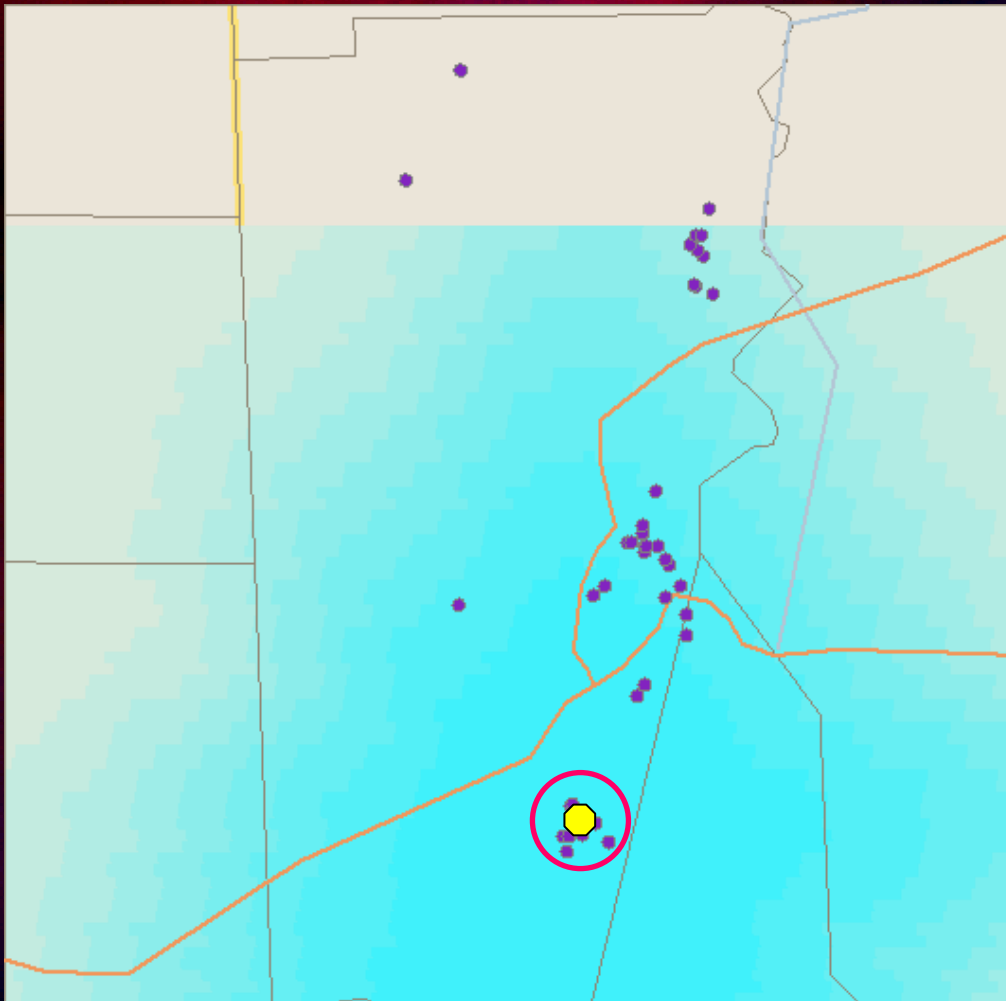
HYDROCHLORIC ACID PLUME FROM DEGUSSA CORP.



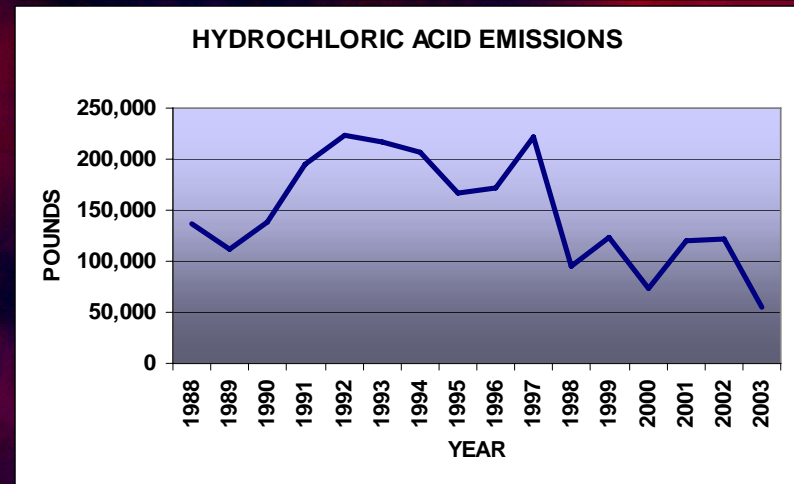
Source	Minimum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²	Maximum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²
Fugitive	0.000014716	0.11196
Stack	0.00025109	0.46888
Total	0.000265806	0.58084



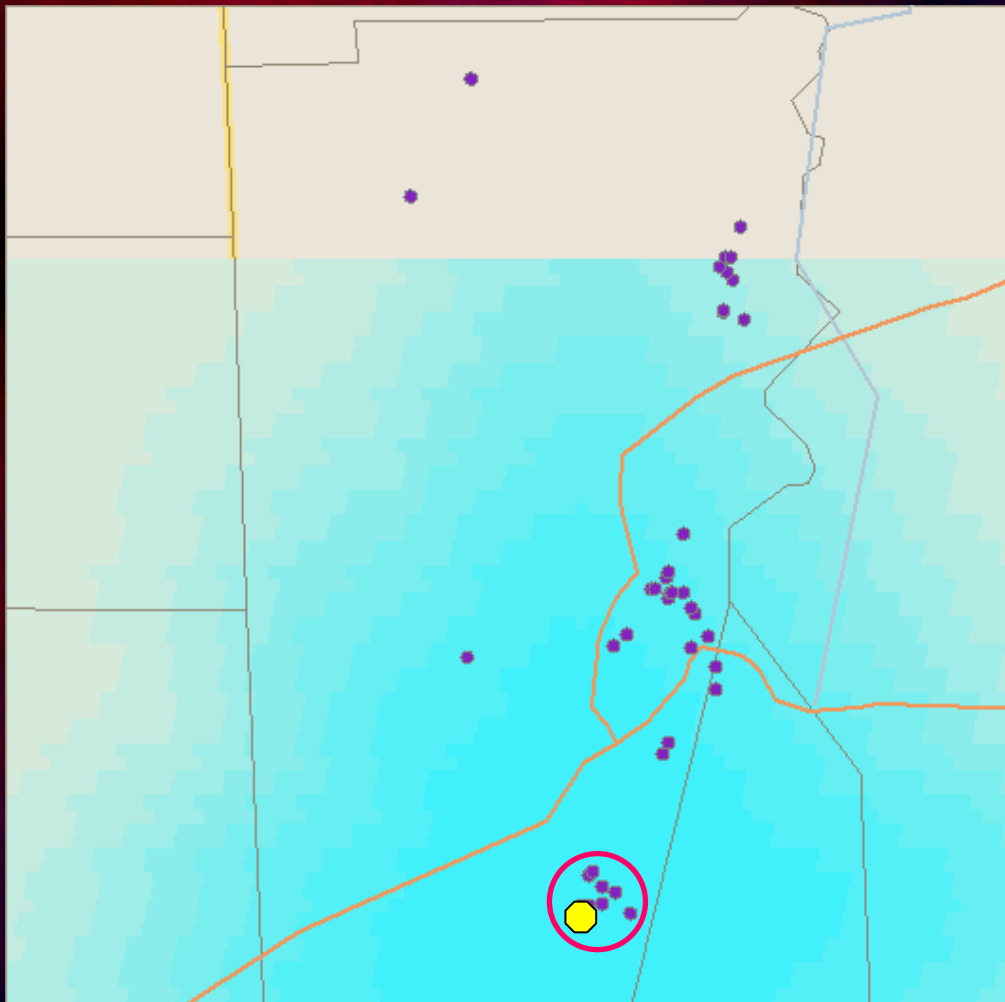
HYDROCHLORIC ACID PLUME FROM KERR MCGEE CHEMICAL LLC



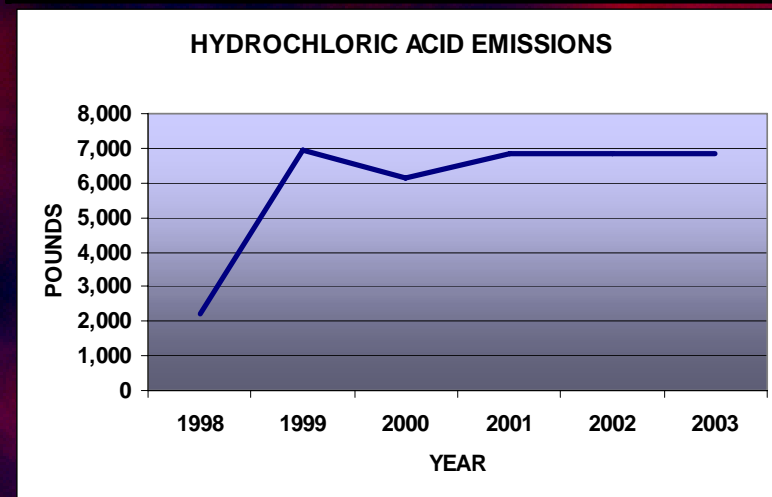
Source	Minimum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²	Maximum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²
Fugitive	0.000010501	0.079892
Stack	0.0041111	7.6768
Total	0.004121601	7.756692



HYDROCHLORIC ACID PLUME FROM MITSUBISHI POLYCRYSTALLINE SILICON



Source	Minimum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²	Maximum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²
Fugitive	0.000089946	0.68429
Stack	0.00005002	0.083325
Total	0.000139966	0.767615



HYDROCHLORIC ACID (HCl)

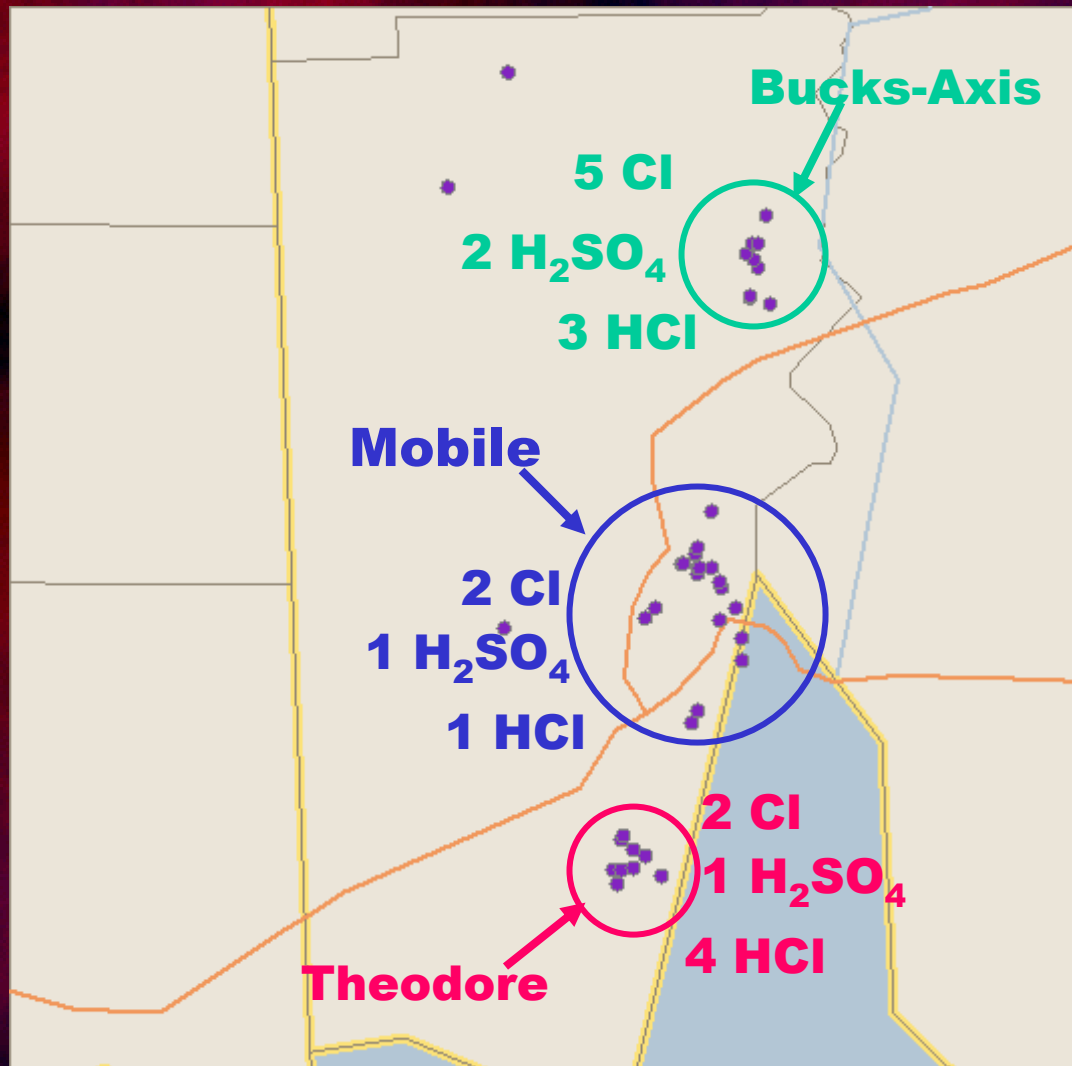
SAFE EXPOSURE CONCENTRATION:

20 $\mu\text{g}/\text{m}^3$

MODELED MAXIMUM AMBIENT CONCENTRATION BY FACILITY

ALABAMA POWER CO.	0.1758 $\mu\text{g}/\text{m}^3$	
DUPONT	0.6860 $\mu\text{g}/\text{m}^3$	
SYNGENTA CROP	0.9375 $\mu\text{g}/\text{m}^3$	
Total (Bucks-Axis)		1.7993 $\mu\text{g}/\text{m}^3$
MOBILE ENERGY	0.1582 $\mu\text{g}/\text{m}^3$	
Total (Mobile)		0.1582 $\mu\text{g}/\text{m}^3$
DEGUSSA CORP.	0.5808 $\mu\text{g}/\text{m}^3$	
KERR MCGEE	7.7567 $\mu\text{g}/\text{m}^3$	
MITSUBISHI	0.7676 $\mu\text{g}/\text{m}^3$	
BASF PERFORMANCE	0.0225 $\mu\text{g}/\text{m}^3$	
Total (Theodore)		9.1276 $\mu\text{g}/\text{m}^3$

TRI FACILITIES RELEASING SELECTED TOXIC CHEMICALS TO AIR IN MOBILE COUNTY (2002)



COMBINING RISKS OF MULTIPLE POLLUTANTS WITH SIMILAR NON-CANCER ENDPOINTS

$$\frac{C_X}{RfC_X} + \frac{C_Y}{RfC_Y} + \frac{C_Z}{RfC_Z} \leq 1.0$$

C_X = Concentration of Pollutant X

RfC_X = Reference Concentration of Pollutant X

COMBINING MAXIMUM CONCENTRATIONS OF CHLORINE + SULFURIC ACID + HYDROCHLORIC ACID

Community	Chlorine (Safe<1.0)	Sulfuric Acid (Safe<1.0)	Hydrochloric Acid (Safe<1.0)	Sum (Safe<1.0)
Bucks-Axis	$0.72/0.2=$ 3.60	$1.08/1.0=$ 1.08	$1.7993/20=$ 0.09	4.77
Mobile	$0.16/0.2=$ 0.80	$0.04/1.0=$ 0.04	$0.1582/20=$ 0.01	0.81
Theodore	$1.46/0.2=$ 7.30	$0.05/1.0=$ 0.05	$9.13/20=$ 0.46	7.81

COMBINING ADJUSTED CONCENTRATIONS OF CHLORINE + SULFURIC ACID + HYDROCHLORIC ACID

Community	Chlorine (Safe<1.0)	Sulfuric Acid (Safe<1.0)	Hydrochloric Acid (Safe<1.0)	Sum (Safe<1.0)
Bucks-Axis	$0.29/0.2=$ 1.4	$1.05/1.0=$ 1.05	$1.7993/20=$ 0.09	2.58
Mobile	$0.16/0.2=$ 0.80	$0.04/1.0=$ 0.04	$0.1582/20=$ 0.01	0.81
Theodore	$0.32/0.2=$ 1.6	$0.05/1.0=$ 0.05	$9.13/20=$ 0.46	2.11

ONE FACILITY ACCOUNTS FOR:

89.2% of Risk in Mobile County

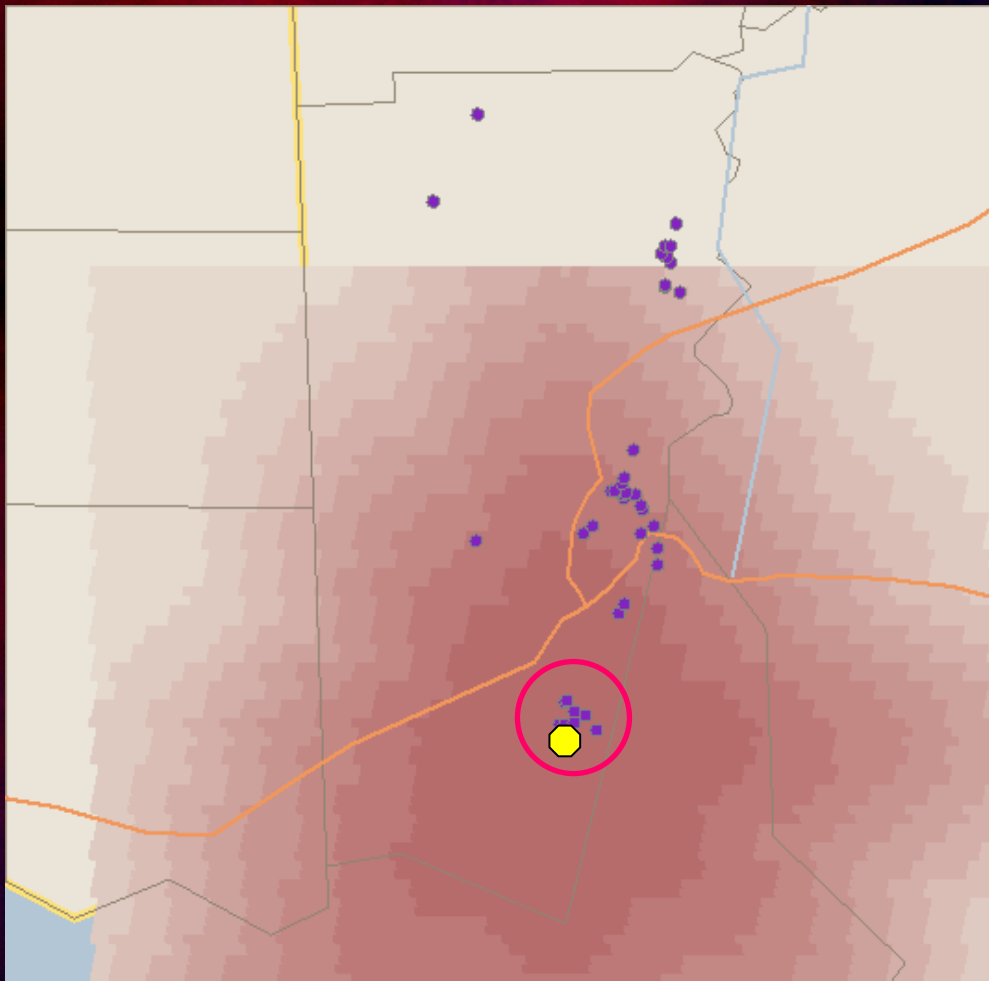
19.6% of Risk in State of Alabama

ONE CHEMICAL FAMILY ACCOUNTS FOR:

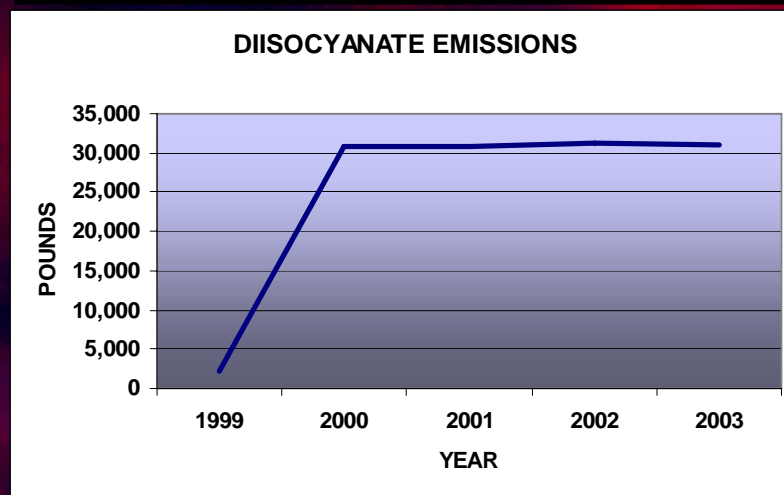
86.2% of Risk in Mobile County

18.9% of Risk in State of Alabama

DIISOCYANTES PLUME FROM DEGUSSA CORP.



Source	Minimum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²	Maximum Ambient Conc. ($\mu\text{g}/\text{m}^3$) within 50 km ²
Fugitive	0.00076648	8.3191
Stack	0.000000048541	0.0001291
Total	0.000766528541	8.3192291



DIISOCYANATES

HEALTH EFFECTS

Irritation of the eyes, nose, throat and skin.

Coughing, wheezing, shortness of breath.

Asthma-like allergies.

DIISOCYANATES

SAFE EXPOSURE CONCENTRATION:

0.01 $\mu\text{g}/\text{m}^3$

MODELED MAXIMUM AMBIENT CONCENTRATION:

8.3192291 $\mu\text{g}/\text{m}^3$

Community	Chlorine (Safe<1.0)	Sulfuric Acid (Safe<1.0)	Hydrochloric Acid (Safe<1.0)	Diiso- cyanates (Safe<1.0)	Sum (Safe<1.0)
Theodore	1.46/0.2= 7.30	0.05/1.0= 0.05	9.13/20= 0.46	8.32/0.01= 832	839.8

Miles from Degussa Corp.	1	3	5	10
Population	662	4,332	15,592	116,649

ENVIRONMENTAL JUSTICE COMMUNITIES

EPA Region 4 (1999 Policy)

> 1.2 X State-wide Percent Minority

$$**1.2 X 29.7\% = 35.6\%**$$

> 1.2 X State-wide Percent Below Poverty

$$**1.2 X 16.1\% = 19.3\%**$$

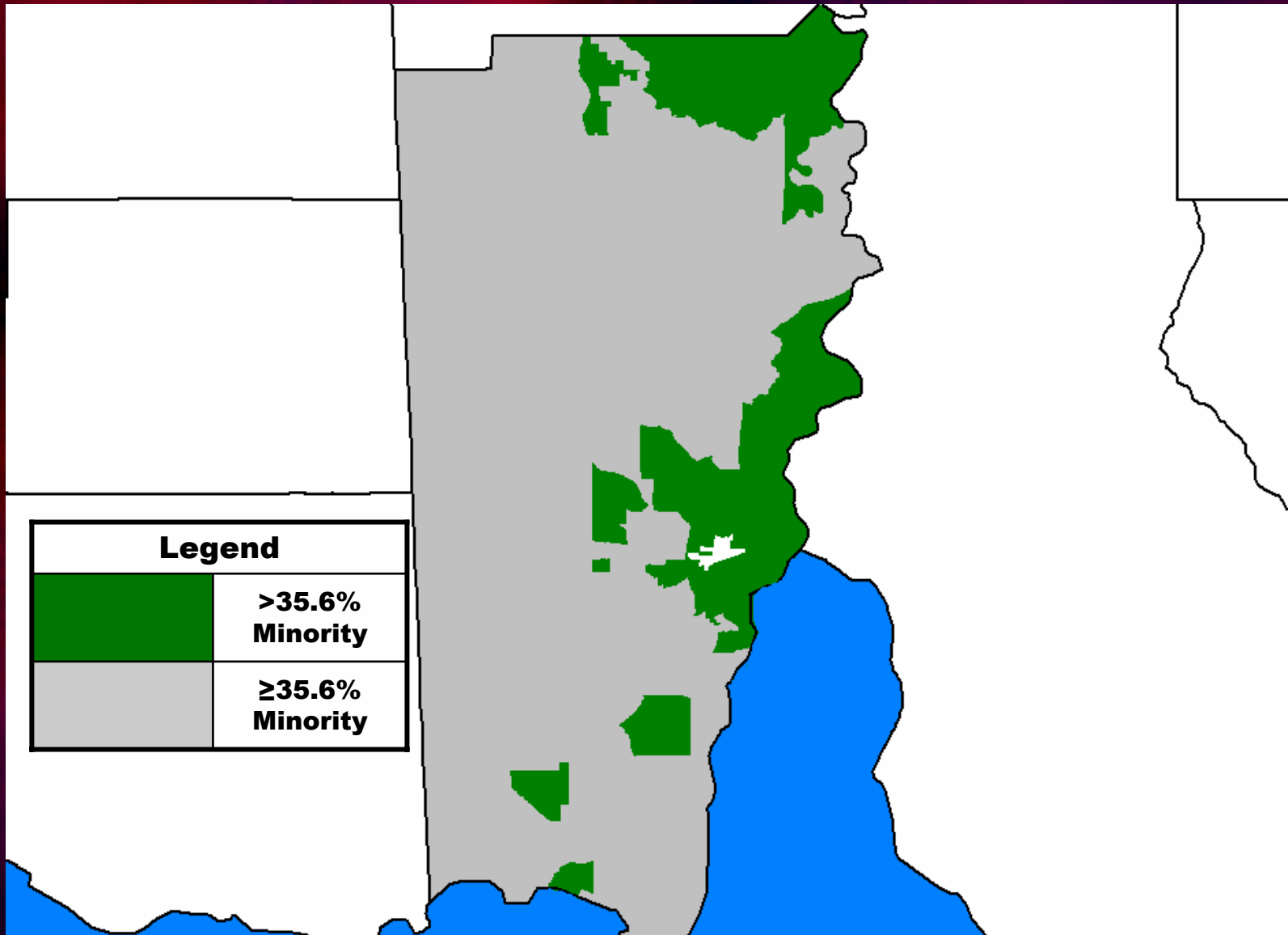
**> 1.2 X State-wide Percent Households
Below \$15,000 Income**

$$**1.2 X 22.5\% = 27.0\%**$$

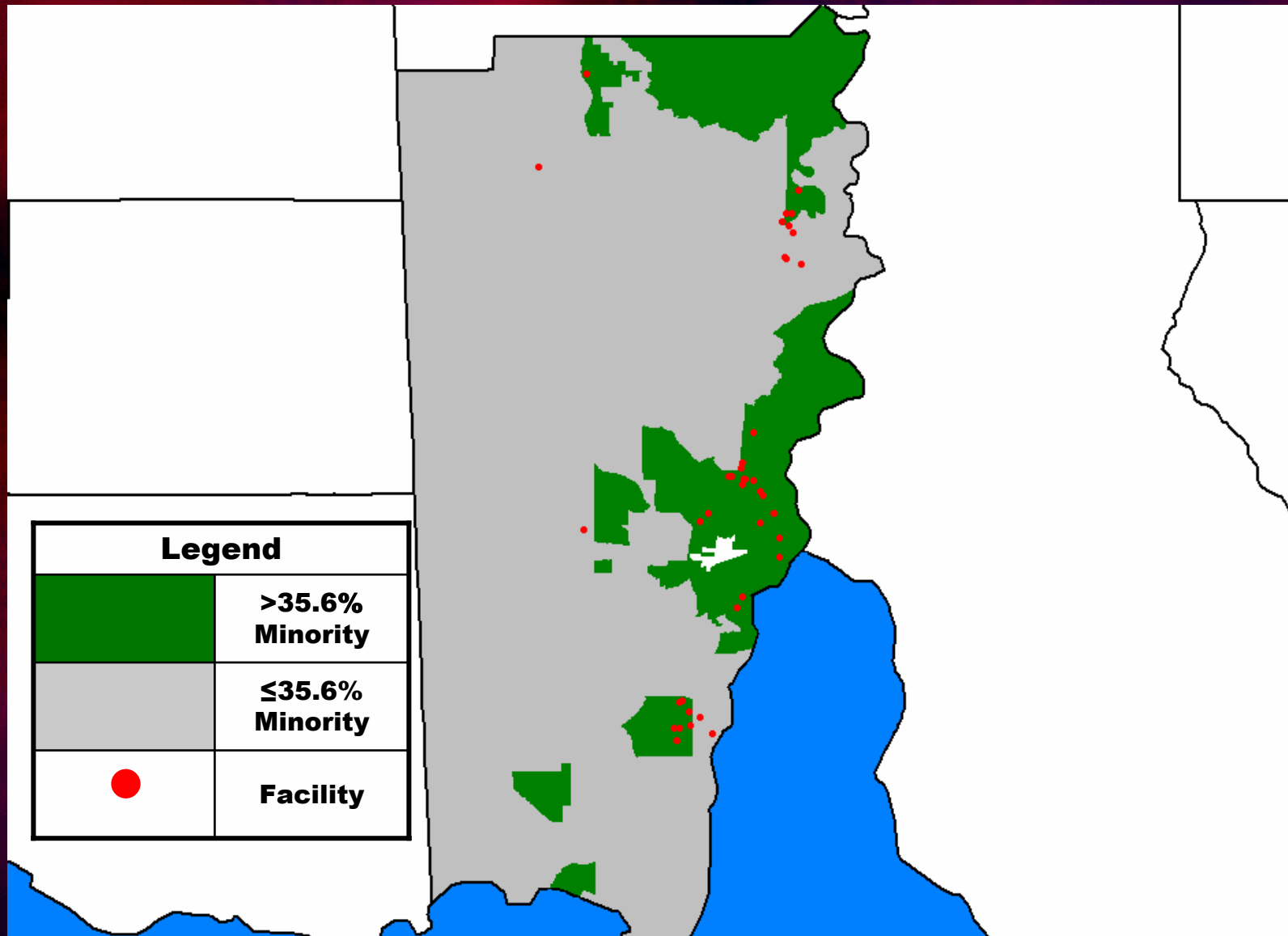
ENVIRONMENTAL JUSTICE MEASURES SURROUNDING DEGUSSA CORP.

Measure	0.5 Mile Radius	1.0 Mile Radius	3.0 Mile Radius	Mobile County	State	EPA Envntl Justice
Minority	58.0%	57.9%	41.6%	37.5%	29.7%	35.6%
Poverty	NA	NA	22.3%	18.5%	16.1%	19.3%
Income	35.2%	35.2%	29.6%	23.3%	22.5%	27.0%

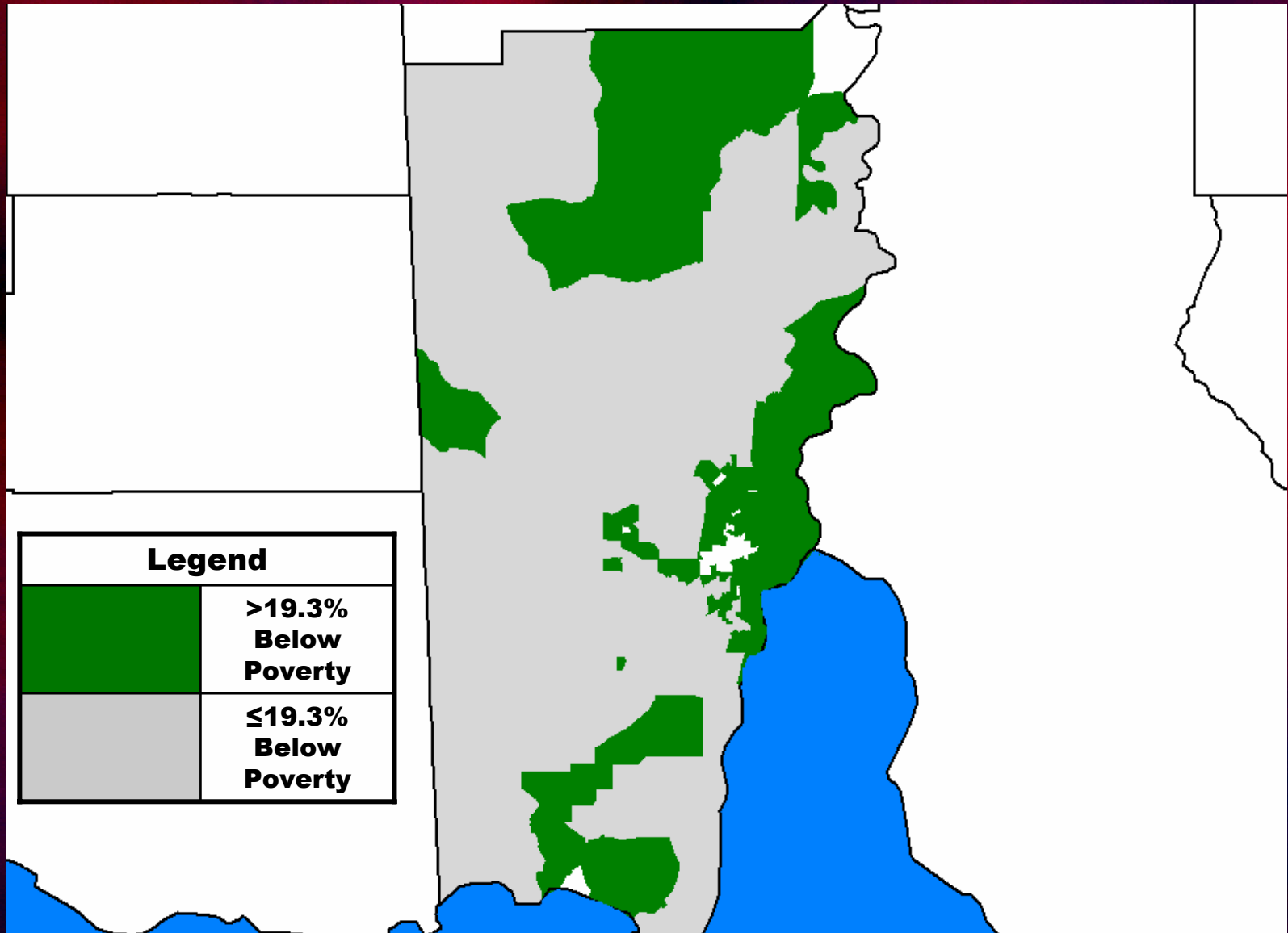
ENVIRONMENTAL JUSTICE (MINORITY) CENSUS BLOCK GROUPS IN MOBILE COUNTY



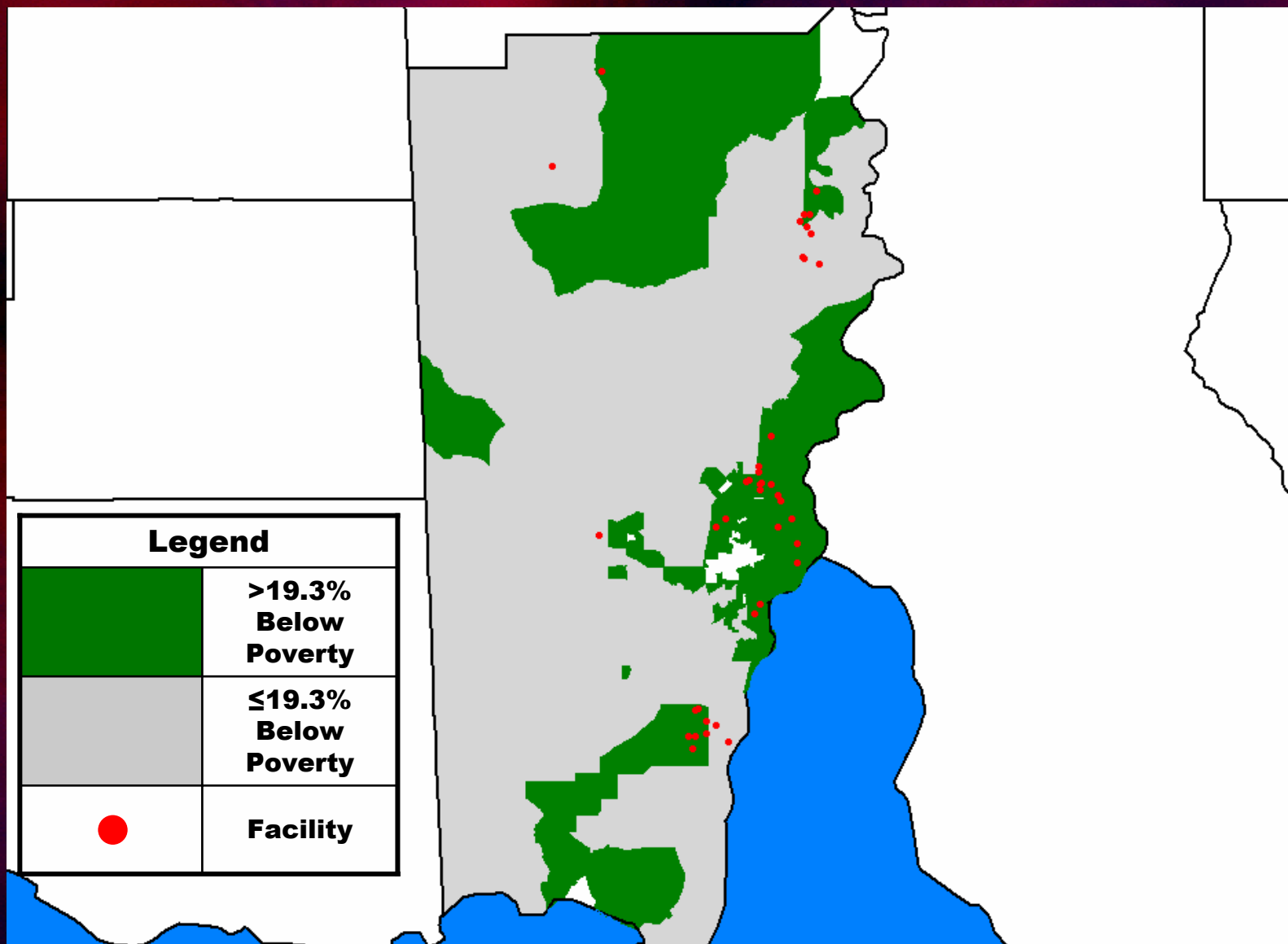
ENVIRONMENTAL JUSTICE (MINORITY) CENSUS BLOCK GROUPS AND TRI TOXIC AIR POLLUTION FACILITIES IN MOBILE COUNTY



ENVIRONMENTAL JUSTICE (POVERTY) CENSUS BLOCK GROUPS IN MOBILE COUNTY



ENVIRONMENTAL JUSTICE (POVERTY) CENSUS BLOCK GROUPS AND TRI TOXIC AIR POLLUTION FACILITIES IN MOBILE COUNTY



CONCLUSIONS

- 1. Current ADEM rules restricting the emission of toxic pollutants do not protect humans from exposure to unsafe levels of single and multiple toxic pollutants from individual facilities.**
- 2. Current ADEM rules restricting the emission of toxic pollutants do not protect humans from exposure to unsafe levels of multiple toxic pollutants from multiple facilities.**

- 3. ADEM lacks the technical capacity to assess the cumulative risks to human health from exposures to multiple toxic pollutants in the environment.**
- 4. Current ADEM rules for permitting toxic pollutant emissions have allowed disparate impacts on minority and poor communities.**

RECOMMENDATIONS

- 1. The EMC should initiate rulemaking to amend ADEM Admin. Code Div. 335-3 to restrict emissions of individual toxic pollutants from individual facilities to ensure that “Risk-based Concentrations” for individual toxic pollutants are not exceeded beyond the source property boundary.**
- 2. The EMC should initiate rulemaking to amend ADEM Admin. Code Div. 335-3 to restrict emissions of multiple toxic pollutants from individual and multiple facilities to ensure that the cumulative risk of exposure to multiple toxic pollutants at any location is not appreciable.**

- 3. ADEM should develop the technical capacity to assess cumulative risks to human health from exposures to multiple toxic pollutants in the environment.**
- 4. The EMC should initiate rulemaking to amend ADEM Admin. Code to require the preparation of a disparate impact analysis whenever pollution of the environment will be authorized in an environmental justice community.**

ADEM:

**THE PREMIER ENVIRONMENTAL
AGENCY IN THE NATION**

**WITHOUT INDIVIDUAL CHEMICAL,
FACILITY AND COMMUNITY CUMULATIVE
RISK ASSESSMENTS ?**

APPENDICES

- A **Mobile County Chemical Quantity (Lbs 2002)**
- B **Mobile County Chemical Hazard (Lbs*Tox 2002)**
- C **Mobile County Chemical Risk (Dose*Tox*Pop 2002)**
- D **Mobile County Facility Quantity (Lbs 2002)**
- E **Mobile County Facility Hazard (Lbs*Tox 2002))**
- F **Mobile County Facility Risk (Dose*Tox*Pop 2002)**
- G **ADEM Authorities to Address Cumulative Health Risk from Toxic Chemicals Released to Air**
- H **Risk Assessment for Toxic Air Pollutants: A Citizen's Guide**
http://www.epa.gov/ttn/atw/3_90_024.html
- I **Introduction to Air Toxics Risk Assessment**
<http://www.epa.gov/ttn/atw/wks/appx1011.pdf>

- J** **Public Health Implications of 1990 Air Toxics Concentrations Across the United States**
<http://ehp.niehs.nih.gov/members/1998/106p245-251woodruff/woodruff-full.html>
- K** **Empowerment Through Risk-Related Information: EPA's Risk Screening Environmental Indicators Project**
<http://www.umass.edu/peri/pdfs/WP18.pdf>
- L** **Ambient Air Pollution: Health Hazards to Children**
<http://pediatrics.aappublications.org/cgi/content/full/114/6/1699>
- M** **The Effect of Air Pollution on Lung Development from 10 to 18 Years of Age**
<http://content.nejm.org/cgi/content/short/351/11/1057>
- N** **Health Risks of 33 Hazardous Air Pollutants in Mobile County**
<http://www.epa.gov/ttn/atw/nata/ted/exporisk.html>
- O** **Toxic Chemicals Released to Air in Mobile County Not Evaluated**
- P** **Evaluating Cumulative Risk Assessment for Environmental Justice: A Community Case Study**
<http://ehp.niehs.nih.gov/2002/suppl-2/203-209fox/EHP110s2p203PDF.PDF>

Q **Mapping Environmental Injustices: Pitfalls and Potential of Geographic Information Systems in Assessing Environmental Health and Equity**
<http://ehp.niehs.nih.gov/members/2002/suppl-2/161-171maantay/EHP110s2p161PDF.PDF>

R **GIS Modeling of Air Toxics Releases from TRI-Reporting and Non-TRI-Reporting Facilities: Impacts for Environmental Justice**
<http://ehp.niehs.nih.gov/members/2004/7066/7066.pdf>

S **Regional Air Impact Modeling Initiative**
http://www.epa.gov/earth1r6/6pd/rcra_c/raimi/raimi.htm
http://www.epa.gov/earth1r6/6pd/rcra_c/raimi/ej_presentation.ppt
http://www.epa.gov/earth1r6/6pd/rcra_c/raimi/postertools.pdf

T **Hotspots Analysis Reporting Program**
<http://www.arb.ca.gov/toxics/harp/overview.htm>
<http://www.arb.ca.gov/toxics/harp/tour/sld001.htm>
<http://www.epa.gov/region5/air/toxics/3c-Dillingham.pdf>