Air Quality 101:
Understanding Emissions

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OFFICE ORGANIZATIONAL CHART

ENVIRONMENTAL SERVICES

- Water Permits
- Waste Permits
- Air Permits
- Permits Support Division

ENVIRONMENTAL COMPLIANCE

- Surveillance
- Enforcement
- Emergency Response & Radiological Services

ENVIRONMENTAL ASSESSMENT

- Air Quality Assessment
- Water Quality Assessment
- Technology
- Remediation
- Laboratory Services
- Underground Storage Tank

MANAGEMENT & FINANCE

- Financial Services
- Information Services
- General Services
- Human Resources

Office of Environmental Assessment Vision

The Environmental Assessment Program will protect human health and the environment through effective planning, fair regulations and thoughtful thorough assessment of environmental conditions of land, water and air. Assessment activities will define environmental problems and direct the efficient and effective uses to resources through planning to analyze, reclaim, improve and protect the environment of Louisiana.

- Emissions Inventory is necessary for almost all planning functions, for example, air quality modeling and "reasonable further progress" submittals to EPA
- An EI is necessary to assess individual facility(ie's) contribution to a particular environmental problem.

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Office of Environmental Assessment Mission

The mission of the Environmental Assessment Program is to maintain and enhance the environment of the state in order to promote and protect the health, safety and welfare of the people of Louisiana. This program provides an efficient means to develop, implement and enforce regulations, **inventory**, monitor and analyze emissions, pursue efforts to prevent and to remediate contamination of the environment. This program pursues a unified approach to remediation, simplifies and clarifies the scope of the remediation process, increases protection of human health and the environment by addressing remediation consistently, allows for fast track remediation, where applicable, reduces review time and labor, increases responsiveness to the public and regulatee, and increases accountability.

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Air Quality Assessment Division's Objective

AQAD meets the vision and goals of OEA's mission, in part, by the following objective:

- The Environmental Assessment Program, through the air quality assessment activity, will maintain an updated statewide **inventory** of air emissions, assess trends in emissions with special attention to areas not meeting standards, and ensure that the emissions inventory data is available to the public via the website 95% of the time.

Presentation Overview

- Part 1: What is an Emissions Inventory (EI)?
- Part 2: Why do we have the EI?
- Part 3: What do we collect in the EI?
- Part 4: How do we collect the EI?
- Part 5: What do we use the EI for?
- Part 6: How can the public access the EI?

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Part 1
What is an Emissions Inventory (EI)?

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What is an EI?

A current, comprehensive listing, by source, of actual air pollutant emissions associated with a specific geographic area for a specific time interval.

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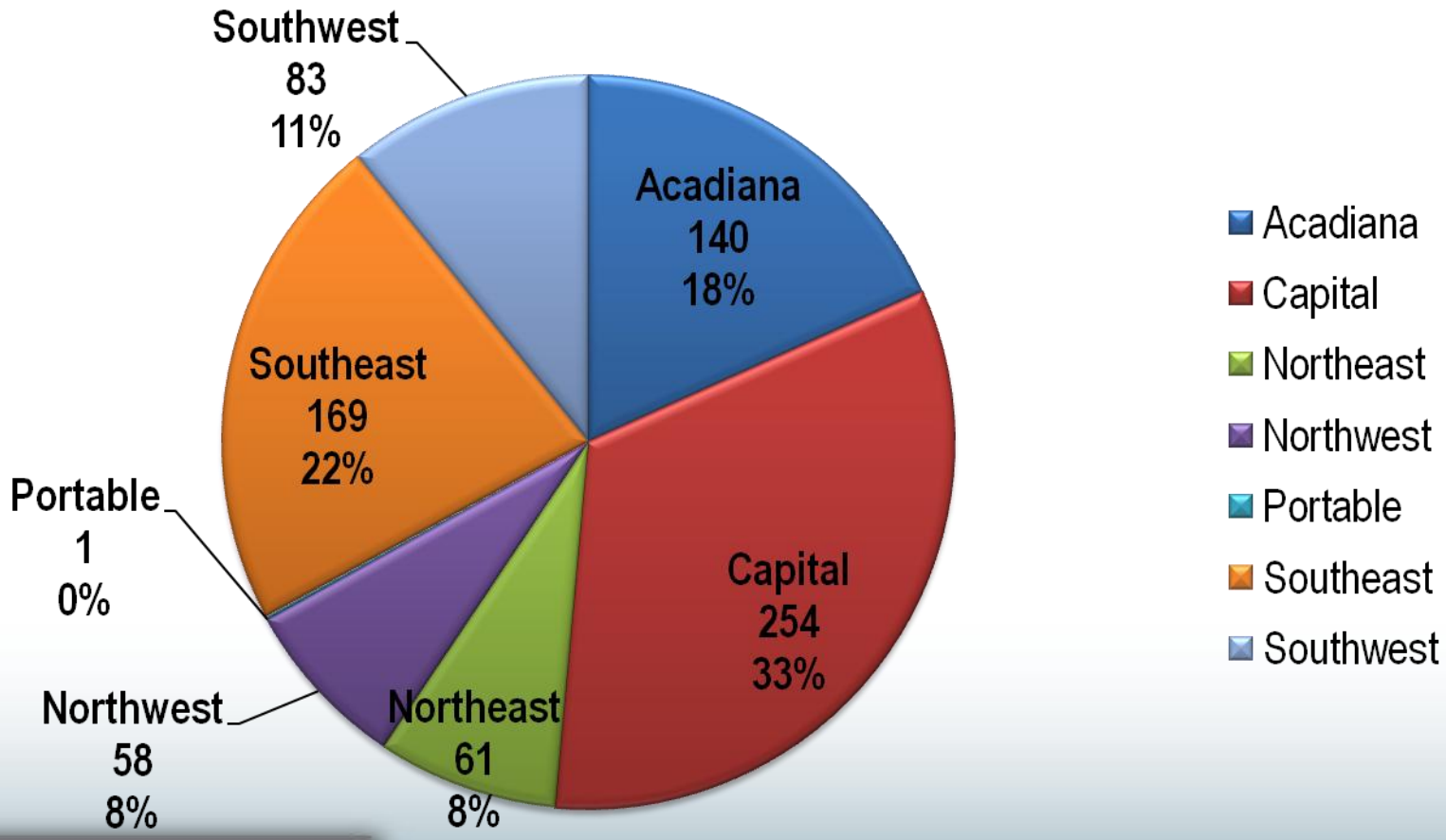
Sources in an EI

- Point Sources
- Nonpoint Sources (aka Area Sources)
- Mobile Sources
  - Onroad
  - Nonroad
- Biogenic Sources

Point Sources

- Large, stationary (non-mobile), identifiable sources of emissions that release pollutants into the atmosphere
  - Examples – refineries, oil and gas facilities, chemical plants, etc.
  - 2007 point source inventory for LA had 766 facilities

2007 Point Sources by Region



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Nonpoint Sources

- Previously called Area Sources
- Collectively represent individual sources that have not been inventoried as specific point or mobile sources.
  - Typically too small, numerous, or difficult to inventory using the methods for the other classes of sources
  - Examples - dry cleaning, bakeries, graphic arts, auto refinishing

Mobile Sources

- **Onroad** – motor vehicle that is any self-propelled vehicle used to carry people or property on a street or highway
  - Examples – cars, trucks, vans, etc.
- **Nonroad** – vehicle that is run by a nonroad engine and that is not a motor vehicle or a vehicle only used for competition
  - Examples – railroad locomotives, aircraft, commercial marine vessels, farm equipment, recreational boating, and lawn and garden equipment, etc.

Biogenic Sources

- Biogenic emissions are emissions that are not caused or produced by humans
  - Examples – trees and vegetation, oil & gas seeps, microbial activity

Part 2
Why do we have the EI?

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Why an EI?

- **Clean Air Act (CAA)** – Section 183(a)(3) requires an EI for areas of ozone nonattainment every 3 years
- **LAC 33:III.919** - requires point sources submit a criteria pollutant EI annually
  - Covers entire state
- **LAC 33:III.5107** – requires point sources submit a toxic air pollutant EI annually
  - Covers entire state

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Why an EI?

- **40 CFR Part 51 Subpart A** – Consolidated Emissions Reporting Rule (CERR) – requires annual EI for point sources of criteria pollutants and EI for nonpoint, mobile, and biogenic sources every 3 years for entire state
  - Currently being revised to the Air Emissions Reporting Requirements (AERR)
  - Data is submitted by LA to EPA
  - State data is incorporated by EPA into the National Emissions Inventory (NEI)

Part 3
What we collect in EI?

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Criteria Pollutants

Indicators of air quality for which National Ambient Air Quality Standards (NAAQS) have been set by EPA. They are collected in EI as:

- **Ammonia (NH_3)** - colorless, pungent, suffocating, highly water-soluble, gaseous compound - reacts with nitric and sulfuric acids in the atmosphere to form fine particulate matter
- **Carbon Monoxide (CO)** - colorless, odorless, and poisonous gas produced by incomplete burning of carbon in fuels.

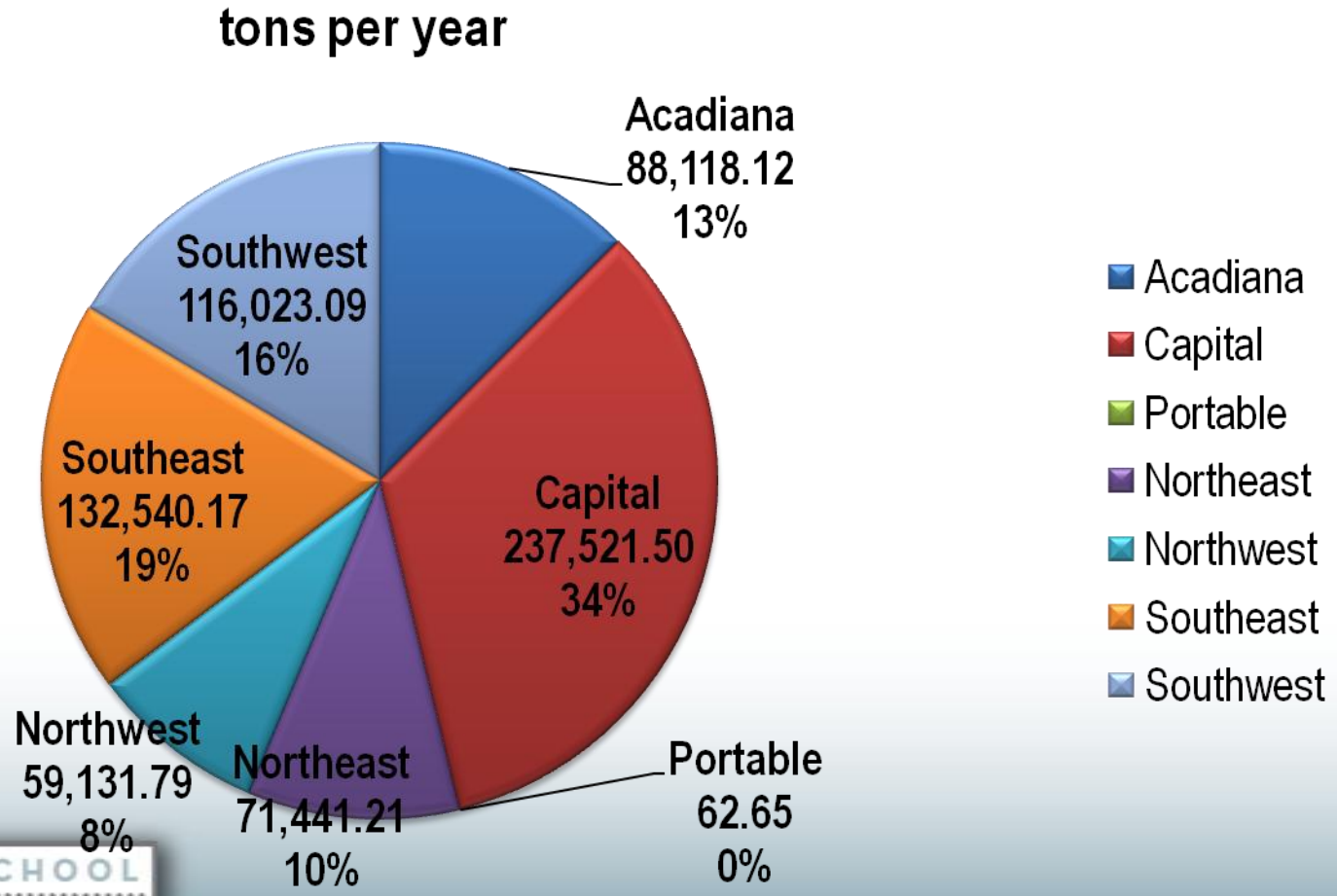
Criteria Pollutants

- **Lead (Pb)** – toxic metal emitted by motor vehicles and industrial sources
- **Nitrogen Oxides (NO_X)** - forms when fuel is burned at high temperatures. Important precursors to both ozone and acid rain.
- **Particulate Matter** - include dust, dirt, soot, smoke, and liquid droplets.
  - PM_{10} - less than 10 microns
  - $PM_{2.5}$ - less than 2.5 microns

Criteria Pollutants

- **Sulfur Dioxide (SO_2)** - colorless, pungent gas that is a respiratory irritant and like NO_X, is a precursor to acid rain. SO_2 can also interact with other compounds in the air to form PM.
- **Volatile Organic Compounds (VOC)** - ozone precursors that react with NO_X in the atmosphere to form ozone.

2007 Point Source Criteria Pollutant Emissions by Region



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Point Source Criteria Pollutant Emissions by Year

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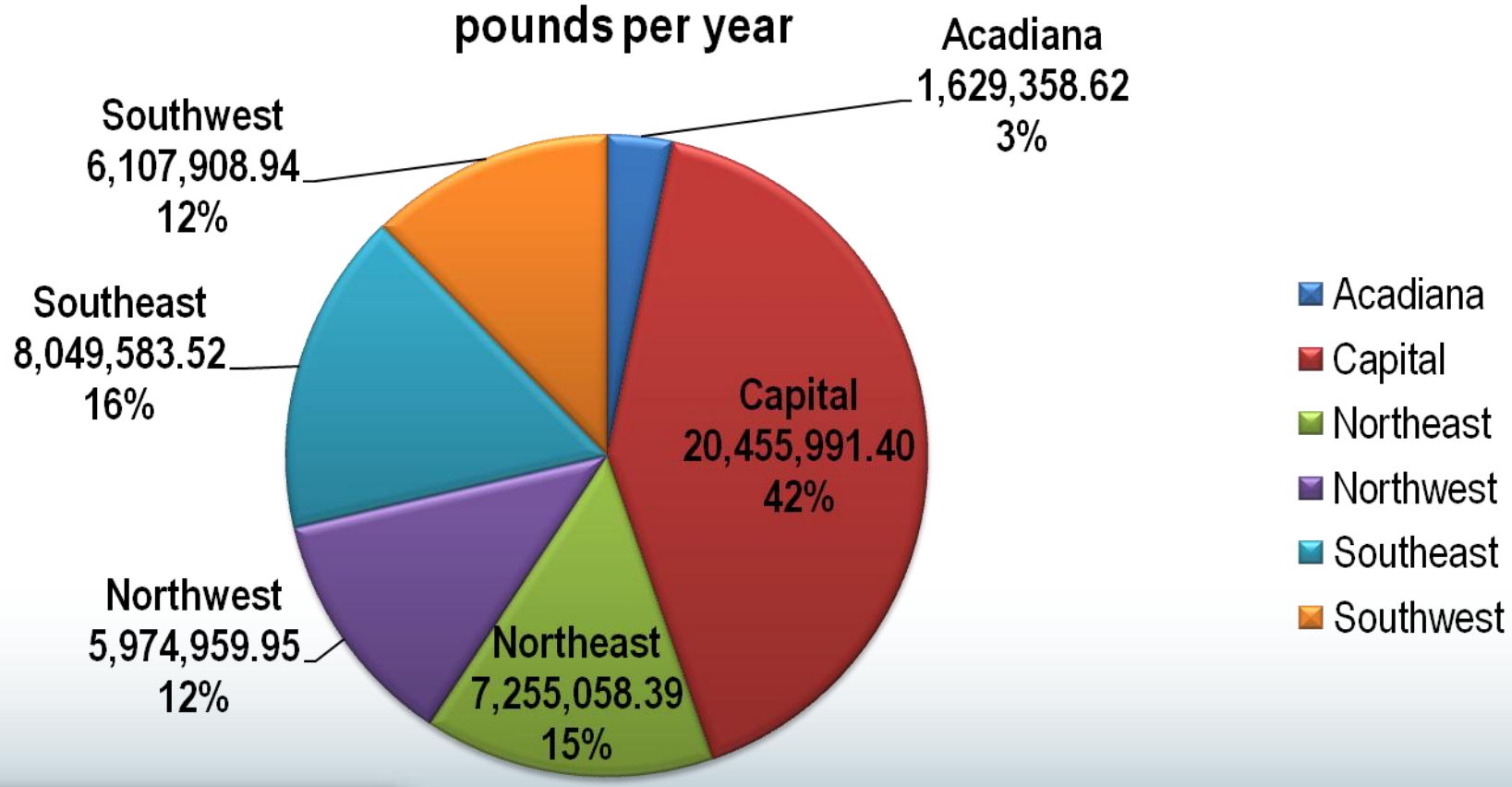
Toxic Air Pollutants

- Pollutants that are hazardous to human health or the environment.
- List of 198 TAPs can be found in LAC 33:III.5112
- LA classifies TAPs as:
  - Class I – known and probable human carcinogens
  - Class II – suspected human carcinogens and known, or suspected, human reproductive toxins
  - Class III – acute and chronic non-carcinogenic toxins

2007 Point Source Toxic Air Pollutant Emissions by Region



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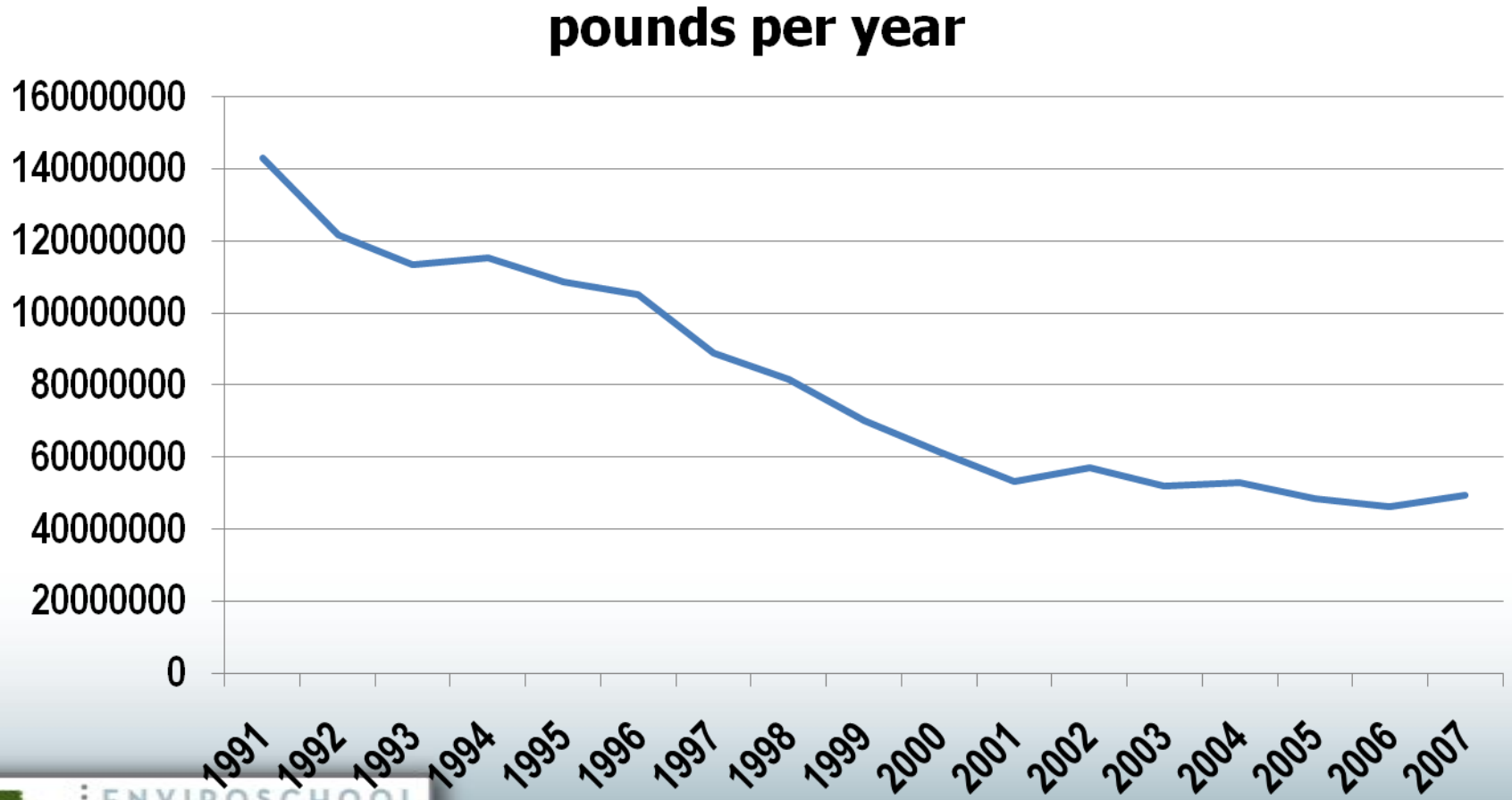
Point Source Toxic Air Pollutants by Year



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Part 4
How do we collect the EI?

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Collection of EI Data

- **Nonpoint sources (area sources)** – emissions are estimated by DEQ for the EI every 3 years using emission factors and activity data. The data is calculated by Source Classification Code (SCC).
- **Mobile sources** – emissions are modeled by DEQ for the EI every 3 years using mobile models
  - Onroad – MOBILE6.2 emissions model
  - Nonroad – NONROAD emissions model
- **Biogenic sources** – emissions are modeled every 3 years using Biogenic Emission Inventory System (BEIS)

Collection of EI Data

- **Point Sources** – actual emissions are estimated annually by facilities meeting the applicability of LAC 33:III.919 and LAC 33:III.5107
  - EI data is submitted to DEQ by our Emissions Reporting and Inventory Center (ERIC)
  - Emissions are either:
    - actual measured emissions using continuous emissions monitoring system (CEMS) data or stack test data
    - estimated using approved methodologies such as emission factors, emission models, engineering judgment, mass balance, etc.
  - Reported emissions are invoiced every year – amount varies on type of pollutant and class of toxic air pollutant

Collection of EI Data

- **Point Sources, continued:**
- The emissions inventory submission by point sources to LDEQ includes a Certification Statement
  - I certify, under penalty of perjury, that the emissions data provided are accurate to the best of my knowledge, information, and belief, and I understand that submitting false or misleading information will expose me to prosecution under federal and/or state regulations.
  - Signed by a Responsible Official for the facility
  - Holds the RO liable for criminal prosecution for knowingly submitting false and/or misleading information in the criteria pollutant EI
  - Facilities submitting false or misleading information are still subject to civil prosecution (enforcement actions) for both criteria and toxic

Collection of EI Data

- **Point Sources, continued:**
- EI data is collected by the source, process, release point, and pollutant emitted (if applicable, the control device is added) along with many descriptions and identifying information of the data elements
- All emissions are reported – there are no exemptions to what goes into the point source inventory for a facility
  - **Source** - equipment or unit that generates emissions, i.e., boiler, tank, incinerator, internal combustion engines

Collection of EI Data

- **Point Sources, continued:**
  - **Process** - description of the operational mode and material throughput of a source generating emissions - includes an SCC and material throughput
  - **Release Point** - physical location of release of pollutants to atmosphere – UTM coordinates, lat/longs
  - **Control System** - equipment through which emissions are routed for control, e.g., flares, scrubbers, filters, etc.
  - **Pollutant** – criteria or toxic air pollutant

Collection of EI Data

- **Point Sources, continued** – Once point source emissions inventory data has been received and certified, the emissions are invoiced per LAC 33:III.919.F for criteria pollutants and LAC 33:III.211.B.14 for toxic air pollutants.
- Emissions are rounded to the nearest whole ton and assessed the appropriate fee found in LAC 33:III.223.
  - Fee Numbers 2300 (non-Title V facility) & 2310 (Title V facility) for criteria pollutants
  - Fee Number 2200 for toxic air pollutants

Collection of EI Data

- **Point Sources, continued** –
- Criteria pollutants are invoiced $12.83 per whole ton, not to exceed 4000 tons per pollutant
  - $PM_{2.5}$ is a subset of PM_{10}, therefore not invoiced to avoid invoicing same emissions twice
  - Lead and ammonia are invoiced through toxic air pollutant invoicing
- Toxic air pollutants fees are based on the class of pollutant, capped at 4000 tons per single TAP:
  - Class I = $142.46 per whole ton
  - Class II = $71.28 per whole ton
  - Class III = $35.64 per whole ton

Part 5
What do we use the EI for?

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Use of the EI

- Planning –
  - monitoring data is used to determine compliance with NAAQS
  - EI data is the basis for developing rules/regulations to maintain compliance to aid in reaching compliance
- Attainment demonstrations for ozone nonattainment areas - modeling
- Preparation of State Implementation Plans (SIP)
- Tracking of Reasonable Further Progress (RFP)

Use of the EI

- NAAQS compliance modeling for permits – dispersion modeling
- Preparation of base year inventories for nonattainment areas
- Development of control strategies
- Compliance & surveillance – WITH CAUTION!!

Part 6
How can the public access the EI?

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Access to EI

- Facility totals available on DEQ's website:
  - http://www.deq.louisiana.gov/portal/tabid/1758/Default.aspx
- Public Records Request for more detailed EI data:
  - http://www.deq.louisiana.gov/portal/tabid/2231/Default.aspx
- Public reports page for point source EI data:
  - http://www.deq.louisiana.gov/portal/tabid/2703/Default.aspx
  - Not available yet

Access to TRI

- **Toxic Release Inventory (TRI)** - publicly available EPA database that contains information on toxic chemical releases and waste management activities reported annually by certain industries as well as federal facilities
  - Mechanism for public to have access to what facilities in their community were releasing and how
  - Gives an overall picture of what facilities are doing
  - Required by Emergency Planning and Community Right-to-Know Act (EPCRA) Section 313

Access to TRI

- EPA Contact - Morton Wakeland
  Toxics Section, Multimedia Planning and Permitting Division
  214-665-8116
  - Email: wakeland.morton@epa.gov
  - EPA's TRI website
    - http://www.epa.gov/tri/index.htm
  - TRI Explorer – EPA's public access site to TRI data
    - http://www.epa.gov/triexplorer/

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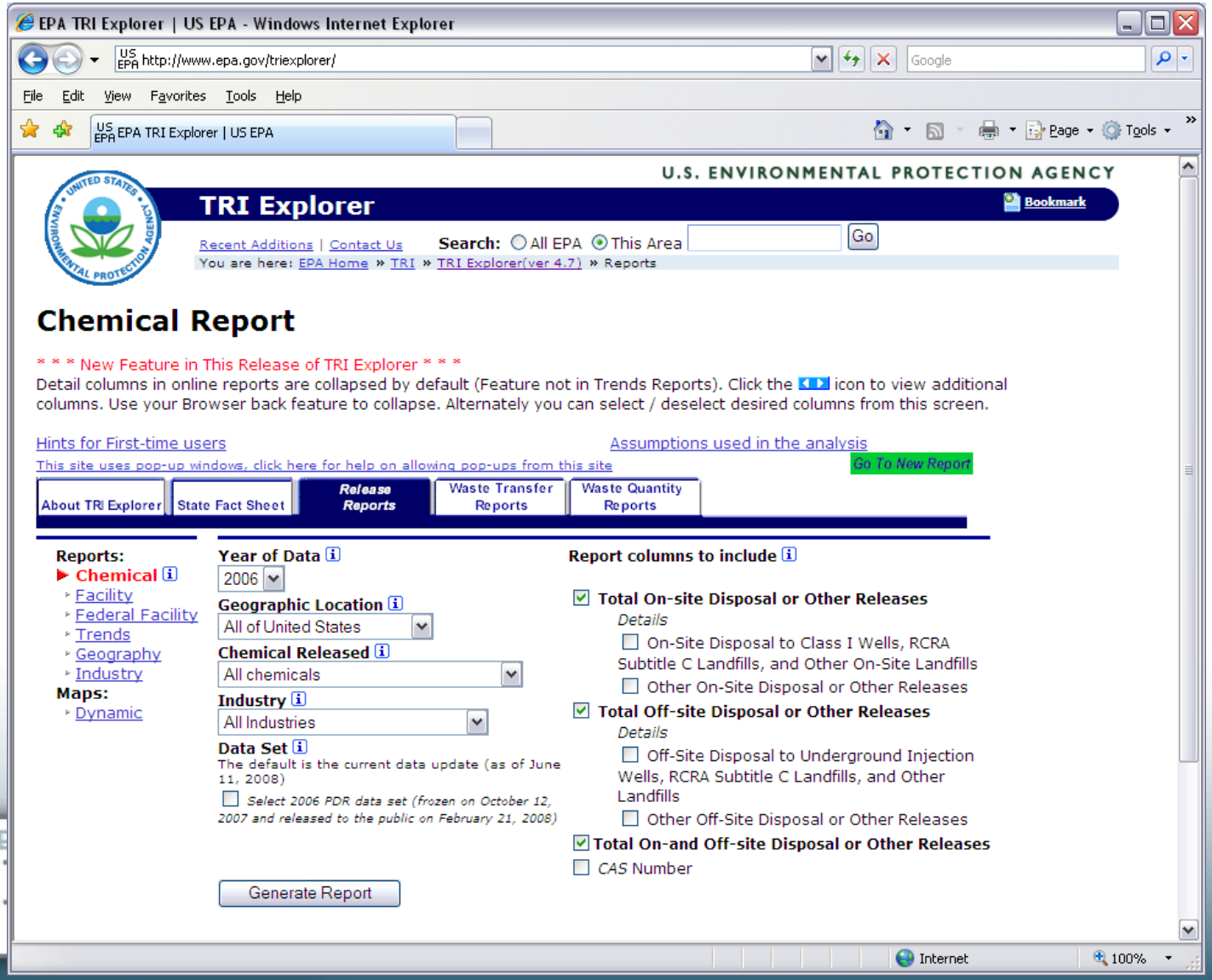
Access to TRI



Differences between in EI & TRI

EI

- Emissions to air only
- Applicability is based on geographical location in addition to emissions
- Once EI regulations apply, there is no minimum amount needed to report
- All point sources that meet EI applicability report
- Different pollutants

TRI

- Releases to air, water, land, & injection
- Applicability is not bound by geographical location
- Minimum amount of releases to report
- Only certain industrial facilities report
- Different pollutants

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DEQ in 2008

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DEQ in 2008

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Frequently Used Terms, Definitions, & Acronyms

- AERR – Air Emissions Reporting Requirements
- AQAD – Air Quality Assessment Division
- BEIS – Biogenic Emission Inventory System
- CAA – Clean Air Act
- CEMS – Continuous Emissions Monitoring System
- CERR – Consolidates Emissions Reporting Rule
- CO – Carbon Monoxide
- EI – Emissions Inventory
- EPA – Environmental Protection Agency
- EPCRA – Emergency Planning and Community Right-to-Know Act
- ERIC – Emissions Reporting & Inventory Center
- NAAQS – National Ambient Air Quality Standards

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Frequently Used Terms, Definitions, & Acronyms

- NEI – National Emissions Inventory
- NO_X – Nitrogen Oxides
- OEA – Office of Environmental Assessment
- PM – Particulate Matter
- RO – Responsible Official
- RFP – Reasonable Further Progress
- SCC – Source Classification Code
- SIP – State Implementation Plan
- SO_2 – Sulfur Dioxide
- TAP – Toxic Air Pollutant
- TEDI – Toxic Emissions Data Inventory (no longer exists)
- TRI – Toxic Release Inventory
- VMT – Vehicle Miles Traveled
- VOC – Volatile Organic Compound

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Frequently Used Terms, Definitions, & Acronyms

- **Acid Rain** - broad term referring to a mixture of wet and dry deposition (deposited material) from the atmosphere containing higher than normal amounts of nitric and sulfuric acids
- **Biogenic Emission Inventory System (BEIS)** - EPA's biogenic emissions model
- **MOBILE6.2** – emissions model that uses vehicle miles traveled (VMT) to calculate actual emissions
- **NAAQS** – that standard established under 42 US Code 7409, include standards for CO, lead, NO_X, ozone, inhalable PM, and SO_2
- **Nonattainment** – an area (parish or group of parishes) declared by the administrative authority to be not in compliance with a federal NAAQS and listed in the *Federal Register* as a nonattainment area

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Frequently Used Terms, Definitions, & Acronyms

- **NONROAD** – emissions model that uses built-in parish level inventories and activity data to calculate actual emissions
- **Nonroad Engine** – internal combustion engine (including fuel system)that is not used in a motor vehicle or vehicle only used for competition
- **Ozone (O_3)** - gas composed of three oxygen atoms. Ground-level ozone is the primary constituent of smog.
- **Reasonable Further Progress** – annual incremental reductions in emissions of the relevant air pollutant(s) that ensure the attainment of the applicable NAAQS by the applicable date. It is also used to ensure that the area maintains attainment once it is reached
- **State Implementation Plan** – a detailed description of the programs a state will use to carry out its responsibilities under the Clean Air Act

Resources

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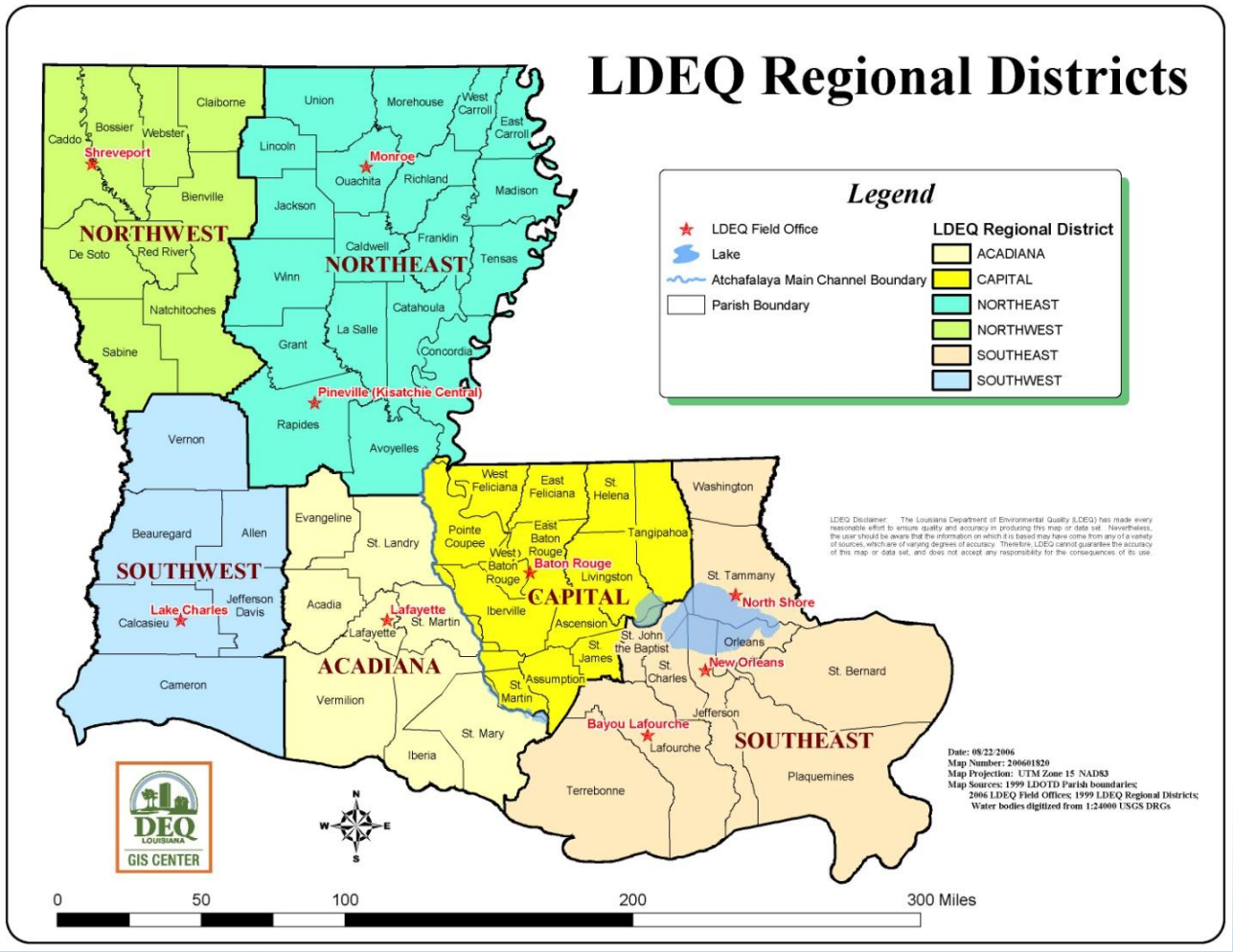
Resources



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Air Quality 101:
Understanding Emissions

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Monitoring Objectives

The Environmental Assessment Program, through the air quality assessment activity, will perform statewide air monitoring activities to evaluate whether Louisiana has achieved and maintained compliance with the National Ambient Air Quality Standards and will achieve a 90% data capture rate for use in determining compliance with the Federal standards.

Air Analysis Activities

- Design, implement and maintain the statewide ambient air quality network.

- Evaluate the air monitoring data for trends and compliance with national and state air quality standards.

- Provide requisite monitoring data for appropriate EPA databases.

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Clean Air Act of 1990

- Federal Law established by the Environmental Protection Agency (EPA)

- State Agencies (Louisiana Department of Environmental Quality) carry out the Act

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Clean Air Act of 1990

- Criteria Pollutants – National Ambient Air Quality Standards (NAAQS)
- Permissible Levels (Primary Standard and Secondary Standard)
- Attainment vs. Non-Attainment Areas and Classifications
- State Implementation Plan (SIP)

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NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS)

CRITERIA POLLUTANTS

1. **Ozone**
2. **Particulate Matter**
3. **Sulfur Dioxide**
4. **Nitrogen Dioxide**
5. **Lead**
6. **Carbon Monoxide**

- **These standards are designed to protect public health with an adequate margin of safety.**
- **All states must work to achieve these standards through the SIP process.**

Air Quality Index

AQI Values	Air Quality	Protect Your Health
0-50	Good	No health impacts are expected when air quality is in this range.
51-100	Moderate	Unusually sensitive people should consider limiting prolonged outdoor exertion.
101-150	Unhealthy for Sensitive Groups	Active children and adults, and people with respiratory disease, such as asthma, should limit prolonged outdoor exertion.
151-200	Unhealthy	Active children and adults, and people with respiratory disease, such as asthma, should avoid prolonged outdoor exertion; everyone else, especially children, should limit prolonged outdoor exertion.
201-300	Very Unhealthy	Active children and adults, and people with respiratory disease, such as asthma, should avoid all outdoor exertion; everyone else, especially children, should limit outdoor exertion.

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Why Monitor Air Quality?

- To keep communities informed about their local air quality
- To find out where air quality needs to be improved
- To determine whether efforts to improve air quality are working
- To understand how air pollution may affect human health and the environment

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Criteria for Choosing Air Monitoring Site Locations

The number of monitors required in an area is determined by population as detailed in the federal regulations 40 CFR Part 58.

The network should be designed to meet one of four basic monitoring objectives listed below:

- To determine highest concentrations expected to occur in the area covered by the network;
- to determine representative concentrations in areas of high population density;
- to determine the impact on ambient pollution levels of significant sources or source categories; and
- to determine general background concentration levels.

Air Quality Standards

- EPA establishes the National Ambient Air Quality Standard (NAAQS) for each of the criteria pollutants.

- There are two types of standards -- primary and secondary.

Primary/Secondary Standards

- Primary standards protect against adverse health effects;
- Secondary standards protect against welfare effects, such as damage to farm crops and vegetation and damage to buildings.

Averaging Times

Because different pollutants have different effects, the NAAQS are also different.

Some pollutants have standards for both long-term and short-term averaging times.

The short-term standards are designed to protect against acute, or short-term, health effects, while the long-term standards were established to protect against chronic health effects.

NAAQS

Pollutant	Primary Stds.	Averaging Times
Carbon Monoxide	9 ppm	8-hour
	35 ppm	1-hour
Lead	1.5 µg/m3	Quarterly Average
Nitrogen Dioxide	0.053 ppm	Annual (Arithmetic Mean)
Particulate Matter (PM10)	150 µg/m3	24-hour
Particulate Matter (PM2.5)	15.0 µg/m3	Annual (Arith. Mean)
	35 µg/m3	24-hour
Ozone	0.075 ppm	8-hour
Sulfur Oxides	0.03 ppm	Annual (Arith. Mean)
	0.14 ppm	24-hour

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Attainment/Nonattainment

- A geographic area that meets or does better than the national ambient air quality standard is called an **attainment area**; an area that doesn't meet this standard is called a **nonattainment area**.

Monitor Types

- The Clean Air Act requires every state to establish a network of air monitoring stations for criteria pollutants, using criteria set by OAQPS for their location and operation. The monitoring stations in this network are called the State and Local Air Monitoring Stations (SLAMS). The states must provide OAQPS with an annual summary of monitoring results at each SLAMS monitor, and detailed results must be available to OAQPS upon request.

Monitor Types

- A second type of monitor, the Special Purpose Monitor (SPMS), is used by State and local agencies to fulfill very specific or short-term monitoring goals.
- The 1990 Amendments to the Clean Air Act also requires the Photochemical Assessment Monitoring Station (PAMS), which measures ozone precursors (approximately 60 volatile hydrocarbons and carbonyl).

SLAMS

- The SLAMS consist of a network of ~ 4,000 monitoring stations whose size and distribution is largely determined by the needs of State and local air pollution control agencies to meet their respective State implementation plan (SIP) requirements.

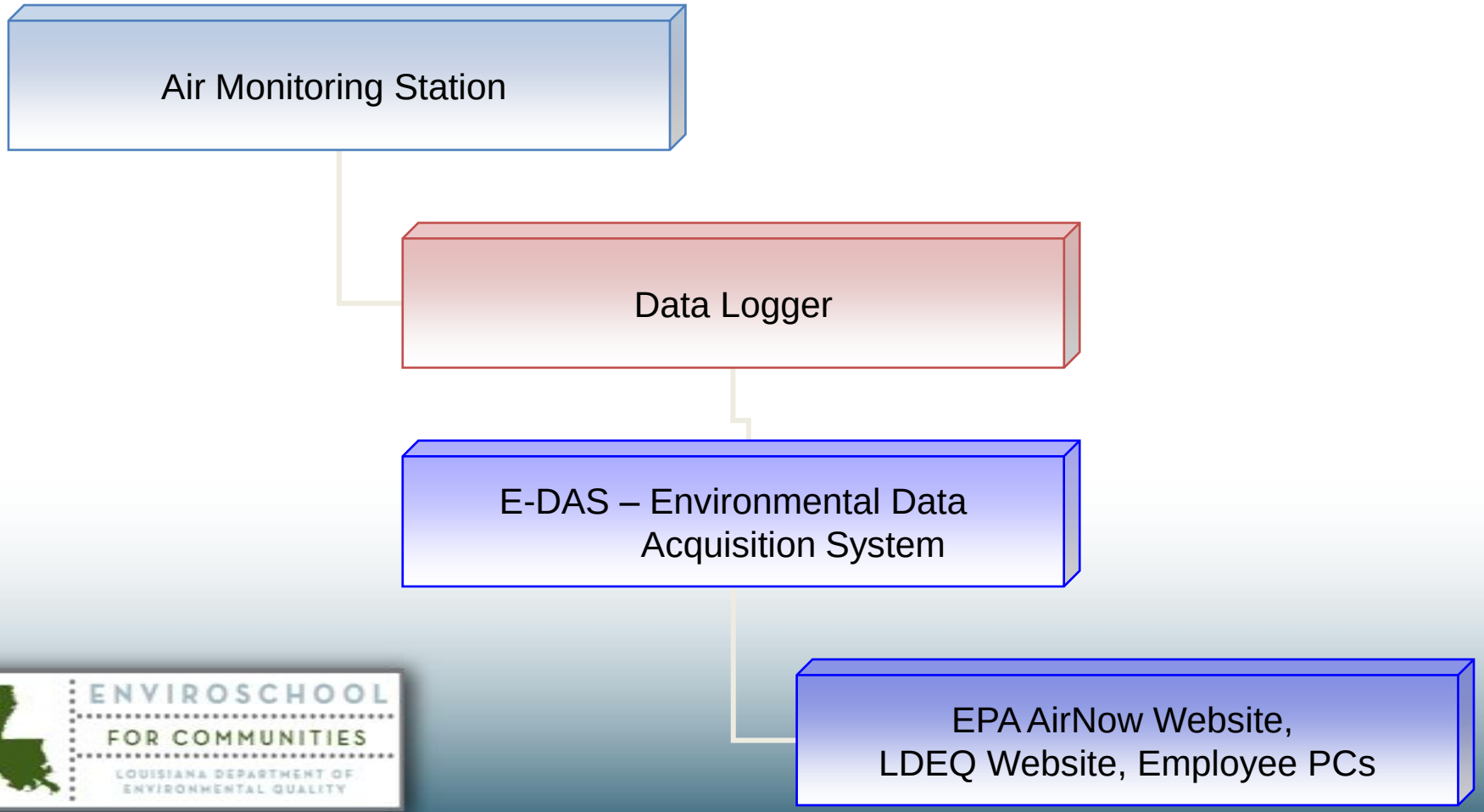
SPMS

- Special Purpose Monitoring Stations provide for special studies needed by the State and local agencies to support State implementation plans and other air program activities. The SPMS are not permanently established and, can be adjusted easily to accommodate changing needs and priorities. The SPMS are used to supplement the fixed monitoring network as circumstances require and resources permit.

PAMS

- A PAMS network is required in each ozone nonattainment area that is designated serious, severe, or extreme. The required networks will have from two to five sites, depending on the population of the area.

LDEQ Air Monitoring Network



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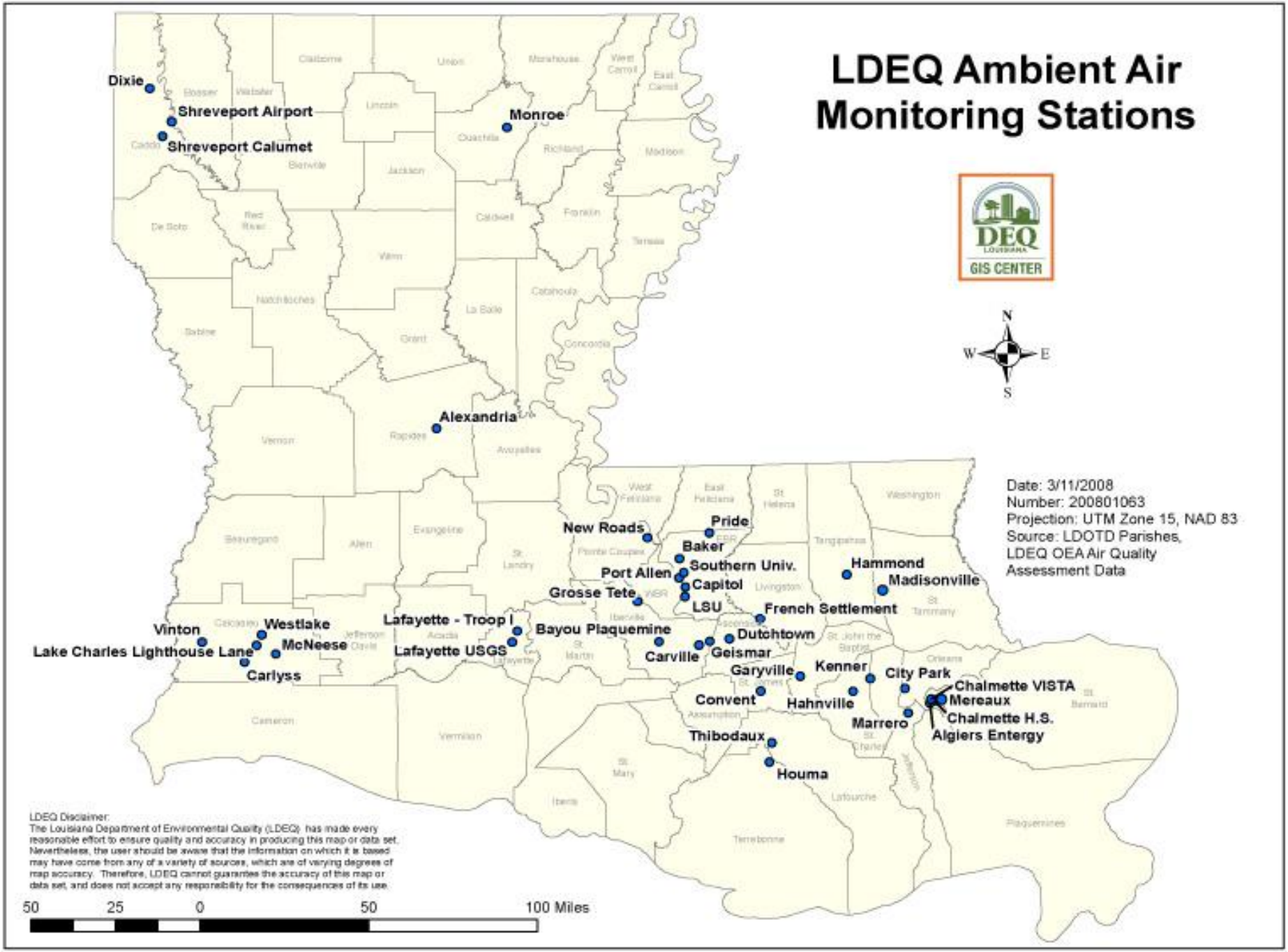
LDEQ Ambient Air Monitoring Stations



Air Monitoring Station

Capitol Air Monitoring Site
- Baton Rouge Area

Inside Air Monitoring Station

DEQ LOUISIANA

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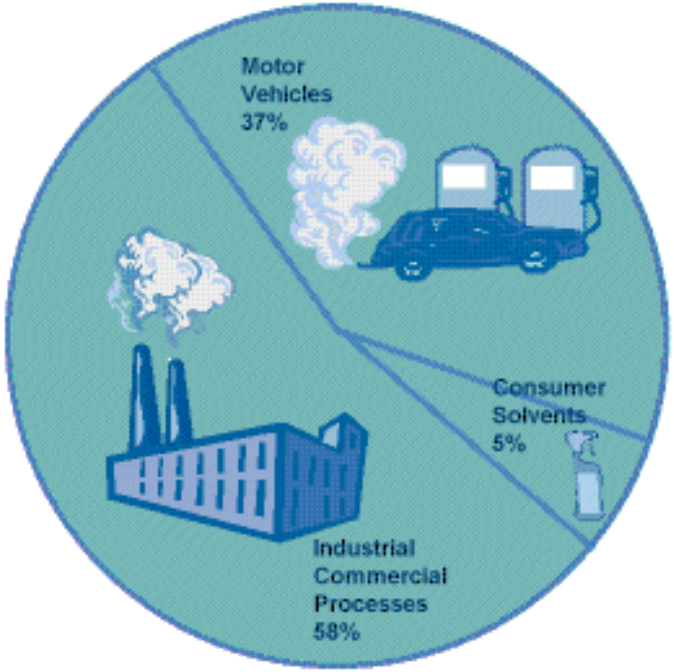
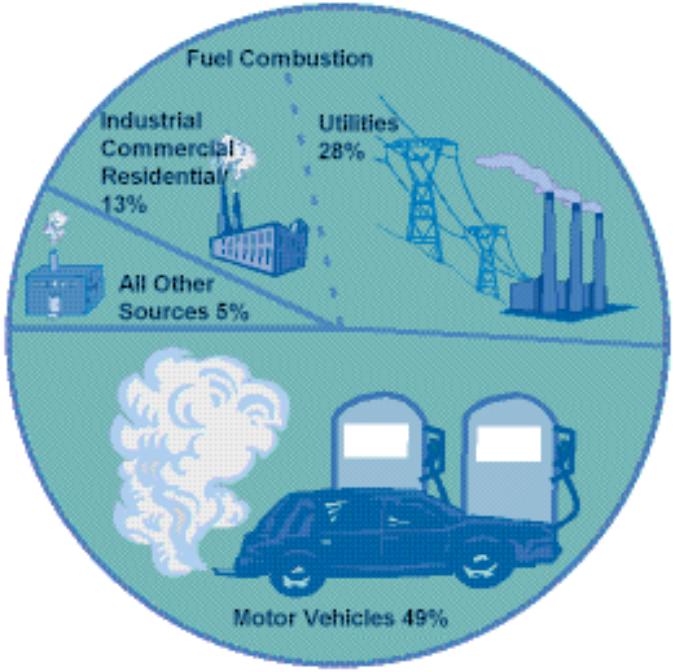
SOURCES OF MAN-MADE OZONE FORMING POLLUTANTS



Sources of VOC



Sources of NOx

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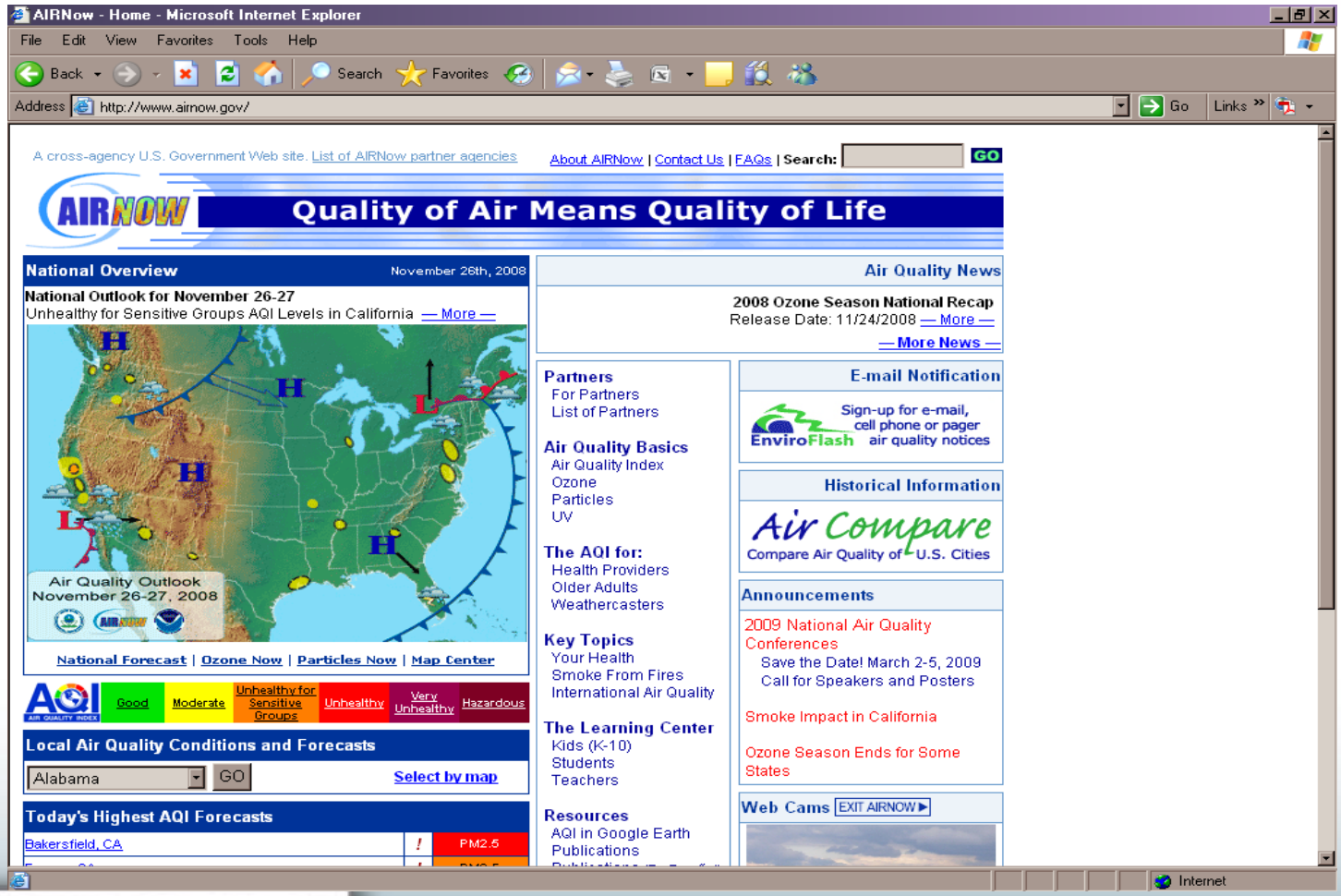
Air Quality Data on EPA's Web Site

www.airnow.gov



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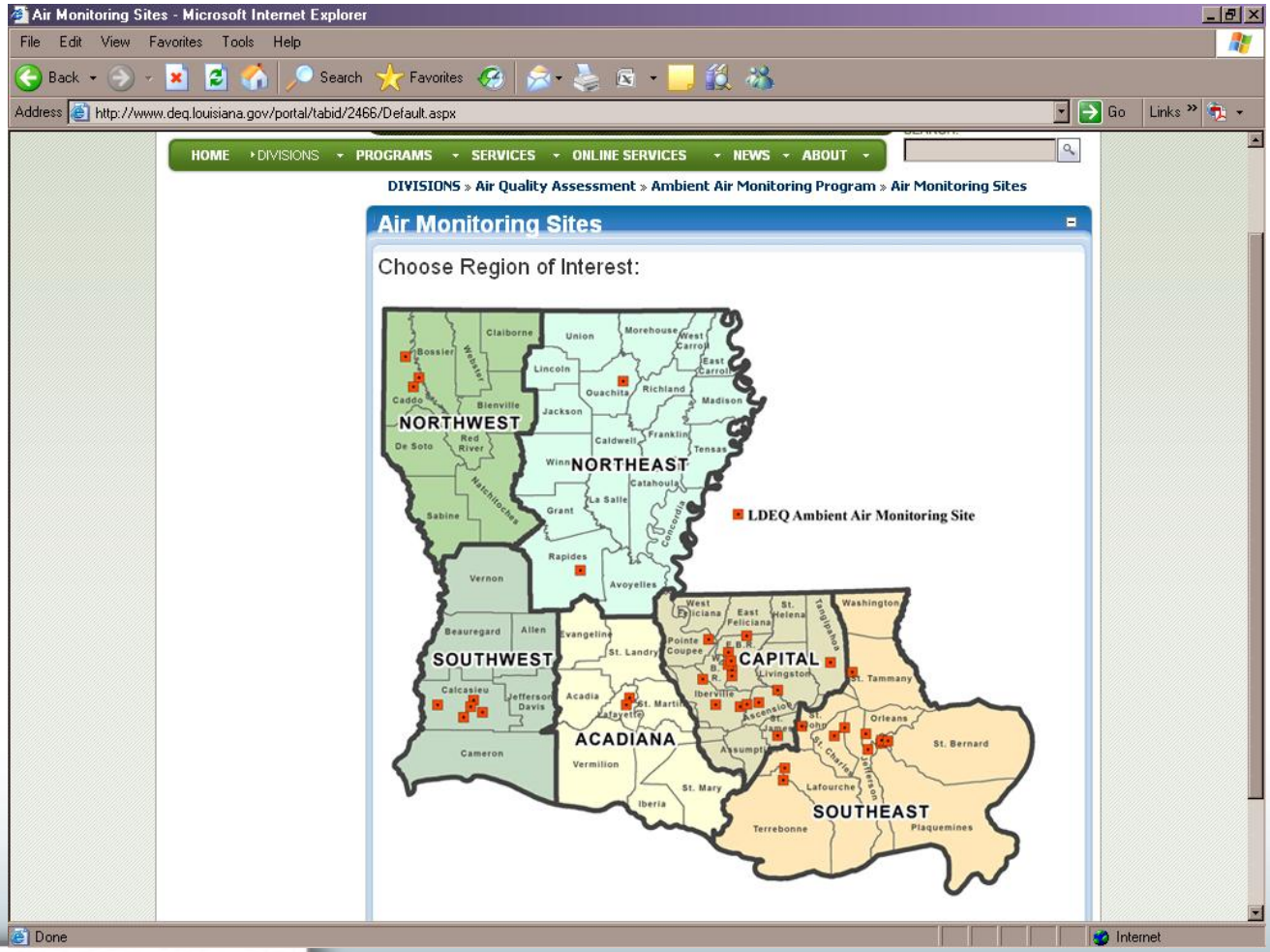
Air Quality Data on LDEQ's Web Site



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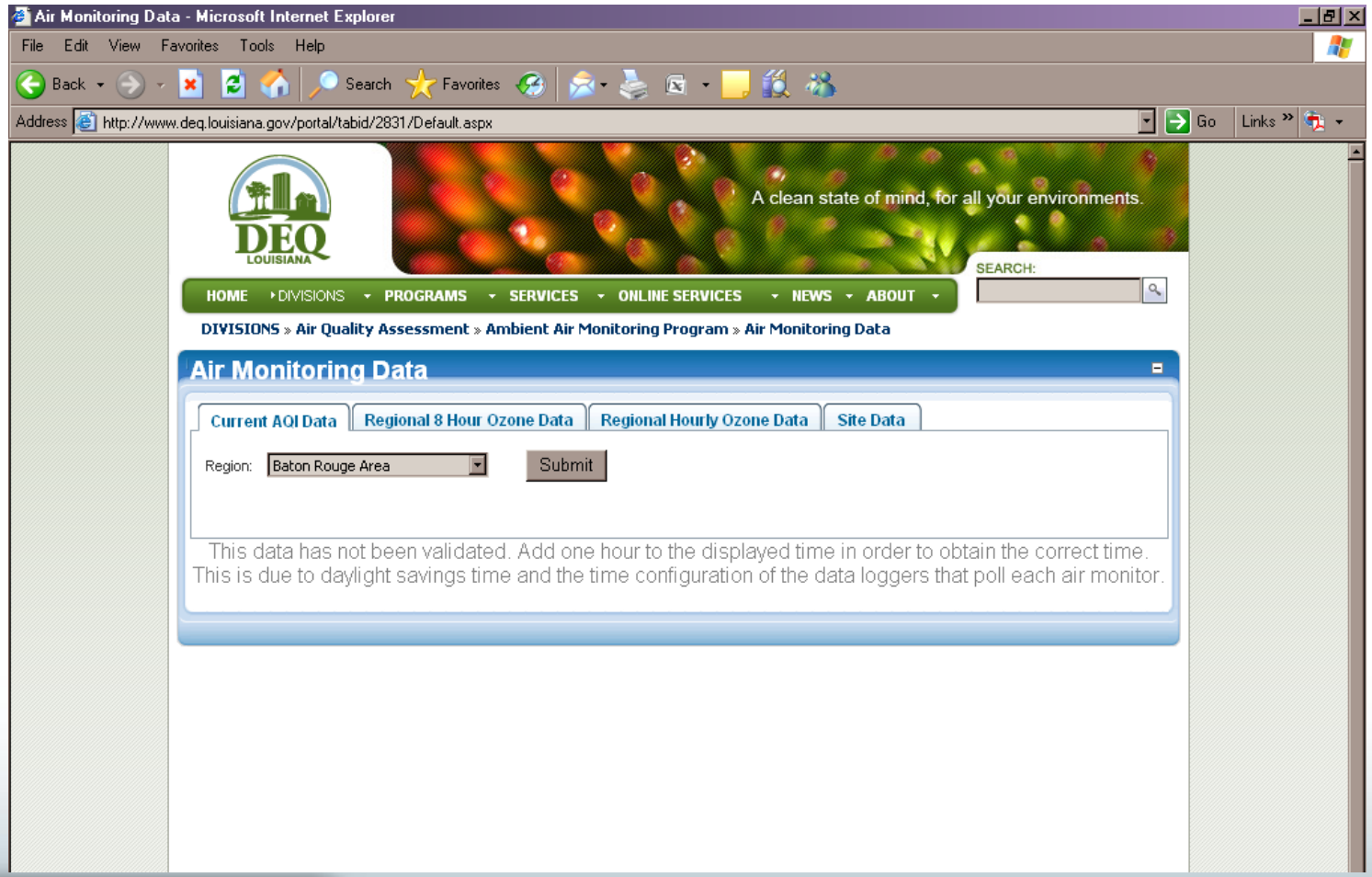

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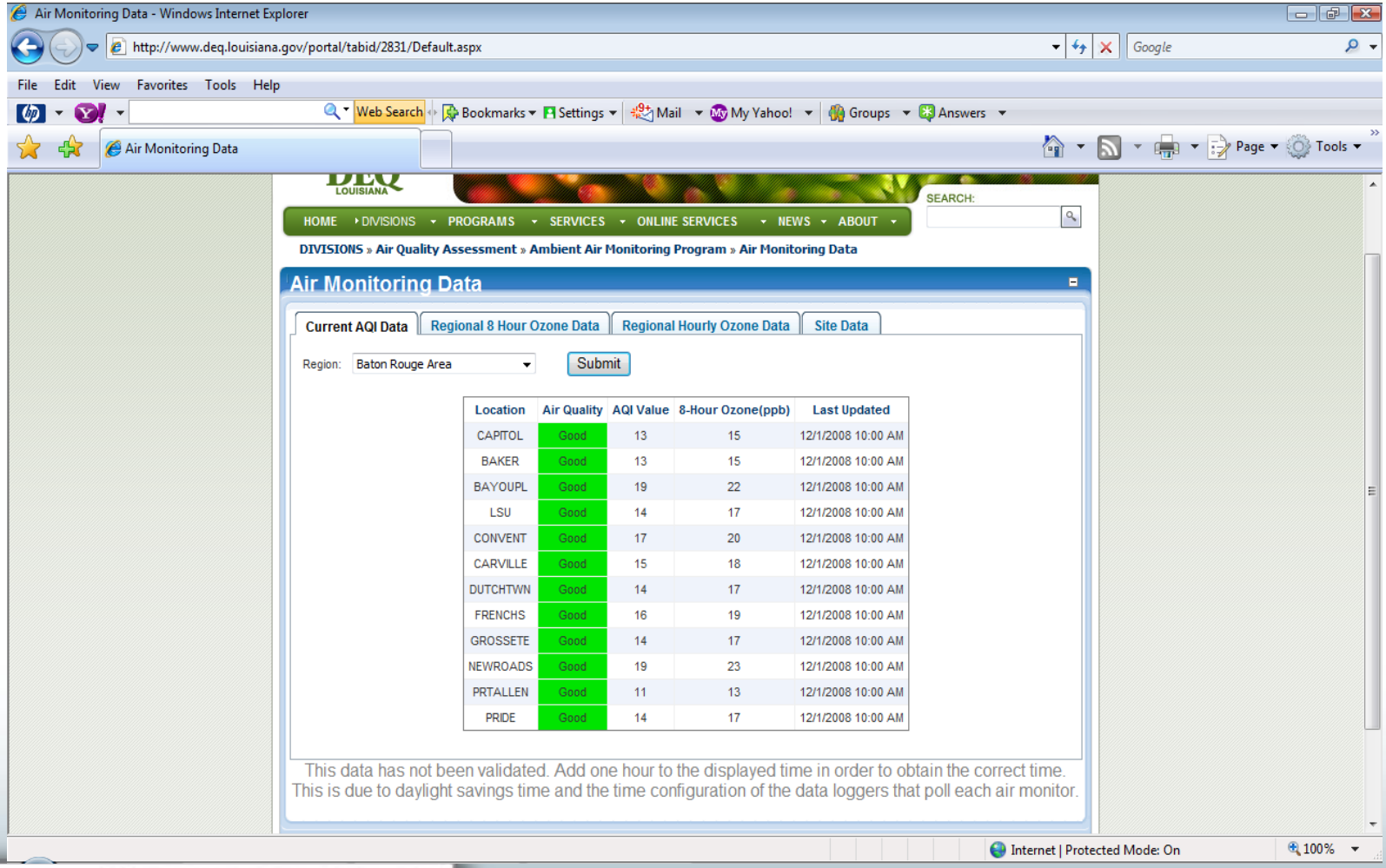

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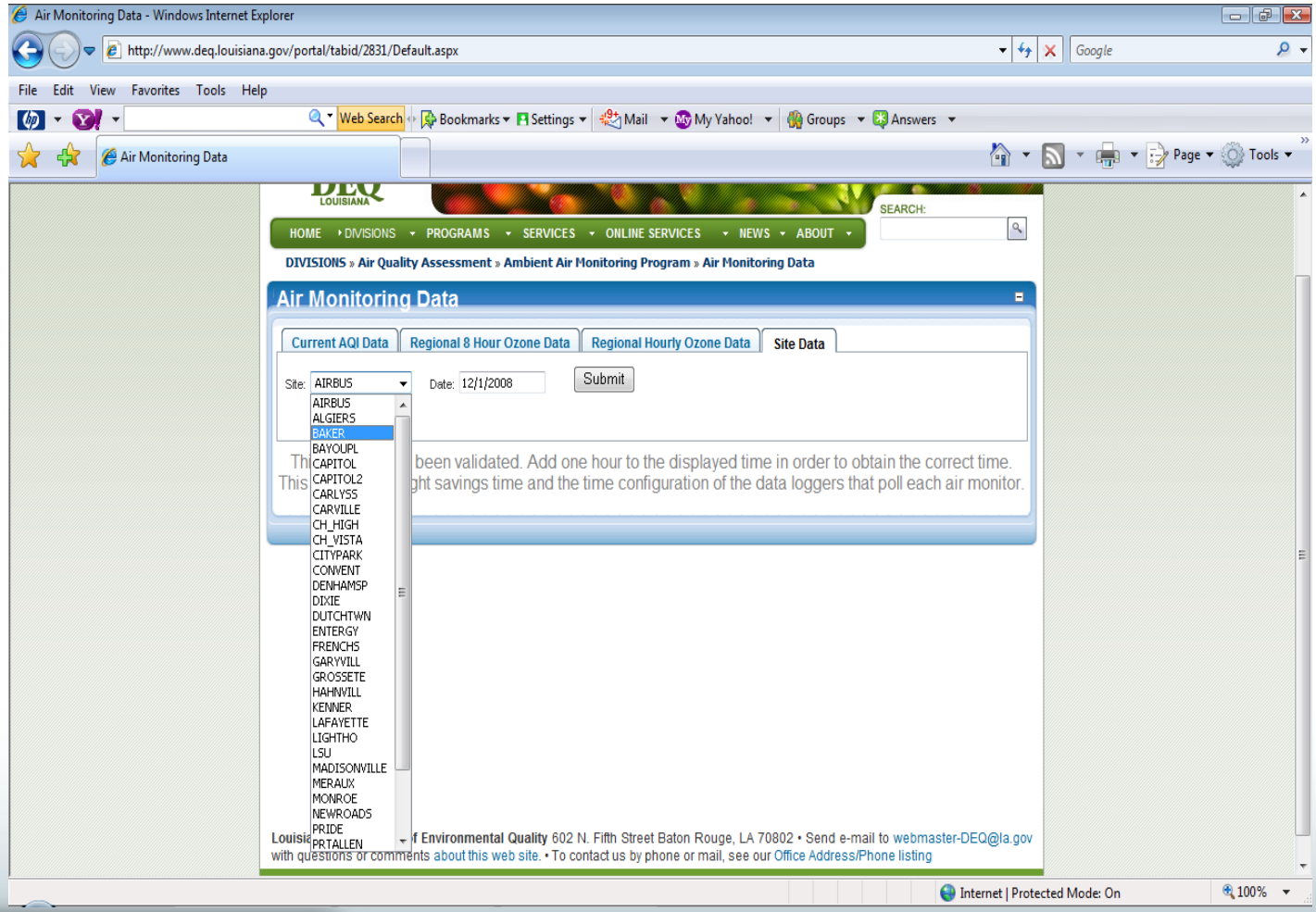

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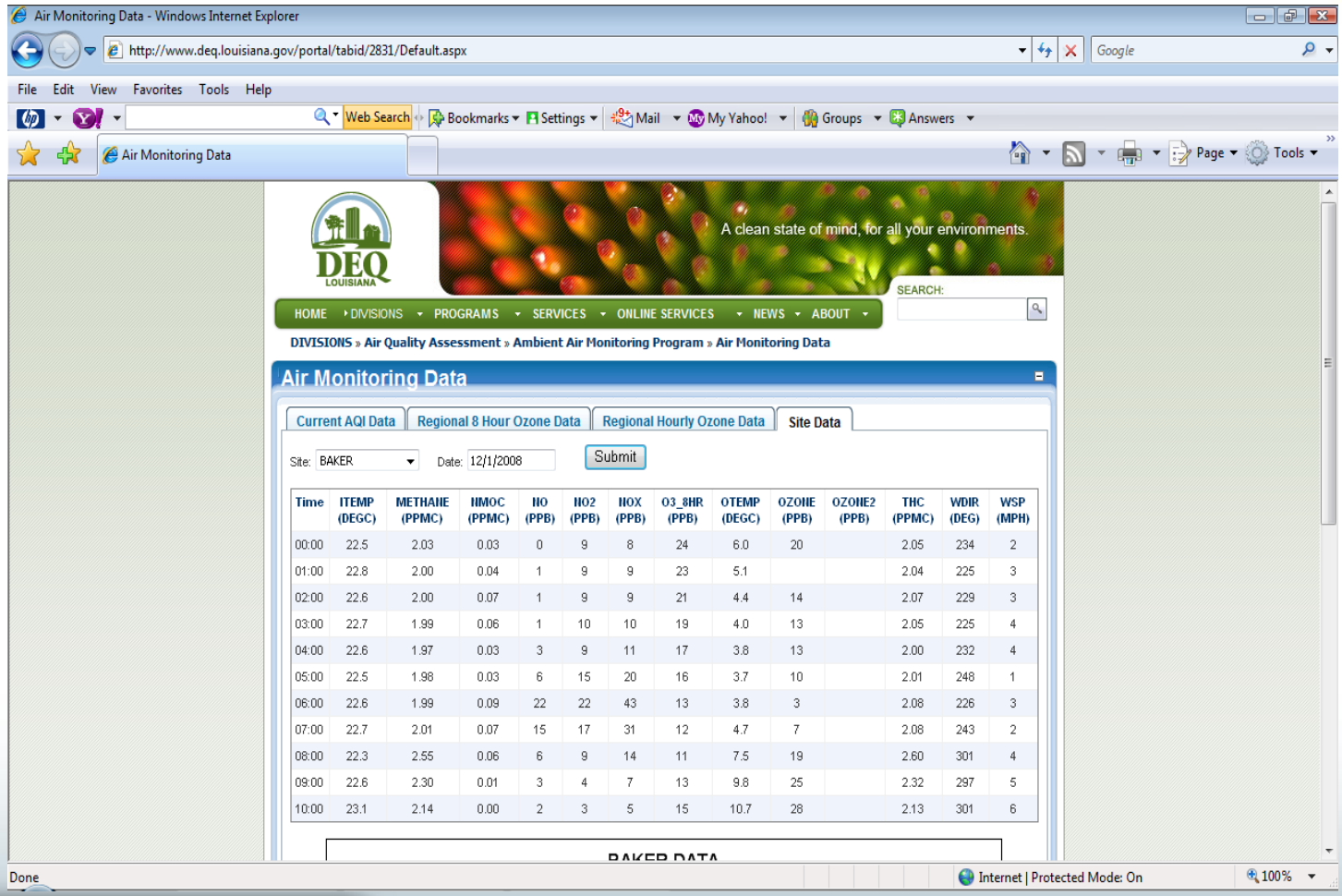

Time	ITEMP (DEGC)	METHANE (PPMC)	NMOC (PPMC)	NO (PPB)	NO2 (PPB)	NOX (PPB)	O3_8HR (PPB)	OTEMP (DEGC)	OZONE (PPB)	OZONE2 (PPB)	THC (PPMC)	WDIR (DEG)	WSP (MPH)
00:00	22.5	2.03	0.03	0	9	8	24	6.0	20		2.05	234	2
01:00	22.8	2.00	0.04	1	9	9	23	5.1			2.04	225	3
02:00	22.6	2.00	0.07	1	9	9	21	4.4	14		2.07	229	3
03:00	22.7	1.99	0.06	1	10	10	19	4.0	13		2.05	225	4
04:00	22.6	1.97	0.03	3	9	11	17	3.8	13		2.00	232	4
05:00	22.5	1.98	0.03	6	15	20	16	3.7	10		2.01	248	1
06:00	22.6	1.99	0.09	22	22	43	13	3.8	3		2.08	226	3
07:00	22.7	2.01	0.07	15	17	31	12	4.7	7		2.08	243	2
08:00	22.3	2.55	0.06	6	9	14	11	7.5	19		2.60	301	4
09:00	22.6	2.30	0.01	3	4	7	13	9.8	25		2.32	297	5
10:00	23.1	2.14	0.00	2	3	5	15	10.7	28		2.13	301	6

BAKER DATA

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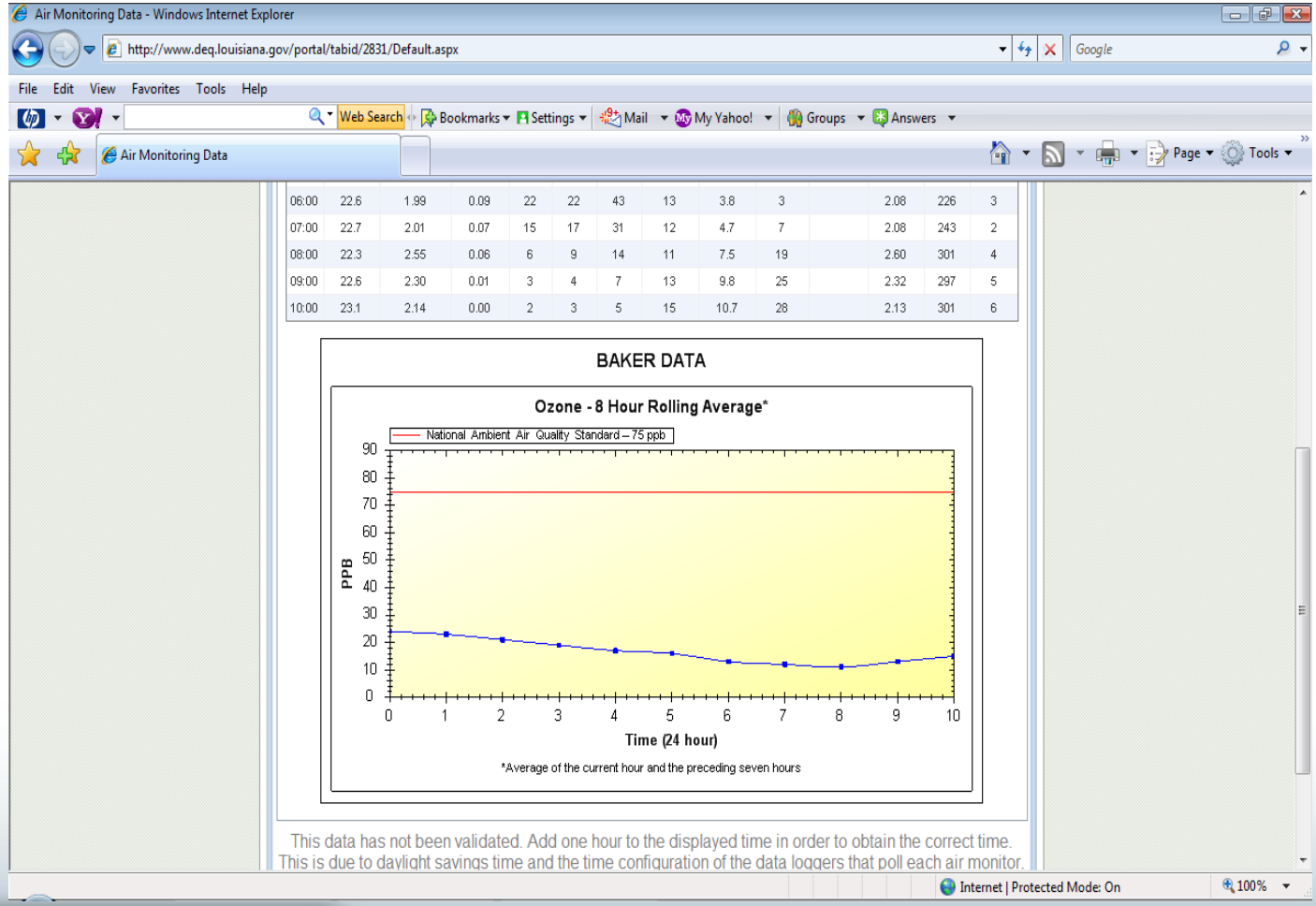

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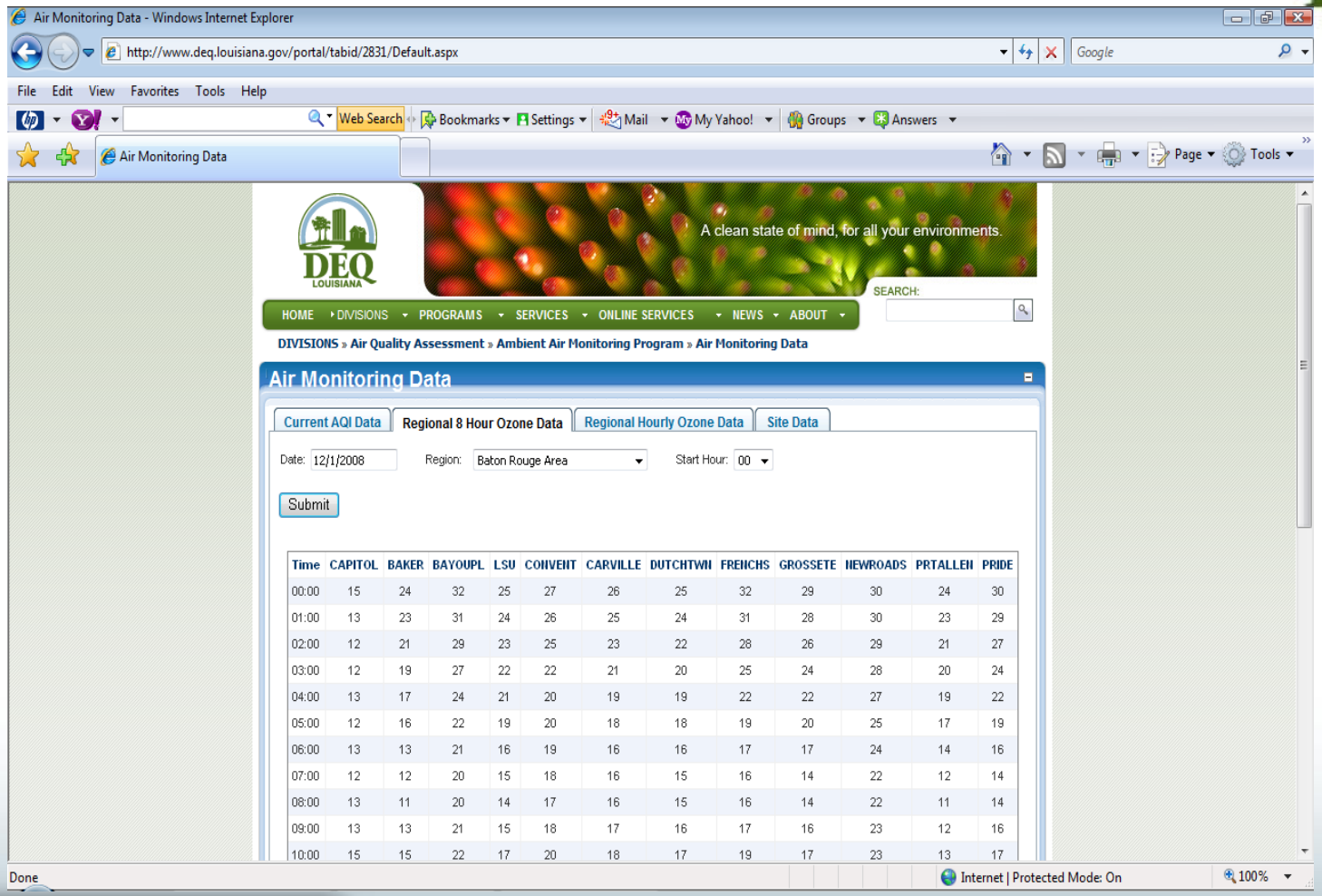
www.deq.louisiana.gov



Time	CAPITOL	BAKER	BAYOUPL	LSU	CONVENT	CARVILLE	DUTCHTWN	FRENCHS	GROSSETE	NEWROADS	PRTALLEN	PRIDE
00:00	15	24	32	25	27	26	25	32	29	30	24	30
01:00	13	23	31	24	26	25	24	31	28	30	23	29
02:00	12	21	29	23	25	23	22	28	26	29	21	27
03:00	12	19	27	22	22	21	20	25	24	28	20	24
04:00	13	17	24	21	20	19	19	22	22	27	19	22
05:00	12	16	22	19	20	18	18	19	20	25	17	19
06:00	13	13	21	16	19	16	16	17	17	24	14	16
07:00	12	12	20	15	18	16	15	16	14	22	12	14
08:00	13	11	20	14	17	16	15	16	14	22	11	14
09:00	13	13	21	15	18	17	16	17	16	23	12	16
10:00	15	15	22	17	20	18	17	19	17	23	13	17

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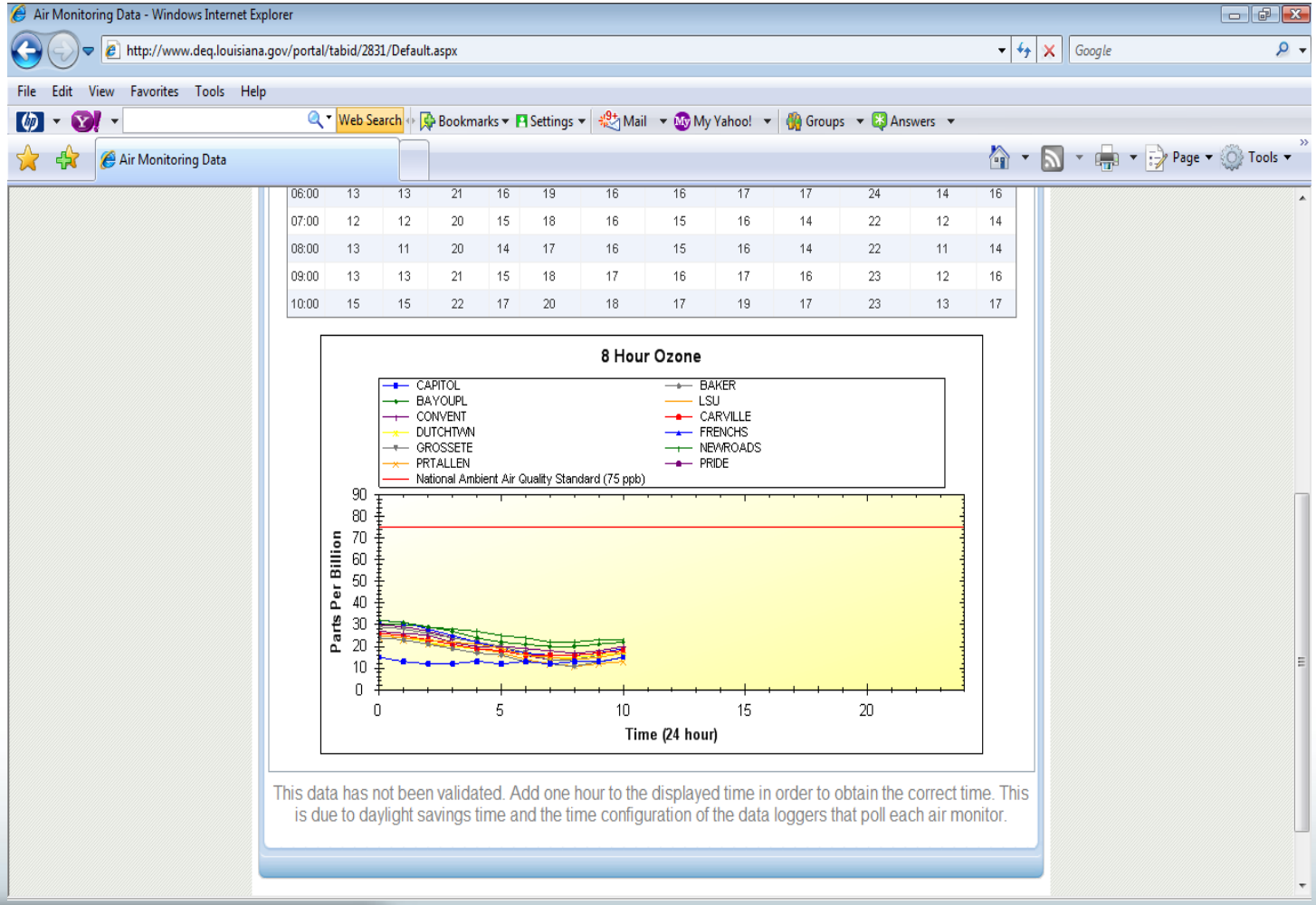

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Frequently Used Terms, Definitions, & Acronyms

- EPA- Environmental Protection Agency
- NAAQS- National Ambient Air Quality Standard
- ppb- parts per billion
- ppm- parts per million

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Resources

- http://www.airnow.gov
- http://www.deq.lousiana.gov
- http://www.epa.gov

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DEQ in 2008

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DEQ in 2008

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