



**Corpus Christi**  
REGIONAL ECONOMIC  
DEVELOPMENT CORPORATION

**REPORT ON OZONE AIR QUALITY**  
**NUECES COUNTY AND SAN PATRICIO COUNTY IN TEXAS**  
**(THE CORPUS CHRISTI URBAN AIRSHED)**

**Prepared by**

**The Corpus Christi Air Quality Committee**  
**Chairman: Bill Hennings, Consulting Engineer**

**February, 2007**

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# REPORT ON OZONE AIR QUALITY NUECES COUNTY AND SAN PATRICIO COUNTY IN TEXAS (THE CORPUS CHRISTI URBAN AIRSHED)

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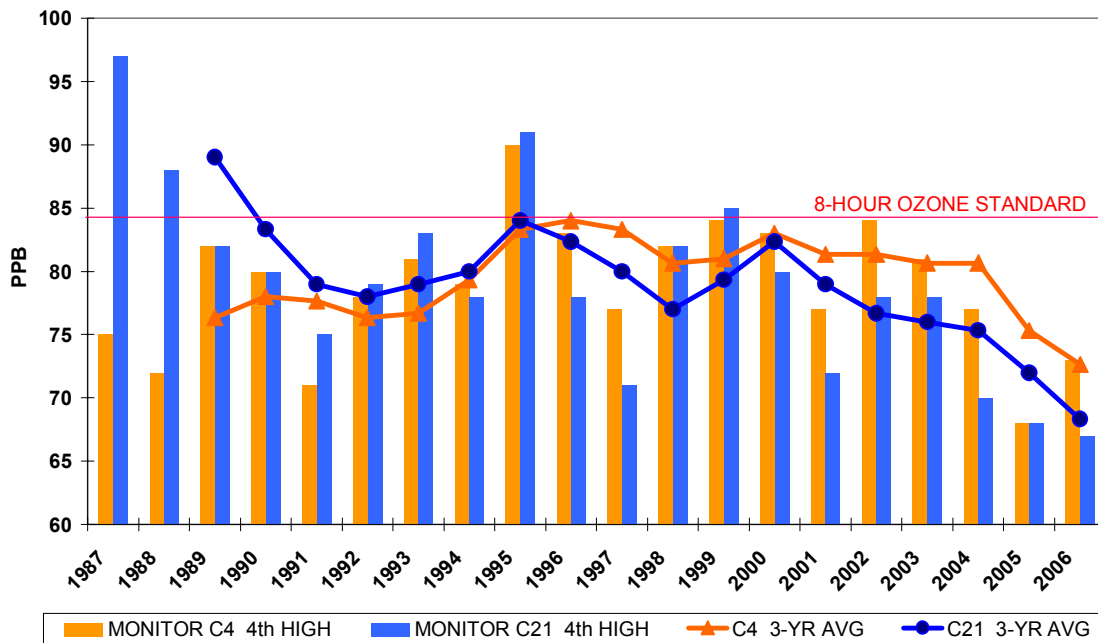
## SUMMARY

Nueces County and San Patricio County continue to remain in attainment with the National Ambient Air Quality Standard for ozone, but the two counties are near non-attainment.

Monitoring has shown a slight downtrend in peak ozone levels during the past ten years. The voluntary measures implemented under the provisions of the Flexible Attainment Region Agreement approved in 1996 and the O3FLEX Agreement approved in 2002 have been successful in reversing the trend of increasing ozone levels. The Air Quality Committee is working to develop a new 8-hour O3FLEX Agreement to serve as a roadmap for maintaining attainment during the next five years.

Monitoring results show that ozone levels have not increased:

**ANNUAL FOURTH HIGH DAILY MAXIMUM 8-HOUR OZONE LEVELS  
CORPUS CHRISTI URBAN AIRSHED**



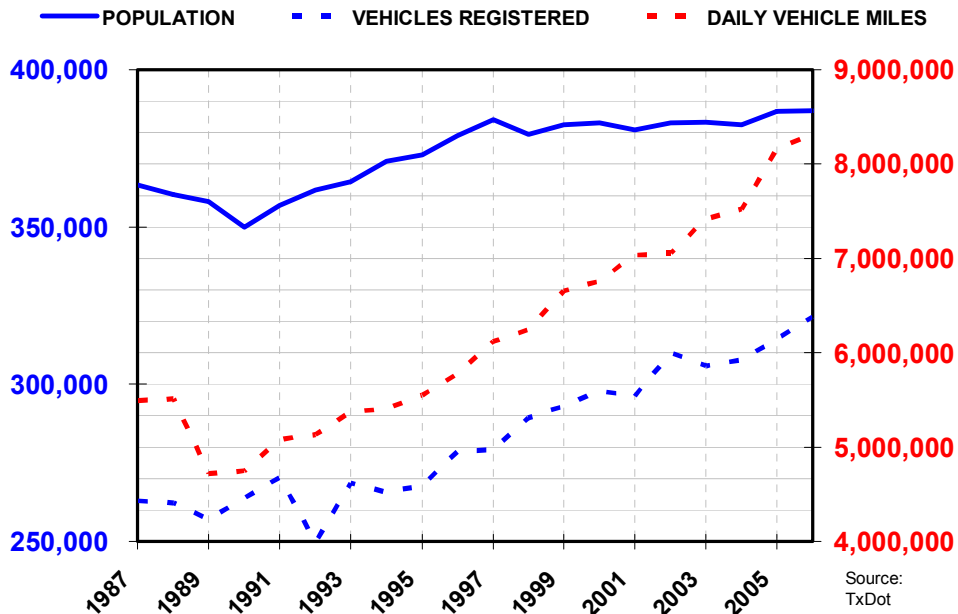
Notes:

1. The history of ozone levels is shown since 1987 for each of the two TCEQ monitors, C4 and C21.

2. The 4<sup>th</sup> high daily maximum levels each year are used in the chart.
3. The running 3-year averages of 4<sup>th</sup> high ozone levels are shown since 1989.
4. The 3-year average of the 4<sup>th</sup> high each year is used to determine attainment with the standard of 85 parts per billion.
5. If the 3-year average were to reach or exceed 85 parts per billion, then Nueces County and San Patricio County would be designated non-attainment in accordance with the Clean Air Act.

Local efforts to reduce air emissions have offset the effects of growth on air pollution. Ozone levels tend to increase with increases in population, vehicle activity, and business activity. Since 1995, the population of the two counties has increased 4%, the number of vehicles registered has increased 20%, and the daily miles driven by those vehicles has increased by 50%.

### SELECTED GROWTH INDICATORS NUECES AND SAN PATRICIO COUNTIES



## **BACKGROUND**

### **URBAN AIRSHED**

Two adjoining counties, Nueces County and San Patricio County in Texas, contain a large urbanized area with a number of industrial point sources of air emissions and a concentration of mobile sources. The two counties are home to the nation's fifth busiest deep-water port, a large industrial and petrochemical complex, two major military bases, and a network of highways including the Interstate Highway System that facilitates commerce and a thriving tourism industry.

Nueces County and San Patricio County are considered an urban airshed (the Corpus Christi urban airshed) in which air emissions from sources in both counties interact to influence the level of ambient air pollution in the community. Control of ambient air quality requires a strategy that considers sources of air emissions in both counties.

### **COLLABORATION WITH TCEQ AND EPA**

Local entities, the Texas Commission on Environmental Quality (TCEQ), and the U.S. Environmental Protection Agency (EPA) are working together to plan and implement voluntary actions appropriate to community needs to improve air quality. This collaboration makes it possible to design common sense strategies that reflect the weather, driving habits, and economy of the region in the creation of a model program. A plan was formalized in 1996 in a Flexible Attainment Region Memorandum of Agreement, and modified and continued in 2002 in an O3FLEX Intergovernmental Agreement. The parties to the plans were the following governmental authorities:

City of Corpus Christi	Texas Commission on Environmental Quality
Nueces County	U.S. Environmental Protection Agency
Port of Corpus Christi Authority	
Regional Transportation Authority	
San Patricio County	

Other stakeholders making major contributions to this effort include the following:

- Corpus Christi Chamber of Commerce Foundation
- Corpus Christi Metropolitan Planning Organization
- Port Industries of Corpus Christi, Inc., and its member companies.
- Texas A&M University-Corpus Christi, Department of Community Outreach, Pollution Prevention Partnership
- Texas A&M University-Kingsville, Department of Environmental Engineering

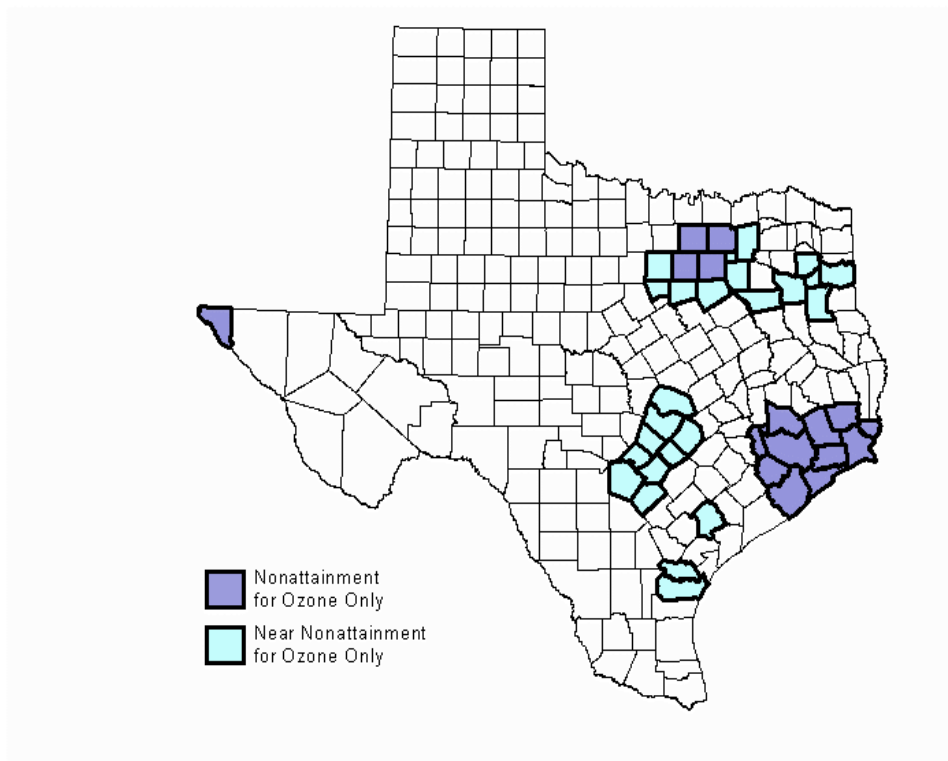
The policy and guidelines governing the O3FLEX program encouraged voluntary air emissions reductions that help keep an area in attainment with the 1-hour ozone standard, while contributing positively to achieve the health benefits envisioned under the proposed

standard based on 8-hour averages. The O3FLEX Intergovernmental Agreement expressly provided that it may also serve regional efforts to meet the Clean Air Act requirements, as appropriate, when the 8-hour ozone guidance was issued. The goal is to encourage voluntary air emissions reductions that help keep Nueces County and San Patricio County in attainment with the 8-hour ozone standard, thereby achieving the health benefits envisioned.

During 2005 the new 8-hour standard was implemented, and the 1-hour standard was withdrawn for Nueces County and San Patricio County. Stakeholders in Nueces County and San Patricio County have expressed their desire to develop a program similar to the Flexible Attainment and O3FLEX programs but based on the 8-hour standard. Guidelines were adopted in 2006 for federal policy allowing an 8-hour O3FLEX program. An 8-hour O3FLEX Agreement for Nueces and San Patricio Counties is being prepared by the Air Quality Committee.

### **APPLICABLE STANDARDS**

The current National Ambient Air Quality Standard for ozone based is based on 8-hour averages and requires that the three-year average of the fourth highest daily maximum 8-hour average ozone level each year must be less than 85 parts per billion. The Corpus Christi urban airshed, comprised of Nueces and San Patricio Counties, is designated attainment with the National Ambient Air Quality Standard for ozone based on 8-hour averages. The Corpus Christi urban airshed is considered to be one of several near non-attainment areas in Texas.



**MONITORING.** The Texas Commission on Environmental Quality operates two Continuous Air Monitoring Stations (CAMS) in Corpus Christi. CAMS 4 is located at the State School at 902 Airport Road. CAMS 21 is located in West Guth Park at 9866 La Branch St. Ozone levels recorded at these two monitors are used to determine the attainment status of the area.



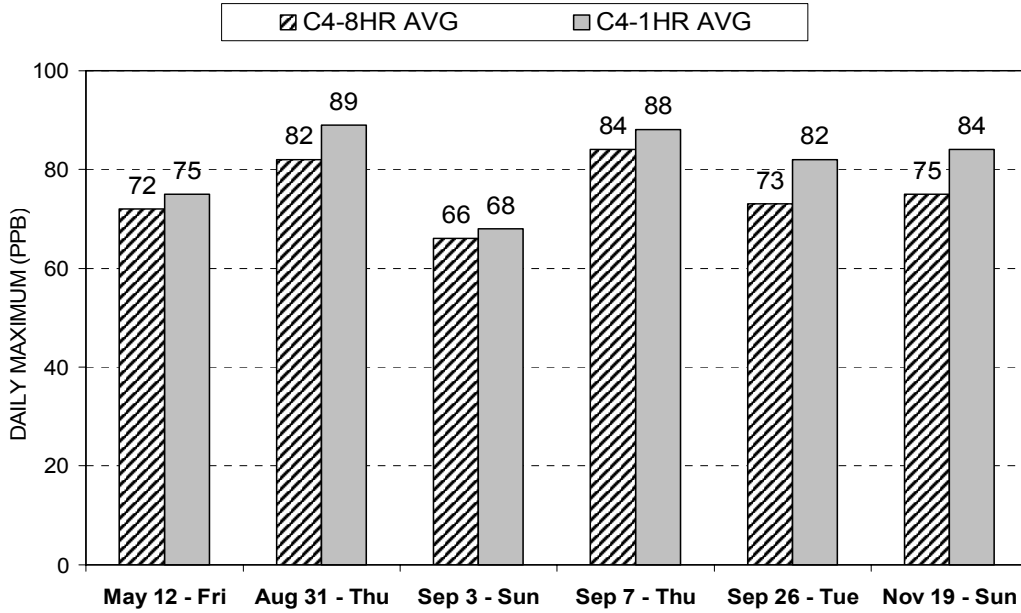
Additional ozone and meteorological monitors are operated by Texas A&M University-Kingsville in the metropolitan area, along the north shore of Corpus Christi Bay (upwind on high ozone days), and to the west and south (downwind on high ozone days). These monitors are used for research purposes to define the magnitude of the transport problem. Three of these were operated during the 2004 and 2005 ozone seasons and have provided a great deal of useful information. Three more were installed in 2006.

There is a third set of seven monitors installed for the Corpus Christi Air Quality Project by TCEQ and the University of Texas-Austin and in operation since 2005. These monitor the levels of hydrocarbons in the area. Two of them are equipped with continuous gas chromatographs which provide speciated hydrocarbon data on a real-time basis 24 hours a day.

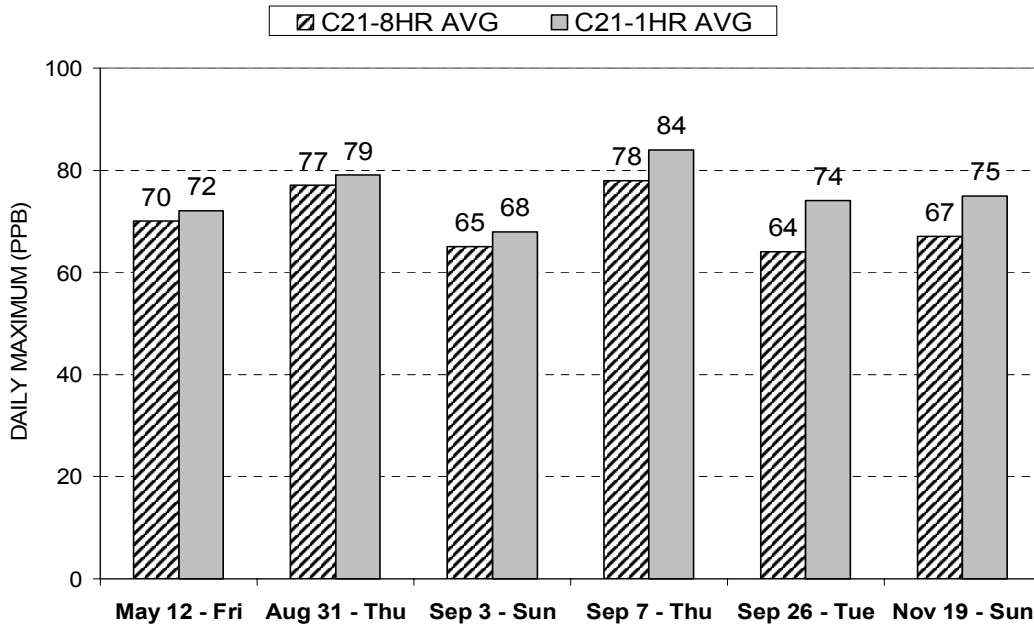
Monitoring has shown that normally low ozone levels in the Corpus Christi area are occasionally elevated to near the standard. These episodes are characterized by hot sunny days, cloudless skies, light northeasterly winds, and high background levels of ozone and ozone precursors associated with inbound transport from northeast of the community.

These conditions facilitate buildup of ozone levels from local emissions of ozone precursors. Special events such as holiday weekends and festivals generate additional motor vehicle traffic that increases local sources. High ozone episodes usually span several days, and end when the inbound transport from the northeast ends.

### HIGH OZONE EPISODES IN 2006 ON MONITOR C4



### HIGH OZONE EPISODES IN 2006 ON MONITOR C21



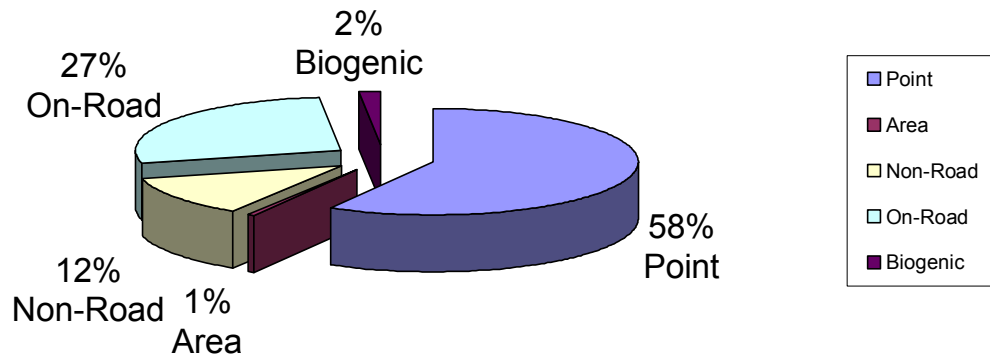
When ozone levels are at or above the standard of 85 parts per billion averaged over eight hours, air quality is unhealthy for sensitive groups; and active children and adults, and people with respiratory disease, such as asthma, should limit prolonged outdoor exertion. During 2006 there were no 8-hour average ozone levels at or above 85 parts per billion, the highest being 84 parts per billion on September 7.

**SOURCES OF POLLUTANTS.** Scientific research performed by Texas A&M University - Kingsville, including emissions inventory activities and backward trajectories for high ozone episodes, indicates the primary sources of ozone precursors:

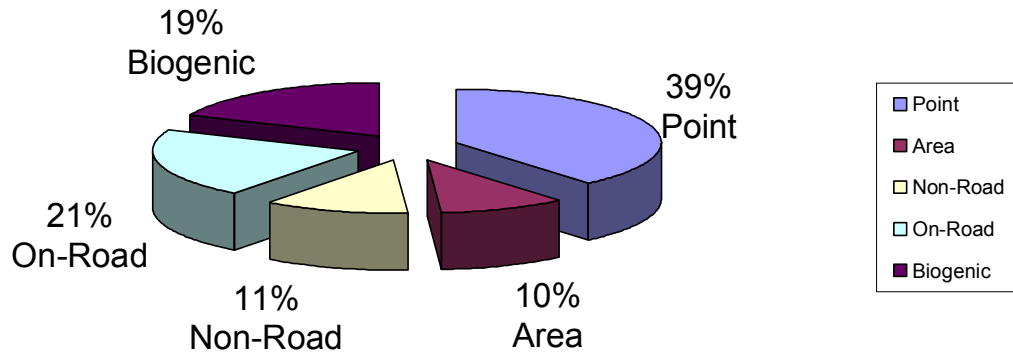
- Inbound transport. Cluster analysis of high ozone episodes from 1995 through 2003 showed that a significant majority of the episodes were heavily influenced by inbound transport of ozone and ozone precursors from northeast of the Corpus Christi area. Progress in reducing ambient ozone and ozone precursors in areas northeast of Nueces County and San Patricio County along and near the Texas coast and in Louisiana is needed to assist in controlling ambient ozone in the Corpus Christi urban airshed.
- Stationary sources account for 58% of nitrogen oxide (NO<sub>x</sub>) emissions and 39% of volatile organic compound (VOC) emissions in the two county area. Within this category, electric generating facilities and other industrial facilities are the largest local sources of nitrogen oxide emissions.
- Mobile sources. On-road and off-road mobile sources produce 39% of nitrogen oxides and 32% of volatile organic compounds in the two county area.

## SUMMARY OF EMISSIONS INVENTORY ESTIMATES

### NO<sub>x</sub> Corpus Christi Urban Airshed



## VOC Corpus Christi Urban Airshed



### **REGIONAL PHOTOCHEMICAL MODELING.**

The Corpus Christi Air Quality Committee and Texas A&M University-Kingsville (TAMUK) participated in the development of a base case regional photochemical model simulating the September 1999 ozone episode. This was accomplished with the cooperation of the Texas Commission on Environmental Quality and the communities of San Antonio, Austin, and Victoria. This episode was regional in nature covering most of central and South Texas. The model simulates ozone plume movement down the coast and ozone production from local emissions. The resultant concentration plot compares quite favorably with actual monitor data.

The University's Department of Environmental Engineering began doing air quality studies for the Air Quality Committee in 1995 using funds contributed by local businesses and government entities. The product of the regional study is a base case Comprehensive Air Quality Model for the region and is used for sensitivity analyses to determine the impact of selected source categories on ozone formation in the area. In that way emissions reduction strategies are tested for their impact on the region. Use of the model helps to provide a determination of the most effective strategies for ozone control unique to the Corpus Christi urban airshed.

A number of sensitivity analyses have been run. Those would include runs to investigate the impact of emissions from sources and locations upwind from Corpus Christi as well

as various source types within the Corpus Christi airshed. A report on that activity is available on the University's website at <http://air.tamuk.edu/rider13-0001/>.

**COMPLETED PLANNING AND EMISSIONS REDUCTION ACTIVITIES.** Since 1995 a number of air quality planning measures and voluntary emission reduction measures have been initiated and have been fully implemented.

Planning and Research. Air quality planning measures have afforded the opportunity for scientific research and study. The air quality planning measures for the Corpus Christi urban airshed are sponsored by the near non-attainment area funding program through the TCEQ. The TAMUK Department of Environmental Engineering leads the research effort, which has as its goal a mechanism enabling sound decisions to reduce emissions, especially the types of emissions that affect peak ambient ozone levels more than others.

Stationary emission sources, control devices, control procedures. Refineries, petrochemical plants, and other major industries implemented the following actions:

- Marine vapor recovery and control equipment is used at marine tank ship and barge loading facilities for transfer of products that have a vapor pressure higher than 0.5 psi.
- Uncontrolled loading of volatile products that have a vapor pressure higher than 0.5 psi is rescheduled to occur on days other than Ozone Action Days to the extent feasible.
- Industries and the Port of Corpus Christi Authority made specific commitments to voluntarily reduce emissions.

Public awareness, notification and participation programs. The TAMU-CC Department of Community Outreach Pollution Prevention Partnership has provided emission reduction recommendations and activities to the community, complementing and building on the public education and outreach activities of the TCEQ. This effort has gained acceptance by small business owners, vehicle owners and operators, and other citizens of emissions reduction recommendations that have contributed to continued attainment of the National Ambient Air Quality Standard for ozone.

- An ozone action day program was initiated by TCEQ. Major participants include the City of Corpus Christi, TAMU-CC, local industries and military installations, the Corpus Christi Regional Transportation Authority, the Port of Corpus Christi Authority, and the Texas Department of Transportation.

Small Business Assistance. The TAMU-CC Department of Community Outreach Pollution Prevention Partnership established a program in 1995 to educate small business on methods to reduce emissions and waste streams at their facilities through an ambitious outreach effort. The strategy for the program was based on the assumption that many small businesses use equipment, materials, and processes that could be changed both to benefit the business and to reduce pollution, and that small businesses will voluntarily

make changes to reduce emissions if managers believe it is in their business' best interest to do so.

Business sectors were targeted through an analysis of emissions inventory data, and in consultation with TCEQ Region 14 and the TCEQ Local Government and Small Business Assistance Program. Sectors included gasoline retail outlets (stage I vapor recovery), graphic arts, dry cleaners, furniture manufacturing, automobile refinishing, and sand blasting/painting. Pollution Prevention Partnership staff members met with small business representatives and consultants to identify motivations for participation, best practices, pollution prevention possibilities, and applicable environmental regulations. Educational seminars, training sessions, and compliance audits were provided based on a program specifically designed for each small business sector to follow the recommendations from industry representatives who participated in focus groups. Sector advisory groups were recruited and high-credibility consultants in each business sector were used as needed for technical assistance, while leveraging other volunteer resources.

Participants received and display the Pollution Prevention Partnership window decal as part of a community wide recognition effort.

#### Mobile sources.

- Local refineries have voluntarily provided the Corpus Christi area with gasoline having lower Reid vapor pressure than required by regulation, as a measure to reduce emissions of volatile organic compounds. Beginning in 1996, refineries have provided gasoline having a maximum vapor pressure of 7.8 psi during the months May through September, a reduction from the maximum of 9 psi then allowed by regulation. Subsequently, research and monitoring programs have shown that the ozone season in the Corpus Christi urban airshed extends through the month of October. Therefore, beginning in 2000, refineries have voluntarily provided gasoline during October of each year having a maximum vapor pressure of 9 psi, a reduction from the maximum of 11.5 psi currently allowed by regulation.
- The use of alternative fuels has been encouraged with the assistance of the Clean Cities Program of the U.S. Department of Energy. The City of Corpus Christi, which operates a consumers' natural gas distribution system, has committed to promote the use of compressed natural gas as an alternative fuel for vehicles. The first public fueling station for compressed natural gas located at 4225 South Port Avenue was constructed and placed into operation in 2001.
- Local propane dealers have actively promoted retail sale and use of propane for vehicle fuel. One of the propane dealers installed a consumer accessible fueling station with 24-hour, card reader availability.
- The Corpus Christi Regional Transportation Authority (RTA) has aggressively pursued strategies to utilize clean fuels. Fleet fixed-route services and para-transit services use low emissions vehicles.

- The Texas Legislature created and funded the Texas Emissions Reduction Plan to provide grants and other incentives for improving air quality throughout the state. The plan is being administered by the Texas Commission on Environmental Quality, in cooperation with the following participants: the Texas Emissions Reduction Plan Advisory Board, the Public Utility Commission of Texas, the Comptroller of Public Accounts, the Texas Department of Transportation, the Energy Systems Laboratory of Texas A&M University, the Texas Council of Environmental Technology, and the State Energy Conservation Office. The plan has been implemented in the Corpus Christi urban airshed to accomplish the following:
  - Provide funding for cleaner on- and off-road engines.
  - Provide funding for energy efficiency programs.
  - Provide funding for cleaner fuels and other infrastructure programs.
  - Provide funding for research and development of new technologies.
  - Replace rules that would have restricted operation of construction equipment and also would have required early purchase of cleaner off-road diesel equipment in certain counties in Texas.
  - The following projects in the Corpus Christi urban airshed have been approved:

Table 2

App. Number	Applicant	Approved Amount	Total Projected NOx Reduction	Tons per Day NOx Reduced	Projected cost per ton	Category	Equipment or Vehicles
20042044	Gulf Marine Fabricators	\$973,000	139.12	0.1113	\$6,994	Repower	Equipment
20042159	Terminal Transportation, Inc.	\$33,000	4.72	0.0038	\$6,992	Repower	Equipment
20042371	Kiewit Offshore Services, Ltd.	\$175,365	26.30	0.0210	\$6,668	Repower	Equipment
20042376	Berry Contracting, LP dba Bay Ltd.	\$726,631	105.21	0.0842	\$6,906	Repower	Equipment
	<b>CORPUS CHRISTI AREA</b>	<b>\$1,907,996</b>	<b>275.35</b>	<b>0.22</b>	<b>\$6,929</b>		

- Other control measures adopted by TCEQ that include Nueces County and San Patricio County in their scope include:
  - Texas Low Emission Diesel (TxLED)
  - Low Reid Vapor Pressure (RVP) Gasoline (required)
  - Large Non-Road Spark-Ignition Engine Standards
  - California NTE Heavy-Duty Diesel Engine Emission Standards
  - Vehicle Anti-Tampering Restrictions
  - Vehicle Gas Cap Testing (Dept. of Public Safety Rules)
  - Portable Fuel container Rule
  - Water Heaters, Small Boilers, and Process Heaters

- Voluntary Energy Efficiency/Renewable Energy

Estimated emissions reductions. The following table contains estimates of emissions reductions achieved as a result of the voluntary programs established in the 1996 Flexible Attainment Agreement and the 2002 O3FLEX Agreement, and which are being continued. Estimates for Stage One Vapor Recovery and Low Reid Vapor Pressure (RVP) Gasoline include all reductions. Regulations now require Stage One for larger gasoline retail outlets; but the ongoing voluntary training activities include non-regulated facilities and result in increased compliance by regulated facilities. Low RVP gasoline is now required in summer months but not in October.

<b>Voluntary Control Strategy</b>	<b>VOC (Tons/Yr)</b>	<b>NOx (Tons/Yr)</b>
Stage I Vapor Recovery	766	---
7.8 RVP Gasoline April - September	622	
9.0 RVP Gasoline in October	88	
TERP reductions		33.4
Graphic Arts BACT	57	
Dry Cleaning BACT	226	
Furniture Mfg. BACT	170	
Auto Refinishing BACT	11	
Sand blasting/painting BACT	20	
Marine Loading Controls	2538	

There were additional reductions resulting from ozone action day alerts and similar educational outreach efforts that are much more difficult to quantify. A telephonic community survey was conducted by DeVille and Associates in September, 2004. Responses were received from 400 people. A similar survey was conducted by DeVille and Associates in 1995. When people were asked what the major sources of air pollution were, 18% stated “auto emissions” compared to 3% in the 1995 survey. 10% associated their activities with air emissions in 2004 compared to 5% in the 1995 survey. When asked what they do to help reduce pollution, 68% stated that they keep their vehicle tuned in the 2004 survey compared to 51% in the 1995 survey. 24% responded that they car pool in the 2004 survey compared to 14% in the 1995 survey. Although it is difficult to assign a measured emission reduction from the improved community education and subsequent emission reduction activities, it can be inferred that the community is realizing reduced emissions as a result of community education and response. Since there is no reliable method to verify results, we have not attempted to associate numbers to those programs.

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