

CHAPTER 4: DATA ANALYSIS

4.1 INTRODUCTION

Data analysis involves the assessment and characterization of environmental conditions, loadings, and trends. Vast amounts of ozone-related data have been collected in the BPA area. Converting this data into an understanding of ozone formation is the primary function of data analysis.

Ozone data analysis for the BPA area has focused on the underlying components of ozone formation, including the relationships among components. Projects often divide data into study groups based on ozone exceedance versus nonexceedance days or hours. Components analyzed include:

- Levels and trends in ozone concentrations;
- The effects of wind patterns on ozone levels;
- Background ozone levels, including long range regional transport and local accumulation/carryover from the previous day; and
- Speciated VOC contribution to total reactivity.

Data analysis summaries, results, and conclusions involving these components of ozone formation are discussed in this chapter. More detailed information can be found in the appendices to this SIP. Refer to Appendix A: Conceptual Model of Ozone Formation in the BPA Ozone non-Attainment Area; Appendix A.1; and Appendix A.2.

The results from these projects build upon themselves, thus shaping and directing future work. As the body of knowledge on ozone formation in the BPA area increases, as data analysis is improved through an enhancement of methods and tools, and as strategic planning for future data analysis needs is expanded, more effective ozone control strategies can be developed.

4.2 LEVELS AND TRENDS IN OZONE CONCENTRATIONS

Levels and trends in the design value for ozone have been studied closely over the years in the BPA area. Additional monitors from the South East Texas Regional Planning Commission (SETRPC) monitoring sites have been used to calculate ozone design values since 2001.

Analysis of the 1-hour ozone design values indicate that values generally have improved from the 1980s up until 2003, although there has been much variation in this data. The 1-hour ozone design values, for the most part, have exceeded the 1-hour ozone standard over the 20-year period.

The 8-hour ozone design value trend has remained fairly constant in the BPA area for roughly the last 20 years, although values have exceeded the 8-hour ozone standard most of the time since the late 1980s. From 1998 to 2003, the design values have hovered closely above the standard. However, design values are expected to decrease over time as a result of the phase in of point source NO_x controls. Refer to Figure 4-1, *Ozone 1-Hour and 8-Hour Design Values for BPA (1982-2003)*, for long-term trends in the 1- and 8-hour ozone design values for the BPA area. With the shift to the 8-hour ozone standard, data analysis projects have also shifted to focus on the underlying components of ozone formation over the longer time period.

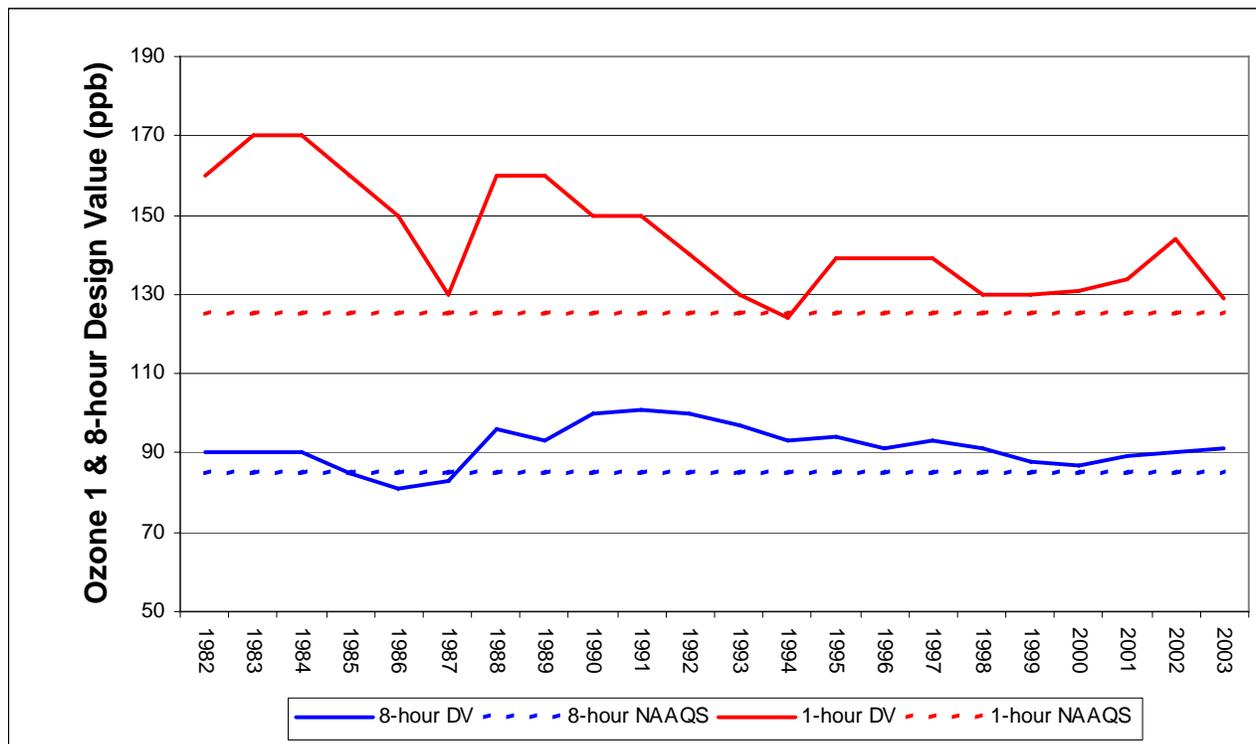


Figure 4-1: Ozone 1-Hour and 8-Hour Design Values for BPA (1982-2003)

A data analysis study¹ conducted on the number of exceedance days per year found that there was a general trend of fewer exceedances per decade from the 1970s to the 1990s. From 1972 to 1989, the number of 1-hour ozone exceedance days ranged from 0 in 1985 to as high as 49 in 1972. During the 1990s, the number of 1-hour ozone exceedance days ranged from 0 to 17 days per year. The number of 8-hour ozone exceedance days from 1997 to 2002 ranged from 6 to 15 days per year, with no clear trend pattern.

A temporal/spatial data analysis study² was conducted on ozone levels, including the time of the year, the day of the week, and the time of day when ozone levels are high, as well as the movement of high ozone levels through the area.

Results demonstrate that ozone exceedances occur primarily from March through October in the BPA area, and typically peak in late August and early September. An analysis of days of the week characterized by high ozone concentrations shows that there is no clear difference between week days and weekend days. This lack of difference indicates that precursors which do not vary with the day of the week, such as industrial emissions, contribute significantly to high ozone levels. Ozone peaks occur most frequently at 13:00 Local Standard Time (LST), while the most frequent time of ozone exceedances is between 12:00 noon and 15:00 LST.

In addition, the study found that the maximum 1-hour ozone design values are just south of Port Arthur at the Sabine Pass (CAMS 640) monitor. In general, Jefferson County monitors all have experienced

exceedances. This spatial pattern of 1-hour ozone design values may be due to the effects of the land/sea breeze flow reversals in the area. The movement of ozone through the BPA area can be explained further by wind patterns in the area.

4.3 EFFECTS OF WIND PATTERNS ON OZONE LEVELS

Several studies have examined the effects on ozone levels by wind patterns, including wind speed and direction. During the summer, high pressure typically persists over the southern U.S., often leading to stagnant conditions and weak pressure gradients in southeast Texas. In the BPA area, there are persistent sea breezes along the coastline, land-sea breeze flow reversals, and often a daily rotation of the winds. In addition, the influence of subsidence inversions, which reduce vertical mixing in the atmosphere, tend to trap and concentrate pollutants near the surface.

Surface winds provide an indication of the importance of local emission sources on air quality, while upper level, or transport, winds reveal the influence of regional scale emissions on air quality. Wind speeds are usually stronger at higher altitudes, and wind directions may shift with altitude.

High ozone days are generally characterized by morning winds from the northwest and winds from the southwest in the afternoon³. Low ozone days are generally associated with southerly wind flows throughout the day. During the morning on low ozone days, the surface wind speeds tend to be relatively high compared to high ozone days. The frequency of stagnated winds on high ozone days is much greater than on low ozone days.

These wind patterns play a direct role in ozone background levels, including the recirculation of local concentrations that therefore accumulate, as well as through the long-range regional transport of ozone.

4.4 BACKGROUND LEVELS AND TRANSPORT OF OZONE

The most recent data analysis work for the BPA area has focused on background levels and transport of ozone. Perhaps the most difficult part in characterizing background ozone is separating the ozone levels that are transported long distances from those levels that are due to the recirculation, accumulation, or previous-day carryover of locally generated ozone.

Background levels of ozone in the BPA area during 8-hour ozone exceedance days typically exceed 40 ppb. In one instance, background levels arriving at the Sabine Pass (CAMS 640) monitor from offshore were greater than 85 ppb, and exceeded 80 ppb for 28 consecutive hours. Understanding the sources of these background levels is critical to the development of any control strategies.

A major data analysis study⁴ was undertaken to determine the effects of background ozone levels on local concentrations. Refer to Appendix A for more detailed information. This study used additional analysis tools to evaluate 1-hour and 8-hour ozone exceedances occurring in the BPA area from 1998-2002. These additional analysis tools were primarily used to assess air parcel movement. In addition, time series of 5-minute ozone data were reviewed. Each tool uses different inputs and methods, and has different benefits and limitations; therefore, the results presented are a composite of all the results.

4.4.1 Analysis Tools

Two primary tools were used to assess air parcel movement: 1) a forward trajectory model that tracks the movement of parcels over time using surface meteorological data for input and 2) back trajectories using the National Oceanic and Atmospheric Administration (NOAA) Hybrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) model.

The forward trajectory model was developed by TCEQ and uses surface winds from all the CAMS monitoring stations in the area. The model releases a single particle each hour from selected sources, and moves it downwind each hour based on that hour's wind speed and direction. The model is typically run on a day by day basis, with particles emitted starting at midnight and continuing forward until 10:00 p.m. or midnight of the following day. The particles are connected to show the path of the particles over time. This approach does not grow or disperse plumes, nor does it indicate the magnitude of the emissions. Each hour's set of particle paths can be animated to show the forward movement of the particles. The particle trajectory model is dependent on surface winds, and for the areas without local monitors, the model interpolates data from distant sites, resulting in some uncertainty in location. However, the animated hourly images generated from model results provide a generalized picture of the source regions and transport patterns that day.

Back trajectories were developed using the HYSPLIT model, which uses Eta Data Assimilation System (EDAS) fields, and are based on 40 km-spaced grid points. Therefore, these HYSPLIT analyses may be a good indicator of large scale (for example, synoptic) flow, but may not be able to capture subtle meso- and micro-scale flows. HYSPLIT can show a general upstream pattern, but may not be the best possible tool for assessing source culpability.

Time series of 5-minute ozone data were also reviewed to help describe day-specific upwind stations, background ozone, plus local and transported contributions of ozone.

4.4.2 Analysis Results

This data analysis study analyzed 23 1-hour ozone exceedance days and 56 8-hour ozone exceedance days in the BPA area from 1998-2002 based on the various meteorological regimes affecting ozone in BPA. These regimes are:

- Local (BPA only)
- Transport from Houston/Galveston/Brazoria
- Local plus Houston/Galveston/Brazoria
- Lake Charles
- Local plus Lake Charles
- Gulf on-shore flow.

Local meteorological conditions are characterized by low or calm wind speeds with less than three knots or nautical mph winds. Since high ozone usually occurs by 16:00 hours, a ten-hour back trajectory from this time that indicates winds do not leave a circle of a 30 nautical mile radius (3 knots * 10 hours = 30 nautical miles) from a BPA monitor recording an exceedance is considered to be local conditions.

Conversely, ten-hour back trajectories from 16:00 hours that crossed the 30 mile radius were considered to be transported from an upwind source region. For these analyses, the transport source regions of interest were Houston/Galveston/Brazoria and to a lesser extent, Lake Charles, Louisiana.

Maritime flow consists of cases where the wind flow comes in from the Gulf of Mexico and over the previous 10+ hours does not seem to lead back to any sources on land. The source may be areas along the Gulf Coast in other states, such as Mississippi, or even further inland.

Combination cases (Local plus Houston/Galveston/Brazoria, Local plus Lake Charles) are much more

difficult to identify. It is difficult to ascertain whether an exceedance was solely due to local conditions, or local conditions superimposed upon ozone transported in high background by observing the trajectory, a plume sequence, and an ozone time series.

Results from this study can be found in Tables 4-1, *BPA Area 1-hour Ozone Exceedances, 1998-2002* and 4-2, *BPA Area 8-hour Ozone Exceedances, 1998-2002*. Results indicate that the majority of high ozone events in BPA can be attributed to recirculation of local emissions as well as transport of ozone and ozone precursors from the Houston/Galveston/Brazoria (HGB) area. In addition, during high ozone events, background concentrations are generally high and contribute significantly to Beaumont ozone events.

The 1-hour and 8-hour ozone exceedance data based on source region vary significantly. For the 1-hour data, the impact from HGB transport plays a greater role than does the 8-hour data. For the 8-hour data, local emissions contribute the majority to exceedances. The fact that HGB transport affects 1-hour ozone exceedances more than it does 8-hour ozone exceedances, and 8-hour ozone exceedances are affected by local emissions, has an impact on control strategies.

Table 4-1
BPA Area 1-Hour Ozone Exceedances, 1998-2002

Source Region	# of Cases	Percentage
Local (BPA)	6	28.5%
HGB Transport	5	21.7
Local + HGB	5	21.7
Maritime	2	8.7
Lake Charles	1	4.3
BPA + Other Out-of-State	1	4.3
Other Regional/Out-of-State	3	13.0
Total	23	100%

**Table 4-2
BPA Area 8-Hour Ozone Exceedances, 1998-2002**

Source Region	# of cases	Percentage
Local (BPA)	31	55%
HGB transport	10	18
Local + HGB	2	4
Maritime	3	5
Lake Charles	5	9
Local + Lake Charles	5	9
Total	56	100%

4.5 CONTRIBUTION OF SPECIATED VOCs

The importance of VOCs to ozone formation has been well established. A data analysis study⁵ was conducted to determine which VOC compounds contribute the most to ozone formation in the BPA area, and to determine trends in these VOCs over the last five years. Refer to Appendix A for more detailed information.

Surface level VOC data in the BPA area is collected at seven TCEQ monitors and six Southeast Texas Regional Planning Commission (SETRPC) monitors. This VOC data is collected in canisters in 24-hour composite samples.

VOC reactivity was determined using a metric called the MIR, or maximum incremental reactivity scale. The MIR is a measure of the number of grams of ozone that can be formed from the addition of one gram of the subject VOC, under ideal conditions. In order to determine which VOCs are significant, the concentration of each compound was multiplied by the MIR to convert to a reactivity-weighted concentration, called the effective MIR. Effective MIRs take into consideration a compound's capability of forming ozone as well as its measured ambient concentration.

The VOCs that are measured are typically grouped into common categories. The median effective MIR for each group is determined by summing the compounds in the category. Total effective MIR reactivity is calculated by summing the effective MIRs for each group.

For over half of the canister samples in the BPA area, either propylene or ethylene is the top contributor to effective reactivity, and eight of the 13 monitors contain both propylene and ethylene in the top four compounds. Butadiene was the largest fraction of the effective reactivity at Port Neches for both the TCEQ and the SETRPC sites. The compound group, xylenes, was a large contributor to the total effective reactivity at two monitors. Butanes, butenes, pentanes, and pentenes were also significant contributors to reactivity at several of the sites.

VOC trends were examined using median reactivity changes in each compound group. Overall, a gradual decline in total reactivity can be seen at most of the monitor sites in the BPA area. This decrease in overall median reactivity indicates a decrease in concentrations of certain compounds from 1997 to 2001.

Refer to Appendix A.1 for more detailed information on trends by monitor.

In addition to surface level air quality monitoring, there have been 18 air quality measurement flights in the BPA area⁶ by TCEQ-contracted aircraft since 2001. Currently, data from these flights is in different stages of development and analysis. As for VOCs, there are canister samples from three flights for which a detailed reactivity analysis has been completed. The primary focus of these three flights was to study emissions from industrial point sources. Of the 20 different sampling locations, there were three locations with high effective MIR reactivity. These three high effective reactivity locations were downwind of industrial point sources and were all sampled on February 17, 2003. This day was a nonexceedance day. Ethylene, propylene, and other alkenes represent a large fraction of the reactivity for the high reactivity canisters. Other compounds, such as the alkanes, butanes, and pentanes, also contributed to the effective reactivity. The most reactive canister contained large portions of trimethylbenzenes, aromatics, ethyltoluenes, toluene, and xylene compounds.

The VOC effective reactivity results obtained from the aircraft canister data and the surface level VOC monitoring data are similar and corroborate one another. If the results of different studies using different data sources concur, then greater confidence in the results may exist.

Other flights that have been conducted in the BPA area were designed to study not only industrial point source emissions, but ozone transport and local ozone production as well. Data from these flights is currently being developed and analyzed. Future sampling in the BPA area will examine regional transport of ozone and particulate matter and their precursors, out-of-state transport, and industrial point source emissions.

New data on speciated VOCs is currently being collected at the SETRPC Jefferson County Airport monitor (CAMS 1019). This data is collected hourly through the use of an automated gas chromatograph (auto GC). The VOC auto GC data collected in 2003 and 2004 has not yet been validated, and therefore is not part of this report. Future work will study this data to determine which VOCs contribute the most to reactivity and ozone formation in the BPA area.

Another data analysis study⁷ was conducted on NO_x and VOC limitations in the BPA area. Refer to Appendix N for more detailed information. Understanding where and when ozone formation is limited by VOC or NO_x helps to determine ozone control strategies.

This analysis used the MAPPER (Measurement-based Analysis of Preferences in Planned Emissions Reductions) program for determining NO_x or VOC limitation at six monitors in the BPA area. MAPPER uses the Smog Production (SP) algorithm to approximate where and when peak ozone concentrations are limited by the availability of VOC radicals or nitrogen oxides. Since the SP algorithm uses ambient data, the accuracy of its results depends greatly on the accuracy of the input data. This analysis includes the concentrations of ozone, nitric oxide (NO), and either NO_x (NO₂ + NO) or NO_y (NO₂ + NO + nitrate radicals and other oxidized nitrogen products). The SP algorithm calculates the extent of reaction and determines if an area is NO_x limited, VOC limited, or transitional, meaning that the area could have either limitation. Results of this study indicate that the median extent of reaction for BPA at five of the monitors was transitional for each year from 2000 through 2002. Only one monitor was NO_x limited during this time period. This monitor, Sabine Pass (CAMS 640), was NO_x limited in 2000 and 2001, but was calculated to be transitional in 2002.

4.6 FUTURE WORK

The results from these projects build upon themselves, thus shaping and directing future work. Strategic planning for future data analysis studies is continually reevaluated as new information becomes available. Some new information for the BPA area may be obtained from some of the data analysis projects planned for the HGB area. These Houston projects may simultaneously provide relevant information for the BPA area due to the ozone/VOC relationship between the two areas, and the fact that some Houston studies may have a larger geographic scope that encompasses the BPA area. Future activities for the BPA area may include, but are not limited to, the following projects.

4.6.1 Determination of Background Levels and Transport of Ozone

Some of the most complex data analysis projects already completed for the BPA area have dealt with characterizing background ozone levels by working to separate those levels that are transported long distances from those levels that are due to the recirculation, accumulation, or previous-day carryover of locally generated ozone. Future work will continue to study air parcel movement with a focus on characterizing 8-hour ozone levels.

4.6.2 Determination of Speciated VOCs Contribution to Airmass Reactivity

Different VOCs have been shown to contribute differently to airmass reactivity. A new automated gas chromatograph monitor started collecting VOC data in July 2003, providing a new data source to determine which VOCs contribute the most to reactivity and ozone formation. Different VOC data sources, such as canister data, automated gas chromatograph data, and aircraft flight data, will continue to be used to provide multiple perspectives for analyses corroboration purposes. The relationship between total airmass reactivity and exceedance versus nonexceedance days are also important topics for further study.

4.6.3 Study of 8-Hour Ozone Exceedance Days

Recent studies to determine where and when ozone formation is limited by VOC or NO_x will help to evaluate 8-hour ozone exceedances and control strategies. Current studies indicate that the area is transitional between VOC and NO_x limitations. Work to track trends in these limitations will continue as new data is collected. In addition, the variability of VOC emissions, such as from industrial emission events, and the specific mix of VOCs emitted, may also be good predictors of exceedance days.

4.6.4 Other Projects

The TexAQS 2005 study will provide comprehensive data that can be analyzed to verify emissions inventories, investigate episodes and events, determine VOC reactivity, and study pollutant transport, such as the ozone/VOC relationship between the HGB and BPA areas. In addition, data analysis projects can be designed and conducted to evaluate SIP control strategies.

4.7 CONCLUSIONS

Data analysis in the BPA area has focused on the underlying factors of ozone formation, including the relationships among these factors. Ambient data has been used to track trends in ozone levels, determine the effects of wind patterns on ozone levels, distinguish between levels of ozone transport and ozone generated locally, identify locally generated ozone that accumulates and recirculates, and evaluate and characterize the contribution of speciated VOCs to total reactivity.

The body of knowledge on ozone formation in the BPA area continually increases through the collection of additional data and the completion of new data analysis studies. For example, future work will study the new auto gas chromatograph (GC) data to determine which VOCs contribute the most to reactivity and ozone formation.

The TCEQ continues to develop new data analysis methods and tools. One new method currently under development is a way to measure ozone trends after filtering out the effects of meteorology. Data analysis improvements will help to support the development of better control strategies.

4.8 BIBLIOGRAPHY

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6. Boyer, D. *Beaumont Flight Data and Analysis Summary*. March 5, 2004. Appendix A.1.
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CHAPTER 5: REQUIRED CONTROL STRATEGY ELEMENTS

5.1 POINT SOURCE NO_x CONTROL STRATEGY

The ozone control strategy for the BPA area has focused primarily on NO_x emission reductions from stationary point sources due to the relatively large contributions from this sector to the emissions inventory. Over the last decade, the commission has adopted progressively more stringent regulations in Chapter 117 for the control of NO_x. The following description summarizes the Chapter 117 rulemaking history to date for the BPA area.

In response to requirements of the FCAA, the commission adopted NO_x RACT rules effective June 9, 1993, in Chapter 117, "Control of Air Pollution from Nitrogen Compounds." These requirements applied to electric utility boilers, industrial boilers and process heaters, gas turbines, rich-burn stationary gas-fired internal combustion engines, nitric acid plants, and adipic acid plants in the BPA area and had a compliance date of November 15, 1999.

On October 27, 1999, the commission adopted "Phase I" of the state's NO_x rulemaking activities for the BPA attainment demonstration. As part of that SIP revision, the commission adopted VOC rules for batch process and industrial wastewater sources and NO_x rules for lean-burn engines. Compliance with the Phase I rules was required by November 15, 2001.

"Phase II" of the state's NO_x rulemaking activities for the BPA attainment demonstration was adopted by the commission on April 19, 2000. These rules required further NO_x reductions from electric utility power boilers (approximately 50 percent reduction) and from industrial boilers and process heaters (approximately 20 percent reduction). The schedule set forth in the rules for the Phase II reductions requires two-thirds of the reductions to be achieved by May 1, 2003, and the remaining one-third to be achieved by May 1, 2005.

5.2 OTHER EMISSION REDUCTION STRATEGIES

In addition to reductions from point sources, the ozone control strategy for the BPA area includes reductions realized from various federal standards for on-road and non-road sources. The on-road mobile source control strategies consist of Federal Motor Vehicle Control Program (FMVCP), Tier I, National Low Emission Vehicle (NLEV), and on-road Heavy-Duty Diesel (HDD), and the non-road strategies consist of locomotives, non-road HDD, small engines, and recreational marine engines.

5.2.1 Portable Fuel Container Rule

A statewide portable fuel container rule was adopted by the commission on October 27, 2004. The new rule establishes new requirements relating to the design criteria for portable fuel containers and portable fuel container spouts. The new rule establishes design criteria for "no-spill" portable gas cans based in large part on the California Air Resources Board (CARB) standards. Effective December 31, 2005, these new rules will limit the type of portable fuel containers and portable fuel container spouts sold, offered for sale, manufactured, and/or distributed in the State of Texas. Fuel released into the environment can lead to the contamination of both air and water. This rule ensures that portable fuel containers manufactured under these standards will release a smaller amount of fuel as the result of spillage and evaporation.

5.2.2 Voluntary Incentive Program-Texas Emission Reduction Plan (TERP)

In 2001 the 77th Texas Legislature passed Senate Bill 5 which established the Texas Emission Reduction Plan (TERP). The bill provided funding mechanisms for the program and the state anticipated that about \$133 million in new fees would be collected to fund the emission reductions contemplated. The major funding source, a tax on out-of-state vehicle registrations, was found to be in violation of the commerce clause of the Fourteenth Amendment of United States Constitution and Article I. Section 3 of the Texas Constitution. See H.M. Dodd Motor Co. Inc. and Autoplex Automotive, LP. v. Texas Department of Public Safety, et al., Cause No GNID2585(200th Judicial District Court, Travis County, February 21, 2002). The 78th Texas Legislature passed House Bill 1365, which restored funding to the TERP program through an alternative funding mechanism.

House Bill 1365 amended the surcharges and fees to fund the TERP program. Funding is expected to total approximately \$150 million per year statewide. The legislature also allocated funds to this program for other affected areas of the state, including the three counties comprising the BPA ozone nonattainment area.

The first emissions reduction incentive grant projects funded under the TERP program were for fiscal years 2002 - 2003 (September 1, 2001, through August 31, 2003). The funds available for award under the grants program were substantially less than the \$130 million originally expected due to the loss of funding from the primary funding mechanism. Revenue generated for the TERP program was only \$20.5 million per fiscal year, with approximately \$14 million per fiscal year available for emission reduction incentive grants. As a result, applications were only accepted for projects in the HGB and DFW nonattainment areas.

The TERP was enhanced in 2003 through the enactment of House Bill 1365 by authorizing funding for projects that include stationary engines and equipment that use fuels other than diesel and restoring adequate funding to the program. Projected revenue for the TERP program is expected to average about \$140 million per fiscal year through FY 2008. The Emissions Reduction Incentive Grants Program is allocated 87.5% of that total, or about \$120.5 million per fiscal year.

As of mid-2005, the program has awarded over \$185 million for 600 projects, which are estimated to result in NO_x reductions of over 39,000 tons, at an average cost per ton of NO_x reduced of \$4,723. In the BPA area, the projects funded thus far are projected to result in NO_x reductions of over 1.5335 tpd in 2007. Future TERP projects are expected to increase this reduction value and produce total reductions of 3 tpd NO_x from both non-road and on-road projects.

For information on recent TERP activities, please visit the following web site:

<http://www.tnrcc.state.tx.us/oprd/sips/terp.html>

The NO_x reductions achieved for the BPA attainment demonstration are summarized in Table 5-1 below.

Table 5-1

Summary of NO_x Reduction Estimates

		2007 Projected emissions in tpd	Reductions in tpd
EPA-ISSUED RULES			
FMVCP, Tier I, NLEV, on-road HDD		35.61	6.4
Locomotive engines		5.24	1.89
Non-road HDD		28.42	7.73
Small engines		0.49	-0.48
Recreational marine engines		0.13	-0.1
	Subtotal	69.89	15.44
STATE-ISSUED RULES			
	<u>Compliance date</u>		
<u>NO_x RACT rules:</u> Electric utility boilers Industrial boilers Industrial process heaters Gas turbines Rich-burn engines	November 15, 1999 (except lean-burn engines)		6.10
Lean-burn engines	November 15, 2001		6.80
<u>Attainment demonstration NO_x rules:</u> Electric utility boilers Industrial boilers Industrial process heaters Gas turbines	2/3 reductions by May 1, 2003 Remaining 1/3 reduction by May 1, 2005		62.19
	Subtotal	170.51	75.09
	TOTAL	240.4	90.53

5.3 OTHER REQUIREMENTS

5.3.1 Reasonable Available Control Measures (RACM) Analysis

Section 172(c)(1) of the Clean Air Act requires states to “provide for implementation of all reasonably available control measures as expeditiously as practicable” and to include RACM analyses in their SIPs. In the General Preamble for implementation of the Clean Air Act Amendments (57 FR 13498), EPA explains that it interprets Section 172(c)(1) as a requirement that states incorporate all reasonably available control measures that would advance a region’s attainment date into their SIP. However, regions are obligated to adopt only those measures that are reasonably available for implementation in

light of local circumstances. In the Preamble, EPA provided guidelines to help states determine which measures should be considered reasonably available:

If it can be shown that one or more measures are unreasonable because emissions from the sources affected are insignificant (i.e. de minimis), those measures may be excluded from further consideration...the resulting available control measures should then be evaluated for reasonableness, considering their technological feasibility and the cost of control in the area to which the SIP applies...In the case of public sector sources and control measures, this evaluation should consider the impact of the reasonableness of the measures on the municipal or other government entity that must bear the responsibility for their implementation.

On July 2, 2002, the U.S. Court of Appeals upheld EPA's definition of RACM, including the consideration of economic and technological feasibility, ability to cause substantial widespread and long-term adverse impacts, collective ability of the measures to advance a region's attainment date, and whether an intensive or costly effort will be required to implement the measures. Consistent with the U.S. District Court's opinion and EPA guidance, the commission has defined specific criteria for the evaluation of potential RACM measures in the BPA area. Individual measures must meet the following criteria:

- The measure will reduce emissions in the BPA area by the beginning of the ozone season, the year of its attainment date (June 15, 2005 for the 1-hour ozone standard and June 15, 2007 for the 8-hour ozone standard);
- The measure is technically feasible;
- The measure is enforceable;
- The measure is economically feasible;
- The measure would not create substantial or widespread adverse impacts within the region; and
- Emissions from the source being controlled exceed a de minimis threshold, defined for the BPA area as 1 tpd NO_x emissions and 3.8 tpd VOC emissions. According to the photochemical model, controlling sources with emissions below these thresholds would have a minimal impact on the design value for the area.

Collectively, any RACM measures must meet the following criteria:

- The measures will enable the region to reduce ozone below 125 ppb for the 1-hour ozone standard at least 1 year prior to its attainment date of November 15, 2005, and below 85 ppb for the 8-hour ozone standard at least 1 year prior to its attainment date of June 15, 2007; and
- The measures can be implemented without intensive or costly effort.

Appendices N through P provide a list of measures for the BPA area that were evaluated against the RACM criteria discussed above. The analysis shows that the BPA area does not need to implement any new RACM at this time. Please refer to Appendix N for the BPA Mobile Source RACM analysis, Appendix O for the BPA Point and Area Source NO_x RACM analysis, and Appendix P for the BPA Point and Area Source VOC RACM analysis.

5.3.2 Clean-Fuel Vehicle Programs

Title II, Part C of the Federal Clean Air Act (FCAA) specifies emissions standards for clean fuel vehicles. The emissions standards outlined in the FCAA are now surpassed by the federal Tier II standards. Tier II standards are mandatory for all light-duty vehicles with model years of 2004 or later. The federal emissions standards for model year 2004 and later light-duty and heavy-duty motor vehicles are more stringent than those required by the federal Clean-Fuel Vehicle Programs outlined in the FCAA. The federal emission standards for heavy-duty diesel engines (HDDE) in model years 2004 through 2006 are equivalent to the heavy-duty ULEV standards under the federal Clean-Fuel Vehicle Programs. The federal standards for HDDE in model years 2007 and later are approximately 90 percent cleaner than ULEV. The emissions reductions achieved by the Tier II and HDDE standards far surpass the emissions reductions that would be expected from implementation of federal Clean-Fuel Vehicle Programs in the BPA area. Please refer to Appendix Q for a detailed comparison of emissions standards for federal Tier II standards, California Low Emissions Vehicles (LEV) required by the federal Clean-Fuel Vehicle Programs, and the current federal Tier II standards which clearly shows that Tier II standards are more effective at reducing emissions from light-duty motor vehicles than the LEV standards required by the FCAA.

5.3.3 Reasonable Available Control Technology (RACT)

Under 42 USC, §7511(b), the EPA is required to issue control techniques guideline (CTG) guidance documents for the purpose of assisting states in developing reasonably available control technology (RACT) controls for major sources of VOC emissions. In turn, each state is required to submit a revision to its SIP that implements RACT regulations for VOC sources in moderate or above 1 hour ozone nonattainment areas. 42 USC, §7511(b)(2)(A) requires states to submit RACT regulations for VOC sources that are covered by a CTG issued after November 15, 1990, (the enactment date of the 1990 FCAA), but prior to the time of attainment. Similarly, 42 USC, §7511(b)(2)(C), requires that RACT be applied to major VOC sources located in moderate or above 1 hour ozone nonattainment areas that are not the subject of a CTG; such sources are known as “non-CTG” sources. Limits in state rules must be at least as stringent as the CTG limits or otherwise must be determined to meet RACT.

The reclassification of BPA from moderate to serious nonattainment for the 1-hour ozone standard resulted in a change in the major source definition from 100 tons per year (tpy) to 50 tpy. Current rules in §115.167 exempt batch process operations in the BPA area at an account with total VOC emissions less than 100 tpy from the control requirements of the division. Rules in §115.427 (a)(3)(H) exempt shipbuilding and ship repair operations in the BPA area which emit a combined weight of VOC from ship and offshore oil and gas drilling platform surface coating operations less than 100 tpy. In rulemaking that will be considered for adoption concurrent with this SIP revision, the exemption levels for these processes is lowered to 50 tpy to reflect the redesignation of the BPA area from moderate to serious for the 1-hour ozone standard, bringing BPA area into compliance for all appropriate RACT requirements.

5.3.4 Contingency Measures

In rulemaking considered for adoption concurrent with this SIP revision, the marine vessel loading contingency measure is deleted for the BPA nonattainment area from Chapter 115. Rules for marine vessel loading were adopted as a contingency measure in Chapter 115, Subchapter C, Division 1 on January 4, 1995. States are required by 42 USC §7502(C)(9) to submit a SIP that provides for the implementation of contingency measures to be undertaken if the area fails to make reasonable further progress or to attain the 1-hour ozone NAAQS by the attainment date. The marine vessel loading measure has not been implemented by the commission, even though the BPA area failed to achieve attainment of the 1-hour ozone NAAQS by the attainment date November 15, 1999. However,

substitution reductions have been provided that occur within the same time frame as the contingency measure reductions would have occurred, and the magnitude of these reductions is greater than the reductions that the contingency measure was expected to achieve.

EPA commented on the May 11, 2005 proposal of this SIP revision, and clarified that in order to substitute reductions for the contingency measure, the TCEQ must show a 3% reduction of the target level from 1996 because that is the attainment year that triggered the reclassification from “moderate” to “serious” for the one-hour standard. Further, EPA stated that TCEQ must show that the reductions occurred in 2004 or earlier, were not relied upon in any pre-2004 rate-of-progress plans and attainment demonstrations, and were above the level of reductions required for reasonably available control technology (RACT).

A NO_x target level for 1996 was not available. The initial reasonable further progress requirement for 1990 - 1996 was for VOC only; NO_x reductions were allowed to be used as part of the rate of progress (ROP) for target year 1999. The target level for 1999, as reported in the Post 1996 ROP Demonstration SIP for the BPA area, adopted October 27, 2004, is 303.37 tpd. That SIP indicates that the 9% reduction from 1996 to 1999 was 7% VOC and 2% NO_x. Thus, the "target" 1996 NO_x value would have been 2% higher than the 1999 target, or 309.56 tpd. The 3% reduction required for the contingency measure would thus be 9.3 tpd. Instead of using NO_x emission reductions from gas-fired, lean-burn stationary internal combustion engines rated 300 horsepower or greater to replace the marine vessel loading contingency measure reductions, the commission is relying upon voluntary reductions in NO_x emissions that were made by three companies in the BPA area and additional voluntary reductions that will occur as a result of the Texas Emission Reduction Plan (TERP). In 2004, three companies in the BPA area agreed to make voluntary reductions in emissions. On December 15, 2004, the commission adopted a revision to the BPA SIP incorporating the agreed orders to make these voluntary reductions federally enforceable. The agreed orders included NO_x reductions of 2,359 tons per year (tpy), which is equivalent to 6.46 tpd. TERP projects in the BPA area that have been funded thus far together with future TERP projects are projected to result in NO_x reductions of 3.0 tpd. Total NO_x emission reductions from the agreed orders and TERP total 9.46 tpd. These reductions were not relied upon in any pre-2004 rate-of-progress or attainment demonstration. These reductions are real, permanent, and federally enforceable. They will occur within the same time frame as reductions from the contingency measure would have occurred, or sooner. For these reasons, the NO_x emissions reductions resulting from the agreed orders and TERP are sufficient to replace the marine vessel loading contingency measure.

CHAPTER 6: FUTURE ATTAINMENT PLANS

6.1 FUTURE INITIATIVES

The TCEQ continues to move forward with technology research and development and building the science for ozone modeling and analysis. These initiatives will be beneficial to improving air quality in Texas.

New Technology Research and Development (NTRD) Program

The NTRD Program provides incentives to encourage and support research, development and commercialization of technologies that reduce pollution in Texas. The primary objective of the NTRD Program is to promote commercialization technologies that will support projects that are eligible for funding under the TERP Emissions Reduction Incentive Grants Program. The responsibility for implementing and administering the NTRD program will be moved from the TCEQ to the Texas Environmental Research Consortium (TERC) on September 1, 2005. TERC will be responsible for issuing the next round of NTRD grant funds that will be available during fiscal year 2006 and thereafter. TCEQ will contract with TERC to provide them with the funding that will be issued for grant projects. Even with this transfer of responsibility to TERC, the statute-driven goals of this program will not change. The TCEQ will continue to work to streamline and expedite the process through which the TCEQ and the EPA provide recognition and SIP credit for new, innovative and creative technological advancement. This program will help spur the entrepreneurial and inventive spirit of Texans to help develop new technologies to assist in solving Texas' air quality problems.

TexAQS 2000 II

The Texas 2000 Air Quality Study, the most comprehensive and successful air quality study conducted to date in the U.S., with over 40 research organizations and over 250 scientists, has provided and will continue to provide a large part of the scientific basis for reassessing the ozone problem in the HGB and BPA ozone nonattainment areas. The second phase of this study, TexAQS II, is scheduled for 2005 and 2006 and will include the eastern half of Texas. The pre-study work was completed in 2004. The meteorological, pollutant concentration, and transport data will be collected from May 2005 through October 2006 with the intensive field study period lasting from August through September 2006. The TCEQ will be heavily involved in this research in order to improve regulatory analysis and prediction tools used for developing ozone SIPs. The study will assess formation and accumulation of ozone, year-round air pollution meteorology, and inventories of ozone. Research will also be conducted on ozone transport into, within, and out of Texas. TexAQS II will also be collecting data from research projects to analyze the regional haze pollution in Texas, both from in state and out of state transport.

For more information on the TexAQS 2000, please see the following web sites:

<http://www.utexas.edu/research/ceer/texaqs/>

http://www.tceq.state.tx.us/policy/ta/am/TexAQS_II.html

<http://www.utexas.edu/research/ceer/texaqsII/visitors.htm>

The commission has a long history of supporting enhancements to air quality models and associated applications and input data. These endeavors are critical to supporting SIP development for Texas areas and will continue to be a top priority. The commission is committed to working in cooperation with the

regulated community, academia, research consortiums, and others to ensure that the modeling used to develop effective control strategies will use the most current scientific methodologies and information to replicate high ozone episodes in a given area.

Because scientific knowledge is constantly evolving, a comprehensive description of ongoing or planned research projects is not provided at this time. However, the TCEQ does maintain a catalog of projects relevant to Texas, which is available at the following web site:

http://www.tceq.state.tx.us/air/aqp/airquality_science.html

Appendices Available Upon Request

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