

STATE OF TEXAS
VISIBILITY PROTECTION STATE IMPLEMENTATION PLAN
Phase I
Periodic Review and Report
June 2001

Introduction

In September of 1987 the Texas Air Control Board, now the Texas Natural Resource Conservation Commission (TNRCC), adopted revisions to the "State Implementation Plan (SIP) for Visibility Protection in Class I Areas Phase I" to comply with federal requirements for visibility (40 Code of Federal Regulations (CFR) §51.306). During Phase I of the visibility program, the State is required to determine if visibility impairment in any mandatory Class I Federal area is reasonably attributable to an existing stationary facility or small group of facilities through visual observation or any other technique the State deems appropriate. Phase I of the visibility program is expected to remain in effect until the State submits the Phase II Regional Haze SIP, which is anticipated to occur in late 2005 or early 2006. When the Phase II visibility program is implemented it should result in the control of pollutants associated with regional haze and urban plumes which affect mandatory Class I Federal areas.

Under the provisions of the Phase I SIP, and to comply with the federal requirements, the State must conduct a periodic review and report on the provisions and effectiveness of the long-term strategy for Big Bend and Guadalupe Mountains National Parks, the State's two Federal Class I areas. The long-term strategy included in the current Phase I SIP consists of the following items:

1. A New Source Review (NSR) program which requires the agency to evaluate the impact of emissions from any proposed major source or major modification to any existing source within 100 kilometers (km) of a Class I area. The program requires the permit applicant to determine if visibility impairment may occur and to consult with the Federal Land Manager (FLM).
2. A smoke management program established and maintained through the requirements and enforcement of 30 Texas Administrative Code (TAC) Chapter 111, Subchapter B, Outdoor Burning.
3. The commitment to conduct periodic review and provide a report to EPA and the public every three years.
4. Consideration of future control measures for any source identified as causing significant attributable visibility impairment.

The following sections list the report requirements from 40 CFR § 51.306 (c) followed by

TNRCC's response:

(1) The progress achieved in remedying existing impairment of visibility in any mandatory Class I Federal areas.

During Phase I of the visibility protection program, states are required to determine if visibility impairment in any Federal Class I areas is reasonably attributable to plume blight or layered haze from an existing stationary facility. The TNRCC concluded that there is no plume blight or layered haze from nearby existing stationary sources that causes reasonably attributable visibility impairment upon Federal Class I areas of Big Bend and Guadalupe Mountains National Parks.

(2) The ability of the long-term strategy to prevent future impairment of visibility in any mandatory Class I Federal area.

The current long term strategy is intended to address and prevent impairment associated with a single source or small group of sources identified as causing or contributing to significant attributable visibility impairment in a Class I area. Continuing to regulate prescribed fire, not only in and around Big Bend and Guadalupe Mountains National Parks, but on a statewide basis as well, should prevent future impairment associated with emissions from prescribed fires.

The Texas strategy calls for a Prevention of Significant Deterioration (PSD) permitting review, which was incorporated into the State's NSR program, of any major source or a major modification to an existing major source within 100 km of a Class I area to include a visibility impairment analysis. Even though no major sources are currently located within 100 km of either Class I area, this strategy should prevent any future visibility impairment from a new major source in Texas proposing to locate within this distance. These two measures are sufficient to prevent future attributable visibility impairment from nearby sources.

(3) Any change in visibility since the last such report, or, in the case of the first report, since plan approval.

Based on transmissometer data, Big Bend National Park experienced two different trends in visibility during the period 1989-1998. Visibility worsened until the mid-90s, while the trend reversed through 1998. Average visibility in 1989 was not significantly different from 1998. Guadalupe Mountains National Park experienced a slight increase in visibility over this same period. While there are significant gaps in the available data, the TNRCC does not think the changes in visibility in these Federal Class I areas is reasonably attributable to any nearby (less than 100 km) existing stationary facility or small group of facilities.

To characterize trends in visibility at Big Bend and Guadalupe Mountains National Parks, the TNRCC examined light extinction data collected by transmissometers from December 1988 through August 1998 at each park. Light extinction (b_{ext}), measured in units of inverse

megameters (1/Mm), is a measure of the attenuation of light as it passes through a medium (i.e., how well light is transmitted through the air). The larger the light extinction, the lower the visibility range. Transmissometer data are available through the Interagency Monitoring of Protective Visual Environments (IMPROVE) monitoring network, established by the National Park Service in 1985.

The TNRCC only considered hourly b_{ext} values associated with a relative humidity (RH) less than 90 percent. This RH value is consistent with what the National Park Service uses to eliminate fog as haze events. Daily averages were then calculated from hourly measurements and retained only if at least 75 percent of the hourly data were valid, a standard typically accepted by the EPA. Unfortunately, this process caused the loss of at least 35 percent of the data days each year, with some years being better than others (Tables 1 and 2). Recovery rates improve if the year total excludes those days omitted because of RH interference.

Year	Number of Days Transmissometer Data Available	Total Days in Year	Percent Return	Percent Return Adjusted for RH	Optimum Number Days Aerosol Data Available
1989	151	365	41%	44%	102
1990	113	365	31%	40%	102
1991	160	365	44%	59%	101
1992	183	366	50%	56%	103
1993	158	365	43%	46%	102
1994	153	365	42%	46%	103
1995	201	365	55%	57%	91
1996	227	366	62%	66%	73
1997	200	365	55%	61%	103
1998	120*	365	33%	35%	98

*Data through August 1998 only were available at time of report analysis

Table 1. Days with ≥ 18 valid hours b_{ext} at Big Bend (BIBE Transmissometer)

Year	Number of Days Transmissometer Data Available	Total Days in Year	Percent Return	Percent Return Adjusted for RH	Optimum Number Days Aerosol Data Available
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1989	221	365	61%	67%	96
1990	93	365	25%	33%	98
1991	193	365	53%	82%	96
1992	191	366	52%	64%	102
1993	217	365	59%	68%	101
1994	211	365	58%	63%	87
1995	223	365	61%	69%	96
1996	238	366	65%	72%	97
1997	194	365	53%	62%	104
1998	127*	365	35%	38%	102

*Data through August 1998 only were available at time of report analysis

Table 2. Days with ≥ 18 valid hours b_{ext} at Guadalupe Mountains (GUMO Transmissometer)

Although such a large volume of missing data greatly hindered the ability to evaluate trends, the TNRCC used what was available. The above tables also compare the number of days with transmissometer data to the optimum number of days per year that aerosol data would have been available. Aerosol monitors at Big Bend and Guadalupe Mountains sample twice a week and can be used to estimate light extinction with the reconstruction equation. Even with a limited transmissometer data set, more days with optical data were available per year than the best case scenario for aerosol data. In addition, percent data return showed no seasonal pattern at either park. At both sites, all quarters of all years except 1990 and 1998 had at least 20 days of data available; year 1998 was limited because of the August 31 endpoint of the data sets.

The 90th, median, and 10th percentile trends were assessed, and calendar year averages were compared for each site. These percentile trends give some idea about the changes in the 10 percent “worst” visibility days, “average” days, and the 10 percent “best” days.

This analysis did not characterize the influence of meteorological variability. Ultimately, the TNRCC plans to develop a method to “filter out” the effects of short term variation and meteorology on visibility to discern impacts from changes in emissions. However, an initial approach is still under investigation.

Big Bend National Park

Year 1988 did not bear significantly on the analysis because only 20 measurements were available (December only). The change between the annual average values in 1989-91 and 1997-98 was not significant. Figure 1 is a plot of annual averages with error bars representing

the 95 percent confidence interval. However, there appears to be two different trends. The period between 1989-94 suggests decreasing visibility, while this trend reverses between 1994-98. The inflection in this trend does coincide with Phase I of EPA's Acid Rain Program, which imposed tougher restrictions on sulfur dioxide emissions from fossil fuel-fired power plant units in 1995. Data loss affected the year 1990, which was missing data between mid-August and mid-December. Therefore, the annual average may not be representative of that year. For 1998, no data were available after August. These are examples of where data loss impacted the TNRCC's ability to evaluate trends.

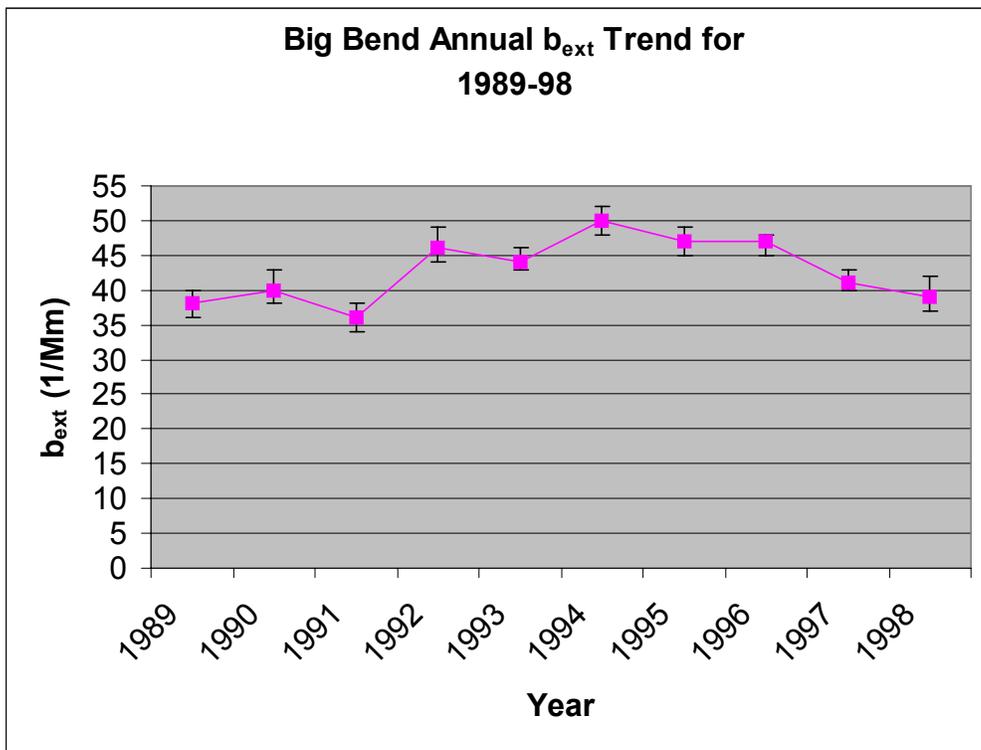


Figure 1.
Annual
Average
Light

Extinction (b_{ext}) at Big Bend with 95 Percent Confidence Intervals

Figure 2 illustrates the trends for the 90th, median (50th), and 10th percentile groups at Big Bend. Two trends are apparent in each of these groups, decreasing visibility through the mid-90s and

then increasing visibility by 1998. The worst days (90th percentile group) show an increase in b_{ext} (decreasing visibility) between 1989 and 1992, a leveling off between 1992-95, and then a significant decline to levels close to those in 1989 for this group. Days of average visibility (median group) follow a similar pattern. The best days (10th percentile group) show an increase in b_{ext} levels between 1989 and 1994, and then a decrease through 1998. The trend for the best days does indicate an overall increase in b_{ext} levels for this group since 1989; however, the decrease in b_{ext} for this group since 1994 should be noted.

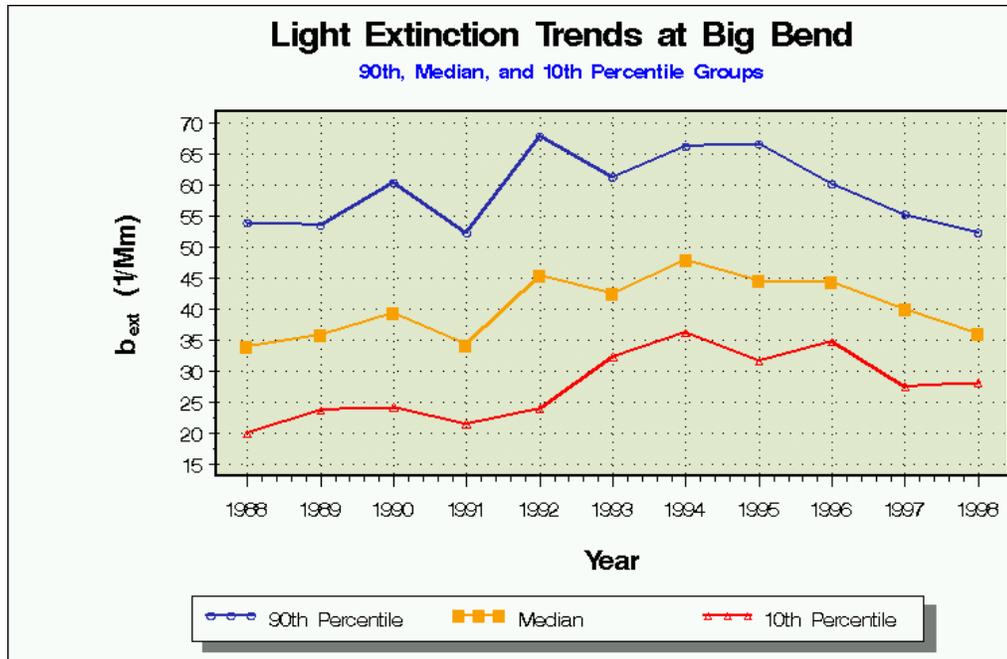


Figure 2. Light Extinction Trends at Big Bend for 90th, Median, and 10th Percentile Groups

Guadalupe Mountains National Park

Again, year 1988 did not provide a valuable contribution to the analysis because only five valid b_{ext} measurements were recorded. Figure 3 demonstrates that during the 10 year period, annual

average b_{ext} values decreased significantly between 1989 and 1993, increased in 1994, and showed no significant change between 1994-98. It should be noted that only a quarter of daily average b_{ext} data in 1990 could be used in the analysis, which included no valid data at all for July-November of that year. Therefore, the 1990 average may not be representative of that year. No data were available after August 1998 at the time of this analysis.

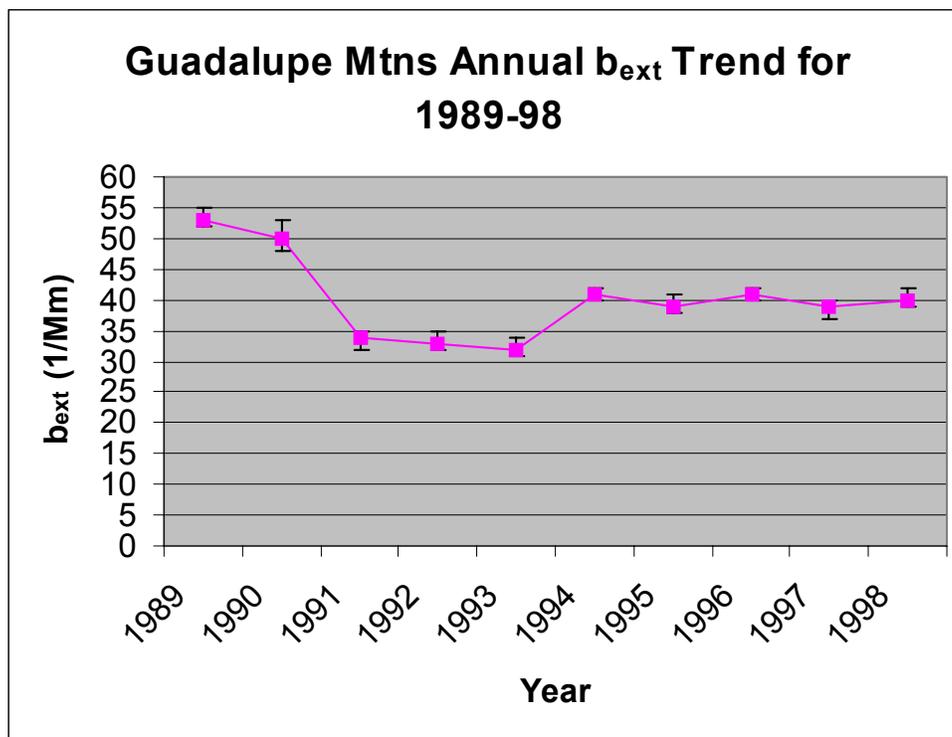


Figure 3.
Annual

Average Light Extinction (b_{ext}) at Guadalupe Mountains with 95 Percent Confidence Intervals

At Guadalupe Mountains, the trends for the worst days (90th percentile), average days (median), and best days (10th percentile) all show a marked decrease in b_{ext} values between 1989 and 1993

(Figure 4). Likewise, all groups exhibit a subsequent increase (not as steep) in 1994 that appears to level off. At this time it is unclear why this trend reversal took place. Based on b_{ext} levels, visibility for days in all groups has increased since 1989.

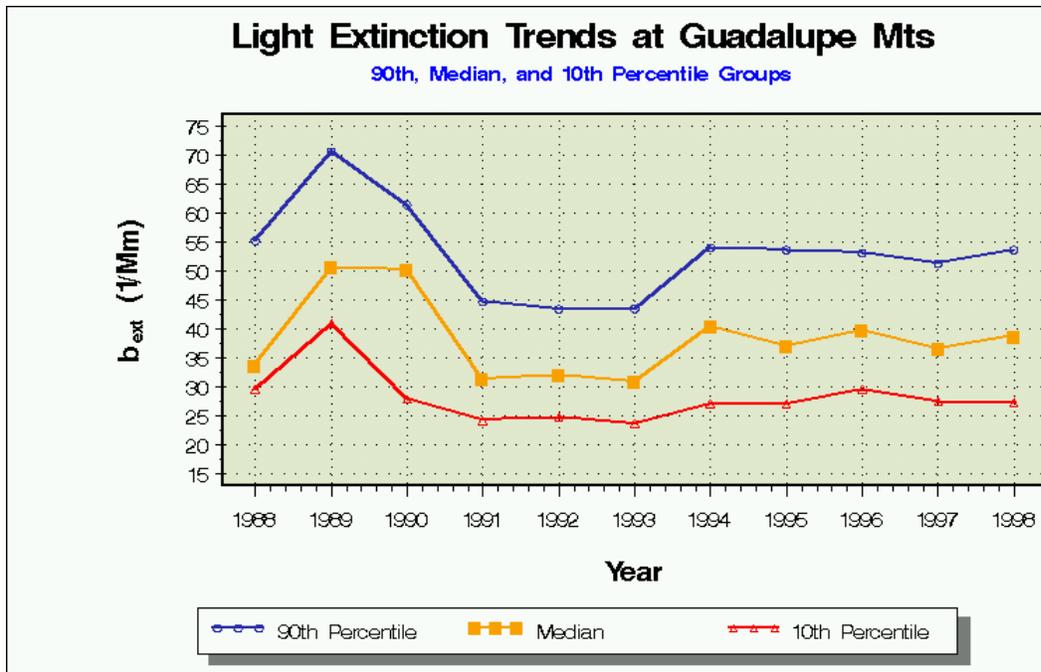


Figure 4. Light Extinction Trends at Guadalupe Mountains for 90th, Median, and 10th Percentile Groups

Low data return limited the TNRCC’s confidence in the certainty of this trend analysis. Also, as with Big Bend, some years at Guadalupe Mountains National Park experienced daily average b_{ext} levels that were considerably higher than the “normal spread.”

(4) Additional measures, including the need for SIP revisions, that may be necessary to

assure reasonable progress toward the national visibility goal.

No additional measures are needed at this time and there is currently no need for a SIP revision under the Phase I visibility protection rules.

(5) The progress achieved in implementing BART and meeting other schedules set forth in the long-term strategy.

As of this review period, no existing stationary sources have been identified as causing or contributing to reasonably attributable visibility impairment in either Big Bend or Guadalupe Mountains National Parks and there is no plume blight or layered haze from nearby existing stationary sources that causes reasonably attributable visibility impairment. Therefore, the requirement to implement Best Available Retrofit Technology (BART) has not been triggered.

(6) The impact of any exemption granted under § 51.303.

Because the requirement to implement BART has not been triggered, there are no exemptions subject to 40 CFR § 51.303.

(7) The need for BART to remedy existing visibility impairment of any integral vista listed in the plan since the last such report, or, in the case of the first report, since plan approval.

There are no integral vistas listed in the State of Texas State Implementation Plan nor has BART been implemented, therefore this section is not applicable.

BRAVO Study Update

The Big Bend Regional Aerosol Visibility Observational (BRAVO) study is a federally funded study designed to understand the transport of emissions from a variety of regional sources and their effects on visibility in Big Bend National Park. Further, it is anticipated that the study will help determine the contributions of specific source regions and source types which are responsible for visibility impacts at Big Bend National Park.

A preliminary study was conducted in 1996 to obtain information on pollutant gradients over a broad area to assist in the design of the full BRAVO study. Although the study was conducted in 1996, the final report was not completed until the summer of 1998. Originally, the BRAVO study was to have been a cooperative effort between the U.S. Environmental Protection Agency (EPA), National Park Service (NPS), Texas Natural Resource Conservation Commission (TNRCC), and the Mexican Government. However, after extensive negotiations, the Mexican representatives chose not to participate in the study.

After the preliminary study was finalized, the NPS, EPA Region 6, TNRCC, and National Oceanic and Atmospheric Administration (NOAA) met in December 1998 to begin working out the details of the 1999 study. Since the initial meeting there have been two follow up meetings. The BRAVO study called for ambient monitoring from July through October 1999 with continuous perfluorocarbon tracer releases at a location near Eagle Pass, Texas and from sources in Eastern and South Texas. Additional ambient monitors were located at sites in Texas. Because the ambient monitoring program is limited to U.S. locations only, information regarding the specific sources or source regions in Mexico contributing to visibility impairment at Big Bend is less complete than originally anticipated. However, by enhancing the aerosol and tracer monitoring along the Mexican border in combination with additional meteorological data along the border, an estimate of the contribution of Mexican source areas should be possible. In addition to monitors along the Texas/Mexico border, sites were selected to fill in gaps along the northern and eastern edges of Texas to document transport into Texas from other states and the Gulf of Mexico.

While the data collection in early July was not accomplished, monitoring was conducted through October 1999. The current expectation is that data validation will be complete by the end of May 2001 with a final report completed during the summer of 2002.

The EPA recently finalized the Regional Haze Rules and states will be required to submit revisions to their State Implementation Plans (SIP) for Visibility Protection in Class I areas (such as Big Bend National Park) beginning in 2005 or 2006. The TNRCC believes that there are a number of uncertainties regarding the causes of impairment at Big Bend National Park that must be addressed in order for the state to make sound judgements when revising the SIP. The TNRCC anticipates that the BRAVO study will provide a basis from which the following uncertainties regarding Big Bend visibility can be answered:

- The percentage of days that sources from Texas as well as from outside of Texas significantly contribute to impairment. The loss of the early July sampling period may compromise this ability.
- The percent contributions of source areas and source categories from Texas and from outside to impairment on a given day.
- The estimated improvement in visibility which can be predicted based on the regional control of source categories from within Texas and from outside

Further, once these uncertainties are resolved, then the TNRCC can begin the public process of going forward with a revision to the SIP that will respond to the requirements of the Regional Haze rule.

Conclusion

The TNRCC is fully committed to continuing efforts in evaluating the causes of visibility impairment in Class I areas and identifying all contributing sources and evaluating all potential short and long term solutions. The TNRCC is required to review and revise the SIP for Visibility Protection in Class I Areas Phase I every three years. This is the third such review and TNRCC has determined that no SIP revision is necessary at this time.

Response to NPS comments

This Visibility Report was sent to the National Park Service (NPS) for review and comment in June 2001 and the TNRCC received their comments in a letter dated January 25, 2002. TNRCC response to NPS comments follows:

Progress achieved in remedying existing visibility impairment in mandatory Class I Federal areas:

The NPS noted that “the current draft Report attempt to self-impose limitations on the State’s ability to improve the park’s persistent visibility impairment problems by wrongly stating that the requirements under Phase I apply only to “nearby sources” having “plume blight” impacts on Class I areas. This approach for attributing impairment to a single source or small group of sources is certainly contemplated under the EPA’s requirements for State Phase I visibility SIPs, but the rules are in no way limited to this scenario.”

TNRCC agrees that layered haze should be considered as well as plume blight and the term layered haze has been added to the report. However, Federal Register/ Vol. 45. No. 233, December 2, 1980, Visibility Protection for Federal Class I Areas states “Phase I of this program will: Require control of impairment that can be traced to a single existing stationary facility or small group of existing stationary facilities.” This Federal Register notice goes on to say “...we can say there are generally two types of air pollution which reduce or impair visibility: (1) Smoke, dust, colored gas plumes, or layered haze emitted from stacks which obscure the sky or horizon and are relatable to a single source or a small group of sources, and (2) widespread, regionally homogeneous haze from a multitude of sources which impairs visibility in every direction over a large area.” This Federal Register notice makes it clear that during Phase I of the Visibility Protection program States should consider single existing stationary facilities or small groups of existing stationary facilities in determining reasonable attribution.

Ability of the long-term strategy to prevent future impairment of visibility in any mandatory Class I Federal area:

The NPS commented on the States’s regulation of prescribed fire as a laudable approach but noted that “there is seemingly a disconnect between this statewide control strategy for an intermittent, spatially variable area source of emissions and the State’s reluctance to follow the same approach for major (and minor) stationary sources of emissions that operate on a

continuous basis from fixed locations.

TNRCC disagrees. The smoke management program which was established and maintained through the requirements and enforcement of 30 Texas Administrative Code (TAC) Chapter 111 is part of the States long-term strategy for visibility protection. The smoke management program is an important part of, not disconnected from, the State's strategy to protect visibility in Federal Class I areas. The combination of the New Source Review program, the commitment to conduct periodic review/reporting, consideration of future control measures for any source identified as causing significant attributable visibility impairment and the smoke management program make up the TNRCC's long-term strategy for visibility protection.

The NPS requested an update on the Voluntary Emissions Reduction Permit (VERP) program for grand fathered facilities in the State of Texas and Senate Bill 7 which was adopted by the State legislature in 1999, and requires emissions reductions for grandfathered facilities at electric generating plants.

A discussion on related legislative initiatives follows:

Senate Bill 766 The 76th Legislature created the Voluntary Emissions Reduction Permit (VERP) program for grandfathered sources of air emissions in Texas. This voluntary program intended to encourage grandfathered sources to obtain a permit and reduce air emissions. As of January 24, 2001, 52 companies have applied for VERPs under Senate Bill 766 and 10 have been issued. These 10 permits resulted in an emission reduction of 134 tons per year from previously grandfathered facilities. The 42 pending VERP applications encompass 64,127 tons per year of 1997 emissions from grandfathered facilities. The emission reductions which will be achieved and resulting quantity of permitted emissions are not yet determined. The agency also has received 166 written commitments to apply for a permit prior to September 1, 2001 in order to qualify for the VERP program. These companies collectively have 225,776 tons of emissions from grandfathered facilities. The reductions which will be achieved and the resulting quantity of permitted emissions are also not yet determined.

HB 2912 The Sunset Bill, HB 2912, became the vehicle for addressing the "grandfather" exemption that allowed industrial plants in existence before the 1971 Clean Air Act to avoid requirements for air permits. In some cases, these older facilities were not required to operate under the same rules as facilities built after 1971.

The Legislation required the permitting of grandfathered facilities and mandatory cuts of nitrogen oxide (NOX) emissions by 2007: 50 percent reductions at pipeline compressors in East Texas (the area along and east of Interstate 35) and up to 20 percent in West Texas. The measure also stipulates that best-available control technology (BACT)—no older than 10 years—be installed at non-pipeline grandfathered facilities, including large

industrial plants.

Senate Bill 7 This bill (the electric utility restructuring bill) requires grandfathered electric generating facilities to cut emissions of nitrogen oxides by 50 percent and sulfur dioxide by 25 percent, beginning May 1, 2003. The inventory of facilities affected by Senate Bill 7 includes all grandfathered electric generating facilities in the state except: 1) those with a nameplate capacity of 25 megawatts or less and operated by a municipal corporation, electric cooperative, or river authority and excluded by the operator in a notification sent to TNRCC by January 1, 2000; or 2) those that generate electricity primarily for internal use but that during 1997 sold less than one-third of its potential electrical output capacity, or less than 219,000 megawatt-hours. These cuts are to be made from 1997 levels. Any facility that does not obtain a permit from the TNRCC by that time must shut down, unless the TNRCC finds that there is good cause for an extension. To achieve these reductions, the bill established a mass cap and trade system whereby electric utility companies are issued emission allowances that may be used for compliance or traded to other utilities for their compliance purposes. The TNRCC adopted rules to implement this program on December 16, 1999, and has issued emission allowances which embody the required reductions of nitrogen oxides and sulfur dioxide.

NPS stated that “while we acknowledge Mexico’s possible contribution to existing visibility impairment, we would also be interested in what actions the State is taking, if any, to address these international contributions to impairment problems at Big Bend and Guadalupe Mountains Nps.

TNRCC and EPA have invested significant resources in acquiring emissions inventories, air quality, meteorological, and modeling data for the region with our Mexican counterparts. TNRCC chairs the International Workgroup for Central State Regional Air Planning Association (CENRAP). This International Workgroup will assist other workgroups with factors involving the impact from emissions in Mexico and Canada that affect Class I areas in the CENRAP region as well as promote training, policy, and communication needs involved in working with bordering countries. TNRCC also chairs the Emissions Inventory workgroup and has several other staff members participating in the planning process of CENRAP. TNRCC is also an active participant in the Binational Advisory Committee, a group of U.S. and Mexican federal, state, and local representatives, to help develop an emissions inventory for first the northern Mexican states and later for the whole country of Mexico. This effort is funded through the Western Governors Association. In addition, TNRCC is deeply involved with the BRAVO Study to identify the source regions and source types responsible for the haze at Big Bend National Park.

NPS pointed out that the TNRCC only used transmissometer data through year 1998 and pointed out that more recent information is now available on the IMPROVE network.

The only data available from IMPROVE in May, 2001 (when this report was prepared),

spanned through August, 1998. The NPS also stated that its assessment of trends through February, 2000, reveals worsening visibility for the worst and average visibility days at both parks. TNRCC will continue to use all transmissometer data available at the time a particular report is prepared.

NPS strongly recommended that the TNRCC use particulate concentrations to assess current conditions and trends because those data were the basis for progress demonstrations under the Regional Haze Rule.

While the TNRCC understands the importance of assessing aerosol data in conjunction with visibility trends, both Texas Class I areas (Big Bend and Guadalupe Mountains National Parks) have transmissometers that directly measure light extinction (b_{ext}). TNRCC used what it considered to be the best data available for the ten year period in order to attempt to discern trends. Furthermore, the TNRCC has some concern that the reconstruction equation may not accurately calculate b_{ext} in all cases. TNRCC staff are currently assessing differences between measured b_{ext} and reconstructed b_{ext} . Initial comparisons between the two methods during the BRAVO study suggest that reconstructed extinction, as currently calculated, may not accurately represent actual visibility at Big Bend National Park. This issue is a major concern and will be evaluated further with historical IMPROVE data at both Big Bend and Guadalupe Mountains. Finally, EPA's Draft Guidance For Tracking Progress under the Regional Haze Rule was not released until September 27, 2001 -- after this report was prepared.

NPS stated that they "believe[s] there now exists sufficient information and analytical techniques for addressing certain existing sources and areas in the State containing small groups of sources that contribute to degraded visibility conditions at Big Bend NP". The National Park Service also notes that atmospheric tracers released from different sources during the BRAVO study in Texas (including the Big Brown and Parrish power plants), were detected at Big Bend monitors.

The BRAVO study is not complete at this time. Even so, preliminary results from the National Park Service's analysis of BRAVO data suggest that a large number of sources outside of Texas (to the South, East, and Northeast) contribute to high sulfur values at Big Bend NP. Even more significantly, National Park Service analysis suggests that sources in Texas, by themselves, are not capable of creating visibility problems in Big Bend National Park. TNRCC will continue to assess the BRAVO study and will consider the information produced as it develops periodic assessments.

Additional measures, including the need for SIP revisions, that may be necessary to assure reasonable progress toward the national visibility goal:

NPS notes a need for the State to revise its PSD and nonattainment area review processes for sources which may have visibility effects on Class I areas at distances greater than 100 kilometers from such areas.

During Phase I of the visibility program, the State is required to determine if visibility impairment in any mandatory Class I Federal area is reasonably attributable to an existing stationary facility or small group of facilities. The New Source Review (NSR) program which requires the agency to evaluate the impact of emissions from any proposed major source or major modification to any existing source within 100 kilometers (km) of a Class I area. The program requires the permit applicant to determine if visibility impairment may occur and to consult with the Federal Land Manager. The TNRCC feels this NSR program, in addition to the other long-term strategies listed in this report, is adequate to address visibility impacts under Phase I.