

FINAL

## 2001 AIR EMISSIONS INVENTORY

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### PADRE ISLAND NATIONAL SEASHORE TEXAS



U.S. NATIONAL PARK SERVICE

JULY 2003



FINAL

**2001 AIR EMISSIONS INVENTORY**

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PADRE ISLAND NATIONAL **SEASHORE**  
TEXAS

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## 1. INTRODUCTION

### 1.1 BACKGROUND

In August of 1999, the National Park Service (NPS) embarked on the Natural Resource Challenge, a major effort to substantially improve how the NPS manages the natural resources under its care. As part of Natural Resource Challenge, the NPS Air Resources Division (ARD) was tasked with the responsibility of expanding efforts to monitor and understand air quality and related values in the parks. In addition, the NPS Environmental Leadership policy directs the NPS to manage the parks in a manner "that demonstrates sound environmental stewardship by implementing sustainable practices in all aspects of NPS management...." In order to achieve both of these objectives, it is necessary to gain an understanding of air pollution emissions that result from activities within the parks. In this regard, development of an in-park air emissions inventory for Padre Island National Seashore (NS) serves three functions in this regard. First, it provides an understanding of the sources and magnitude of in-park emissions and a basis for contrasting them with emissions from the surrounding area. Second, it identifies existing and potential strategies to mitigate in-park air emissions. Finally, it evaluates and ensures the compliance status of the park relative to state and federal air pollution regulations.

### 1.2 TYPICAL AIR EMISSION SOURCES

Typical air emission sources within NPS units include stationary, area, and mobile sources. Stationary sources can include fossil fuel-fired space and water heating equipment, generators, fuel storage tanks, and wastewater treatment plants. Area sources may include woodstoves and fireplaces, campfires, and prescribed burning and wild fires. Mobile sources may include vehicles operated by visitors and NPS employees and nonroad vehicles and equipment.

The air pollutants that are addressed in this report are summarized in the table below. Of the pollutants noted, ozone is not produced and emitted directly from stationary, area, or mobile sources, but rather it is formed as a result a chemical reaction of NO<sub>x</sub> and VOC emissions in the presence of sunlight. It is primarily an issue on the East Coast and Southern California, while particulate matter is more of an issue in the West. Carbon dioxide historically has not been considered a pollutant. However, in recent years, there has been much interest in its contribution to global climate warming since it is considered a greenhouse gas.

## AIR POLLUTANTS AND THEIR CHARACTERISTICS

Pollutant	Characteristics
Particulates (PM <sub>10</sub> )	<ul style="list-style-type: none"> <li>Mixture of solid particles and liquid droplets; fine particles (less than 2.5 micrometers) produced by fuel combustion, power plants, and diesel buses and trucks</li> <li>Can aggravate asthma, produce acute respiratory symptoms, including aggravated coughing and difficult or painful breathing, and chronic bronchitis</li> <li>Impairs visibility</li> </ul>
Sulfur Dioxide (SO <sub>2</sub> )	<ul style="list-style-type: none"> <li>Can cause temporary breathing difficulties for people with asthma</li> <li>Reacts with other chemicals to form sulfate particles that are major cause of reduced visibility in many parts of the country</li> </ul>
Nitrogen Oxides (NO <sub>x</sub> )	<ul style="list-style-type: none"> <li>High temperature fuel combustion exhaust product</li> <li>Can be an irritant to humans and participates in the formation of ozone</li> </ul>
Carbon Monoxide (CO)	<ul style="list-style-type: none"> <li>Odorless, colorless gas produced by fuel combustion, particularly mobile sources</li> <li>May cause chest pains and aggravate cardiovascular diseases, such as angina</li> <li>May affect mental alertness and vision in healthy individuals</li> </ul>
Volatile Organic Compounds (VOCs)	<ul style="list-style-type: none"> <li>Fuel combustion exhaust product</li> <li>Consists of a wide variety of carbon-based molecules</li> <li>Participates in the formation of ozone</li> </ul>
Ozone (O <sub>3</sub> )	<ul style="list-style-type: none"> <li>Not directly emitted by mobile, stationary, or area sources</li> <li>Formed from complex reactions between NO<sub>x</sub> and VOC emissions in the presence of sunlight</li> <li>Occurs regionally due to multiplicity of sources</li> <li>Can irritate the respiratory system</li> <li>Can reduce lung function</li> <li>Can aggravate asthma and increase susceptibility to respiratory infections</li> <li>Can inflame and damage the lining of the lungs</li> </ul>
Carbon Dioxide (CO <sub>2</sub> )	<ul style="list-style-type: none"> <li>Does not directly impair human health</li> <li>It is a greenhouse gas that traps the earth's heat and contributes to the potential for global warming</li> </ul>

## 1.3 INVENTORY METHODOLOGY

The methodology to accomplish the air emissions inventory was outlined in a protocol that was prepared at the initiation of the project (EA Engineering 2001). Tasks consisted of a site survey in March 2003, interviews with Padre Island NS<sup>1</sup> personnel, review of applicable park records, emission calculations, review of applicable state air quality regulations, an assessment of mitigation measures and potential emission reduction initiatives, and report preparation. The data were used in conjunction with a number of manual and computer software computational tools to calculate emissions. Computational tools included U.S. Environmental Protection Agency (USEPA) emission factors such as the Factor Information Retrieval System (FIRE) database, USEPA *TANKS 4.0* model, U.S. Forest Service *First Order Fire Effects Model (FOFEM) 4.0* model, and USEPA *MOBILE6.2* and *PARTS* mobile source emissions model. The

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year 2001 was selected as the basis for the air emission inventory since data for that year were the most recent available at the National Seashore. It should be noted that emissions are expected to vary from year to year due to fluctuations in visitation, prescribed and wildland fires, and other activities. Additional information on emission estimation methodology, including emission factors, are provided in Appendices A and B.

#### **1.4 PARK DESCRIPTION**

Padre Island NS is located in southeast Texas, on the Gulf of Mexico, southeast of the city of Corpus Christi, Texas (Figure 1). The park encompasses 130,454 acres of America's vanishing barrier islands. Padre Island NS is the longest section of an undeveloped barrier island in the world, protecting rare coastal prairie; a complex, dynamic dune system; and the Laguna Madre, one of the few hypersaline lagoon environments left in the world. The National Seashore and surrounding waters provide important habitat for marine and terrestrial plants and animals, including a number of rare, threatened, and endangered species. Situated along the Central Flyway, Padre Island is a globally important area for over 350 migratory, overwintering, and resident bird species. The National Seashore's remote location also makes it one of the few places where the public can find quiet and solitude relatively near a major urban area and where one can observe the night sky with minimal interference from light pollution. The National Seashore is also one of the few places the public can go to see sea turtle hatchlings being released into the wild.

The National Seashore is mostly prairie/grasslands with ephemeral marshes and ponds bordered on the east by the Gulf of Mexico and on the west by the Laguna Madre. The highest elevation is approximately fifty feet. The National Seashore is 70 miles long with 65.5 miles of Gulf beach. Most of the seashore is accessible only by four-wheel-drive vehicle.

The Gulf beach is composed of white sand and is less than a hundred feet wide. Much of it is firmly packed, except for a stretch of about forty miles, which becomes increasingly soft towards the center and is composed to a large degree of shells. Bordering the beach is a narrow dune ridge running throughout the park and almost the length of the entire island. Sometimes natural or unnatural forces create breaches in the dune ridge and sand blows through creating "blowout" dunes, which may drift across the island at the rate of as much as 35 feet per year until they become vegetated. Sometimes dune fields of many acres are formed.





FIGURE, I. PADRE ISLAND NS LOCATION

West of the dune ridge are the grasslands and marshes. Few trees exist on the island, and those that do are mostly mesquite, live oak, or willow. On the western shore of the island are extensive mudflats.

Park developments are confined to the northernmost 10 miles of the park and support park management and approximately 750,000 to 800,000 visitors annually (Table 1). In addition to the Malaquite Visitor Center and concession facility, there is a 1,150-vehicle parking lot, a park headquarters and ranger station, two park housing units (only one is occupied), a 40-site RV campground, and the Bird Island Basin boat dock that is operated by a concessionaire. A paved, two-lane Park Road 22 provides access to the park, westward to Bird Island Basin, and south to park headquarters and the Visitor Center and Malaquite Beach, at which point the Gulf beach becomes the primary transportation corridor south. The beach is hard and accessible by both two- and four-wheel drive vehicles for five miles at which point the beach corridor is accessible only by four-wheel vehicles. In total, existing park developments occupy 391 acres.



TABLE 1: PADRE ISLAND NATIONAL SEASHORE DEVELOPED AREAS

Name/Location	Function/Facilities
Park Headquarters	Headquarters Building, Ranger Building, Maintenance Shop, Automotive Shop, Carpenter Shop, Storage Garage, Turtle Lab, Greenhouse, Vehicle Fuel Tanks
Malaquite Visitor Center	Visitor Center, Concessionaire Food and Gift Shop, Shower Building, Auditorium, Campground
Bird Island Basin	Boat Ramp and Windsurfing Concessionaire

## 1.5 AIR QUALITY STATUS

Padre Island NS is located in Kleburg, Kenedy, and Willacy Counties, TX, which are classified as attainment for all the National Ambient Air Quality Standards (NAAQS). The Texas Commission on Environmental Quality administers the state's air pollution program. Padre Island NS is designated as a Class II air shed by the State of Texas, as authorized by the Clean Air Act. The park is protected by allowing limited increases over baseline concentrations of criteria pollutants. Air quality issues in and near the park relate to state- and federally-leased oil and gas operations in the park, Laguna Madre, and Gulf of Mexico.



## 2. STATIONARY AND AREA SOURCE EMISSIONS

This section summarizes emissions from stationary sources at the National Seashore for the year 2001. The discussion is divided into sections covering emissions from combustion sources, fuel storage sources, and area sources. The following emissions were calculated for each source: particulate matter (PM<sub>10</sub>), sulfur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>), and volatile organic compounds (VOCs). Emission factors and calculation procedures used are provided in Appendices A and B.

### 2.1 STATIONARY SOURCES

#### 2.1.1 Space And Water Heating Equipment

The fossil fuel heating sources at the National Seashore are propane furnaces at the park's headquarters and the Malaquite Visitor Center. All other NPS space and heating units are electric. Criteria emissions were calculated using the appropriate residential emission factors for propane. For example, NO<sub>x</sub> emissions from the five headquarter furnaces are calculated as follows:

$$286 \text{ gallons/yr} \times \frac{14 \text{ lb PM}}{1,000 \text{ gallons}} = 4 \text{ lb PM/yr}$$

Actual criteria pollutant emissions from heating equipment are summarized in Table 2. Potential emissions also were calculated by assuming that the furnaces were operated continuously during the year, and these emissions also are noted in Table 2.

**TABLE 2. 2001 ACTUAL AND POTENTIAL AIR EMISSIONS FROM PADRE ISLAND NATIONAL SEASHORE HEATING EQUIPMENT**

Location	No.	Fuel	Fuel Consumption	PM <sub>10</sub> (lbs/yr)	SO <sub>2</sub> (lbs/yr)	NO <sub>x</sub> (lbs/yr)	CO (lbs/yr)	CO <sub>2</sub> (lbs/yr)	VOC (lbs/yr)
<b>Actual Emissions</b>									
Headquarters	5	Propane	286	<1	0	4	1	3,571	<1
Visitor Center	2	Propane	114	<1	0	2	<1	1,429	<1
		Total	400	<1	0	6	1	5,000	<1
<b>Potential Emissions</b>									
Headquarters	5	Propane	38,295	15	0	536	73	478,689	11
Visitor Center	2	Propane	15,318	6	0	214	29	191,475	5
		Total	53,613	21	0	751	102	670,164	16

### 2.1.2 Generators

There are three NPS-owned generators in the National Seashore. Emissions were calculated by multiplying the unit rating (kW) of the generators by an estimated annual run time (hr/yr) to get the kW-hr/yr, and the appropriate emission factors were then applied. For example, PM emissions from the 15 kW diesel generator at the water treatment plant were calculated as:

$$15\text{kW} \times \frac{26 \text{ hours}}{\text{year}} \times \frac{1.34\text{hp}}{\text{kW}} \times \frac{0.0022 \text{ lb PM}}{\text{hp} - \text{hr}} = 11\text{lbPM/yr}$$

Potential emissions also were calculated for the generators. According to EPA guidance on calculating potential emissions from generators, 500 hours is an appropriate default assumption for estimating the number of hours that an emergency generator could be expected to operate. Actual and potential generator emissions are summarized in Table 3.

**TABLE 3. 2001 ACTUAL AND POTENTIAL AIR EMISSIONS FROM PADRE ISLAND NATIONAL SEASHORE GENERATORS**

Location	Rating (kW)	Run Time	PM <sub>10</sub> (lbs/yr)	SO <sub>2</sub> (lbs/yr)	NO <sub>x</sub> (lbs/yr)	CO (lbs/yr)	CO <sub>2</sub> (lbs/yr)	VOC (lbs/yr)
<b>Actual Emissions</b>								
Headquarters	5	26	0	0	1	0	--	0
Water Treatment Plant	15	26	1	0	16	3	601	1
Pump Station	5	26	0	0	5	1	200	0
Total			2	0	22	5	801	2
<b>Potential Emissions</b>								
Headquarters	5	500	1	5	12	3	--	1
Water Treatment Plant	15	500	22	1	312	67	11,558	25
Pump Station	5	500	7	0	104	22	3,853	8
Total			30	6	427	92	15,410	34

### 2.1.3 Fuel Storage Tanks

Padre Island NS has two gasoline and one diesel fuel aboveground storage tanks at headquarters that service NPS vehicles and other motorized equipment. There are no public automotive service stations in the park.

There are two basic types of VOC emissions from storage tanks: working losses and standing losses. Working losses are composed of both withdrawal and refilling loss emissions.

1 Calculating Potential to Emit (PTE) for Emergency Generators, Office of Air Quality Planning and Standards (MD-10) U.S. Environmental Protection Agency, September 6, 1995.

Withdrawal loss emissions result from the vaporization of liquid fuel residue on the inner surface of tank walls as the liquid levels in the tank are decreased and air is drawn into the tank. Refilling losses refer to fuel vapor releases to the air during the process of refilling the tank as the liquid level in the tank increases and pressurizes the vapor space. Standing losses describe those tank emissions from the vaporization of the liquid fuel in storage due to changes in ambient temperatures. VOC losses are also a direct function of the annual product throughput or turnovers. Emissions from diesel tanks are extremely small since the volatility of diesel fuel is extremely low compared to gasoline. VOC emissions from the NPS fuel storage tanks were calculated using the USEPA *TANKS* software program. *TANKS* is based on the emission estimation procedures from Chapter 7 of EPA's Compilation of Air Pollutant Emission Factors (AP-42) and uses chemical, meteorological, and other data to generate emission estimates for different types of storage tanks. Table 4 summarizes the emissions from the gasoline fuel tanks.

**TABLE 4: 2001 PADRE ISLAND NATIONAL SEASHORE FUEL TANK EMISSIONS**

Location	Product	Tank Type	Volume (gal)	Throughput (gal/yr)	VOC (lbs/yr)
Headquarters	Gasoline	AST	1,000	10,900	565
	Gasoline	AST	500	5,600	290
				Total	855

#### 2.1.4 Wastewater Treatment Plants

The National Seashore replaced a conventional wastewater treatment plant with a constructed wetlands treatment facility. Since the facility does not mechanically pump and otherwise treat effluent, VOC emissions are estimated to be minimal.

## 2.2 AREA SOURCES

### 2.2.1 Woodstoves

There are no woodstoves or fireplaces in the National Seashore.

### 2.2.2 Campfires

There is one campground at the Malaquite Visitor center with 50 sites, but there are no conventional campfire rings. However, beach fires are allowed in the park. Park officials do not keep statistics on beach fires, but they estimated that about 2,000 occur annually. Assuming that

each beach fire consumes approximately 10 pounds of wood, air emissions were calculated and are summarized in Table 5.

TABLE 5. 2001 ACTUAL AIR EMISSIONS FROM PADRE ISLAND NATIONAL SEASHORE BEACH FIRES

Location	Fires/Yr	Tons/Yr	PM <sub>10</sub> (lbs/yr)	SO <sub>2</sub> (lbs/yr)	NO <sub>y</sub> (lbs/yr)	CO (lbs/yr)	VOC (lbs/yr)
Beach	2,000	10	346	4	26	2,526	2,290

### 2.2.3 Wildland Fires and Prescribed Burning

Wildland fires are ignited naturally, usually by lightning, and are typically suppressed, while prescribed fires are ignited intentionally in order to achieve fire management objectives. Prescribed burning is a land treatment process to accomplish natural resource management objectives, including reducing the potential for destructive wildfires, eliminating excessive fuel buildup, controlling insects and disease, improving wildlife habitat and forage production, maintaining natural succession of plant communities, and restoring natural processes. Only prescribed burning emissions are considered as anthropogenic emissions; however, to the extent that prescribed burning is conducted to achieve ecological benefit, the emissions could be considered natural.

The First Order Fire Effects Model (FOFEM) was used to estimate emissions. FOFEM is a computer program developed by the Intermountain Fire Sciences Lab, U.S. Forest Service to predict the effects of prescribed fire and wildfire in forests and rangelands throughout the U.S. In particular, it quantifies emissions of PM<sub>10</sub>, PM<sub>2.5</sub>, CO, CO<sub>2</sub>, and CH<sub>4</sub>.

Historically, the park has not conducted prescribed burning. The number and size of wildfires has varied over the years; therefore, emissions from two years were calculated to illustrate the range of difference

TABLE 6: WILDFIRE AIR EMISSIONS FROM PADRE ISLAND NATIONAL SEASHORE

Year	Fuel Type	Acres	PM <sub>10</sub> (tons/yr)	PM <sub>2.5</sub> (tons/yr)	CO (tons/yr)	CO <sub>2</sub> (tons/yr)	VOC (tons/yr)
1999	Bluestem Grass	3,500	21	19	46	12,605	5
2001	Bluestem Grass	10	<1	<1	<1	36	<1

As methane

**2.2.4 Miscellaneous Area Sources**

Miscellaneous area sources include food preparation, degreasers, paints and other surface coatings, lighter fluid consumption, consumer solvents, and propane use by visitors in recreational vehicles. However, there are no data on the consumption of these materials, whose emissions are estimated to be negligible.

**2.3 Oil and Gas Operations**

The 1962 legislation for Padre Island NS provided for federal acquisition of the island surface. However, private entities or the State of Texas retained the subsurface oil and gas rights in the park. Oil and gas developments have been actively pursued on Padre Island since 1951. To date, 73 operations, predominantly gas, have occurred within the current boundaries of the park. At the present time, there are two active gas wells at the six-mile mark, two shut-in wells, and two new wells that were recently approved. The two active wells are powered by a compressor engine that is operated continuously. The size of the engine and the quantity of gas produced and consumed are not known. Therefore, it was assumed that the size of the engine is 150 horsepower, and calculated emissions are provided in Table 7.

**TABLE 7: EMISSIONS FROM GAS PRODUCTION AT PADRE ISLAND NATIONAL SEASHORE**

Combustion Unit	PM <sub>p</sub> (lbs/yr)	SO <sub>2</sub> (lbs/yr)	NO <sub>x</sub> (lbs/yr)	CO (lbs/yr)	C02 (lbs/yr)	VOC (lbs/yr)
Compressor	--	--	57,816	49,932	2,023,560	812

**2.4 SUMMARY OF STATIONARY AND AREA SOURCE EMISSIONS**

Table 8 summarizes the stationary and area source emissions calculated above in a format that allows comparison between the various sources as well as providing totals for each pollutant or pollutant category under consideration.

TABLE 8: SUMMARY OF 2001 STATIONARY AND AREA SOURCE EMISSIONS AT PADRE ISLAND NATIONAL SEASHORE

Activity	Particulates (PM~0)		Sulfur Dioxide		Nitrogen Oxides		Carbon Monoxide		Carbon Dioxide		VOCs	
	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr
<b>Stationary Sources</b>												
Heating Units	<1	<0.01	0	0	6	<0.01	1	<0.01	3,571	1.78	<1	<0.01
Generators	2	<0.01	0	0	22	0.01	5	<0.01	800	0.40	2	<0.01
Gasoline Storage Tanks											855	0.43
Stationary Sources Subtotal	2	<0.01	0	0	29	0.10	6	<0.01	4,371	2.19	857	0.43
<b>Area Sources</b>												
Beach Fires	346	0.17	4	<0.01	26	0.01	2,526	1.26	--	--	2,290	1.15
Wildland Fires (2001)	120	0.06	--	--	--	--	260	0.13	72,030	36	30 <sup>1</sup>	0.02
Area Source Subtotal	466	0.23	4	<0.01	26	0.01	2,786	1.39	72,030	36	2,320	1.16
<b>Oil and Gas Production</b>												
Gas Compressor Engine	0	0	0	0	28,908	14.45	24,966	12.48	1,011,780	506	406	0.20
<b>Totals</b>												
Totals without Wildland Fires	Particulates (PM <sub>10</sub> )		Sulfur Dioxide		Nitrogen Oxides		Carbon Monoxide		Carbon Dioxide		VOCs	
	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr
Totals without Wildland Fires	348	0.17	4	<0.01	28,963	14.48	27,498	13.75	1,016,151	508	3,553	1.78
Totals with Wildland Fires	468	0.23	4	<0.01	28,963	14.48	27,758	13.88	1,088,181	544	3,583	1.79

<sup>1</sup> As methane

### 3. MOBILE SOURCE EMISSIONS

This section summarizes emissions from mobile sources at the National Seashore for 2001. Mobile emission sources include highway and nonroad vehicles. The following emissions were calculated for each source: particulate matter (PM<sub>10</sub>), nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO), and volatile organic compounds (VOCs).

#### 3.1 VISITOR HIGHWAY VEHICLES

The principle paved road in the National Seashore extends in a north-south direction for approximately 10 miles from the northern park boundary to its terminus at Malaquite Beach. Beyond this point, both two-wheel and four-wheel drive vehicles can travel an additional five miles on hard-packed sand to the Milepost 5 marker, after which only four-wheel drive vehicles can travel on softer and uneven sand.

The number of visitor vehicles operating in NPS units is often correlated to the number of annual visitors to the park unit. Estimated visitors to the National Seashore in 2001 were approximately 655,000. In order to provide some estimate of visitor highway vehicle emissions, it was assumed that the average visitor per vehicle ratio was 2.8 and that the average vehicle traveled the approximate 15 mile roundtrip distance from the park's northern entrance to just beyond Malaquite Beach. This equates to a total estimated visitor vehicle-miles-traveled (VMT) of approximately 3,508,930 miles per year.

The majority of mobile source emissions can be categorized as either exhaust or evaporative emissions. Exhaust emissions are related to the combustion of fuel in the engine and include VOC, NO<sub>x</sub>, CO, and PM<sub>10</sub>. Exhaust emissions are dependent on a number of factors, including engine load, engine design and age, combustion efficiency, emissions equipment such as catalytic converters, and other factors. Evaporative emissions, which can occur while the vehicle is running or at rest, are related to the volatilization of fuel from vapor expansion, leaks and seepage, and fuel tank vapor displacement. Evaporative emissions are primarily dependent on daily temperature cycles and fuel volatility. In addition to vehicle exhaust, PM<sub>10</sub> emissions also result from brake and tire wear, as well as the re-entrainment of dust from paved and unpaved roads (referred to as fugitive dust).

Emission factors produced by the USEPA MOBILE6.2 model were used in conjunction with VMT data in order to estimate mobile source emissions for VOC (both exhaust and evaporative),

NO<sub>x</sub>, and CO. Similarly, emission factors produced by the PARTS model were used in conjunction with VMT data to estimate PM<sub>10</sub> emissions. MOBILE6.2 produces exhaust and evaporative emission factors for the following classes of vehicles: light duty gasoline vehicles (LDGV), light duty gasoline trucks 1 (LDGT1), light duty gasoline trucks 2 (LDGT2), heavy duty gasoline vehicles (HDGV), light duty diesel vehicles (LDDV), light duty diesel trucks (LDDT), heavy duty diesel vehicles (HDDV), and motorcycles. It also produces a composite emission factor for all vehicles based on the vehicle class mix supplied to the model. Inputs to the model include average vehicle speed, vehicle VMT mix, annual mileage accumulation rates and registration distributions by age, inspection and maintenance (UM) program information, fuel information, ambient temperature data, and others.

Both the MOBILE6.2 and PARTS models are typically used to support planning and modeling efforts in urban or regional areas, and include default inputs suited for these applications. Therefore it is suitable for applications over large, regional transportation networks. Application of the MOBILE6.2 model required the utilization of unique inputs that were representative of mobile source activity within the park. In particular, it was necessary to utilize unique inputs for the visitor vehicle class mix and the vehicle age distribution.

The Center for Environmental Research and Technology within the College of Engineering at the University of California's Riverside Campus (CE-CERT) established park-specific vehicle fleet characterizations in developing air emission inventories for Zion National Park (CE-CERT, 2001). CE-CERT found that the distribution of vehicle ages in the park reflected a larger fraction of newer vehicles than the overall model default vehicle age distribution. The vehicle fleet characterization developed by CE-CERT was applied in the mobile modeling for the NS.

In addition to VMT mix and age distribution, CE-CERT also established park-specific modeling inputs for driving pattern characterization. CE-CERT found that park driving patterns differ significantly from the default driving patterns typically used in mobile modeling, such as the Federal Test Procedure (FTP). In particular, they found that the FTP reflects both higher speeds and a wider range of speeds than observed in the parks. However, since the MOBILE6.2 model is not designed to readily incorporate unique driving pattern data, the default driving cycle remains the basis for the mobile source emission estimates provided here.

Other important mobile modeling inputs that can significantly affect mobile emission factors are the average speed, fuel characteristics, and I/M program parameters. The average speed input to the mobile models was assumed to be 35 mph. The fuel volatility was assumed to be RVP 13.5

(winter) and 7.8 (summer), and reformulated gasoline was not assumed to be present (EPA 2001).

In order to account for seasonal differences in mobile emissions, separate MOBILE6.2 runs were performed to produce emission factors for winter and summer. A composite emission factor for each season, reflecting a park specific VMT mix adapted from the CE-CERT data, served as the basis for mobile source emission estimates. Additional particulate emissions (or entrained road dust) from vehicles operating on paved roads also were calculated based on VMT. A summary of visitor vehicle emissions is provided in Table 10.

### 3.2 GSA/NPS HIGHWAY AND NONROAD VEHICLES

The National Seashore operates a fleet of 55 highway and all-terrain vehicles (ATVs) that are owned by the NPS or leased from the General Services Administration (GSA). The estimated aggregated vehicle-miles-traveled by park vehicles is provided in Table 9, and a summary of park highway vehicle emissions is provided in Table 10.

**TABLE 9: NPS ROAD VEHICLES AT PADRE ISLAND NS**

Vehicle Type	Number	Annual Usage (mi/yr)
Light-Duty Gasoline Vehicles	2	11,500
Light-Duty Gasoline Vehicles/Trucks	29	94,910
Heavy Duty Diesel Trucks	5	3,800
Total	54	213,848

The NPS also owns and operates a few pieces of nonroad motorized equipment, including 18 all-terrain vehicles (ATVs), that is used to maintain roads and grounds and for other purposes. Since there are no data regarding their usage, default values for emission factors and annual usage were derived from the USEPA Nonroad emission database (EPA, 1991) and used to calculate annual emissions, which also are provided in Table 13.

### 3.3 MARINE VESSELS

#### 3.3.1 Public Boating

Boating is a popular recreational activity especially in the Laguna Madre on the west side of the island. The number of boat launches at the Bird Island Basin on the northwest corner of the park was used to estimate the number of public boating trips in park waters. Since no additional data

were available, data from other parks where motorized boating activities occur were used. These include data on engine power, operating time, and engine load factors, which are noted in Appendix B along with emission factors. Estimated emissions from public boating are provided in Table 10

### **3.3.2 NPS Boats**

The NPS operates three boats that are powered by 2-stroke gasoline engines. Again, data on engine power, operating time, and engine load factors are noted in Appendix B along with emission factors, and emissions are provided in Table 10.

## **3.3 SUMMARY OF MOBILE SOURCE EMISSIONS**

Table 10 summarizes the mobile source emissions for road and nonroad vehicles and equipment operating on the National Seashore in 2001.

TABLE 10: SUMMARY OF 2001 MOBILE SOURCE EMISSIONS AT THE PADRE ISLAND NATIONAL SEASHORE

Activity	Particulates (PM <sub>10</sub> )		Sulfur	Dioxide	Nitrogen Oxides		Carbon Monoxide		VOCs	
	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr
	<b>Road Vehicles</b>									
Visitor Vehicles	6,747	3.37			9,000	4.50	110,993	55.50	7,530	3.77
GSA/NPS Road Vehicles	213 <sup>1</sup>	0.11	--	--	391	0.20	3,937	1.97	235	0.12
Road Vehicle Emission Subtotal	6,960 <sup>1</sup>	3.48	--	--	9,391	4.70	114,930	57.47	7,765	3.88
	<b>Nonroad Vehicles</b>									
NPS Nonroad Vehicles	325	0.16	--	--	1,311	0.66	740	0.37	373	0.19
Public Boating	889	0.44	--	--	137	0.07	26,703	13.35	13,438	6.72
NPS Boats	54	0.03	--	--	8	<0.01	1,625	0.81	818	0.41
Nonroad Vehicle Emission Subtotal	1,268	0.63	--	--	1,456	0.73	29,068	14.53	14,629	7.31
	<b>Totals</b>									
Totals	Particulates (PM <sub>10</sub> )		Sulfur	Dioxide	Nitrogen Oxides		Carbon Monoxide		VOCs	
	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr
	8,228	4.11	--	--	10,847	5.42	143,998	72.00	22,394	11.20

Includes exhaust PM<sub>10</sub> and road dust



## 4. PADRE ISLAND NATIONAL SEASHORE AND REGIONAL EMISSIONS

### 4.1 PADRE ISLAND NS SUMMARY

A summary of Padre Island NS emissions is provided in Table 11.

TABLE 11: ESTIMATED ANNUAL EMISSIONS FROM PADRE ISLAND NS

Source	PM <sub>1,0</sub> (tonsl/yr)	SO <sub>2</sub> (tons/yr)	NO <sub>x</sub> (tons/yr)	CO (tons/yr)	VOCs (tons/yr)
Point Sources					
Heating Equipment	<0.01	0	<0.01	<0.01	<0.01
Generators	<0.01	0	0.10	<0.01	<0.01
Gasoline Storage Tanks	--	--	--	--	0.43
Subtotal	<0.01	0	0.10	<0.01	0.43
Area Sources					
Beach Fires	0.17	<0.01	0.01	1.26	1.15
Wildland Fires	0.06	--	--	0.13	0.02
Subtotal	0.23	--	0.01	1.39	1.16
Oil and Gas Operations					
Gas Compressor Engine	--	--	14.45	12.48	0.20
Mobile Sources					
Road Vehicles	3.48	--	4.70	57.47	3.88
Nonroad Vehicles	0.63	--	0.73	14.53	7.31
Subtotal	4.11	--	5.42	72.00	11.20
Totals					
Totals	4.34	<0.01	19.98	85.87	12.99

As methane

### 4.2 REGIONAL AIR EMISSIONS

Emission estimates for Kleberg, Kenedy, and Willacy Counties and the state of Texas were obtained from the 1999 National Emission Inventory (NEI) maintained by USEPA. It is important to note that differences may exist between the methodologies used to generate the Padre Island NS emission inventory and those used to generate the NEI. For example, gasoline storage tanks have been included as stationary sources for the National Seashore, while the NEI treats them as area sources. Table 12 provides a comparison of the park's emissions with those from the surrounding counties and the State of Texas. The park's emissions are less than one percent of those from the surrounding counties for point, area, and mobile source categories.

**TABLE 12: ESTIMATED ANNUAL EMISSIONS FROM PADRE ISLAND NS,  
SURROUNDING COUNTIES, AND THE STATE OF TEXAS**

Area	PM <sub>10</sub> (tons/yr)	SO <sub>2</sub> (tons/yr)	NO <sub>x</sub> (tons/yr)	CO (tons/yr)	VOC (tons/yr)
Point Sources					
Padre Island NS	<0.01	0	0.10	<0.01	0.43
Kleburg County, TX	69	0	<1	426	750
Kenedy County, TX	5	37	340	142	192
Willacy County, TX	0	0	174	103	10
Surrounding Counties	74	37	514	671	952
Texas	54,700	977,386	920,494	463,370	251,840
Area Sources					
Padre Island NS	0.23	<0.01	<0.01	1.39	1.16
Kleburg County, TX	4,922	40	35	24	1,926
Kenedy County, TX	859	<1	<1	5	760
Willacy County, TX	9,042	13	26	93	1,050
Surrounding Counties	14,823	53	61	122	3,736
Texas	797,800	8,361	40,542	532,560	545,340
Mobile Sources					
Padre Island NS	4.11	--	5.42	72.00	11.20
Kleburg County, TX	1,067	191	1,789	9,015	1,728
Kenedy County, TX	108	67	607	4,759	2,131
Willacy County, TX	124	174	1,958	6,697	1,429
Surrounding Counties	1,299	432	4,354	20,471	5,288
Texas	1,873,475	113,121	1,274,494	5,161,011	600,335

## 5. COMPLIANCE AND RECOMMENDATIONS

### 5.1 COMPLIANCE

Padre Island NS is located in Kleburg, Kenedy, and Willacy Counties, TX. The Texas Commission on Environmental Quality (formerly, the Texas Natural Resources Conservation Commission) administers the state's air pollution program. Park personnel should coordinate with the agency on permit issues relating to stationary sources, as well as prescribed burning activities (see Appendix D for selected air quality regulations). Prior to replacing or adding relatively large heating units, generators, and fuel storage tanks, the Texas Administrative Code (TAC) should be consulted regarding the need to obtain a permit to construct or a permit to operate such sources. According to the TAC Chapter 106, current general exemptions to these pennits include:

- Natural gas or propane fuel burning equipment of less than 40 million Btu per hour heat input
- Stationary internal combustion engines rated less than 240 hp.

According to TAC Chapter 111, Subchapter B, outdoor burning, under certain conditions and without a peiiiiit, is allowed for:

- fires used solely for recreational or ceremonial purposes
- prescribed burning
- firefighting training.

The principal air quality issue in the vicinity of the park relates to oil and gas exploration and production. In addition to the two active wells on park property, approval to drill an additional two gas wells was granted in late 2002. Drilling and production of state-owned oil and gas is expected to continue from state tracts adjacent to the park boundaries, either on the east in the Gulf of Mexico, or on the west in the Laguna Madre. Exploration and development of federally-owned oil and gas in the Gulf of Mexico's outer continental shelf also will continue.

### 5.2 RECOMMENDATIONS

Actions to promote sustainable development in the design, retrofit, and construction of park facilities have associated air quality benefits. These include actions that reduce or replace consumption of conventional fossil fuels and/or reduce the consumption of other resources. Reductions in potable and non-potable water consumption also achieve concurrent reductions in

energy consumption and associated air emissions. Acquisition of energy efficient appliances whenever possible also is an incremental energy saving measure that has associated air quality benefits.

The park has undertaken a number of emission and energy reduction measures. Examples include:

- Two kW photovoltaic system to supply power for a seasonal cabin
- Skylights and energy efficient lighting at the Malaquite Visitor Center
- Removal of 25 percent of exterior lights at the Visitor Center to enhance night sky viewing
- Movement monitors and skylights at campground restrooms
- Elimination of electrical systems associated with the former wastewater treatment facility
- Propane-fueled Jeep

The park is also investigating the installation of vehicle refueling equipment for the existing propane tank at headquarters in order to procure propane-fueled vehicles from the General Services Administration. Several other recommendations include:

- the utilization of biodiesel fuel (e.g., B20) for both road and nonroad equipment
- the replacement of its 2-stroke gasoline boat engines with cleaner 4-stroke engines.

With respect to point and area sources, the natural gas-fired generator used by the oil and gas field operations is the most significant in Padre Island NS. Although there are few opportunities beyond limiting the number of sources or their operating times to reduce these emissions, the oil and gas operators should be made aware of their contributions to the park's total point and area source emissions. They should also be made aware that a good maintenance program to keep the equipment operating at optimal efficiency is very important to minimizing emissions, particularly CO and VOC emissions.

## 6. REFERENCES

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## **APPENDIX A**

### **FUEL DATA AND EMISSION FACTORS**



## FUEL DATA

Fuel	Heating Value	Sulfur Content
No. 2 Distillate Fuel Oil/Diesel	140,000 Btu/gal	0.05% by weight
Natural Gas	1,050 Btu/ft <sup>3</sup>	2,000 grains/10 <sup>6</sup> ft <sup>3</sup>
Propane	91,500 Btu/gal	0.18 grains/100 ft <sup>3</sup>

## STATIONARY SOURCE EMISSION FACTORS - BOILERS/HEATING UNITS

DISTILLATE OIL (DF-2) - CRITERIA POLLUTANTS					
Combustor Type	Emission Factor (lb/1,000 gal fuel burned)				
	PM <sup>(a)</sup>	SO <sub>2</sub> <sup>(b)</sup>	NO <sub>x</sub> <sup>(e)</sup>	CO	VOC <sup>(d)</sup>
Residential Furnace <sup>(e)</sup>	0.4	142S	18	5	0.713
Boilers < 100 Million Btu/hr (Commercial/Institutional Combust. <sup>(c)</sup> )	2	142S	20	5	0.34
Boilers < 100 Million Btu/hr (Industrial Boilers <sup>(f)</sup> )	2	142S	20	5	0.2
Boilers > 100 Million Btu/hr (Utility Boilers <sup>(h)</sup> )	2	157S	24	5	--

Source: AP-42, 5th Edition, Supplements A, B, C, D, and E, Tables 1.3-1 and 1.3-3.

NATURAL GAS - CRITERIA POLLUTANTS					
Combustor Type (MMBtu/hr Heat Input)	Emission Factor (lb/10 <sup>6</sup> ft <sup>3</sup> fuel burned)				
	PM <sup>o</sup>	SO <sub>2</sub>	NO <sub>x</sub> <sup>(e)</sup>	CO	VOC
Residential Furnaces (<0.3) -Uncontrolled	7.6	0.6	94	40	5.5
Tangential-Fired Boilers (All Sizes) -Uncontrolled	7.6	0.6	170	24	5.5
-Controlled-Flue gas recirculation	7.6	0.6	76	98	5.5
Small Boilers (<100) -Uncontrolled	7.6	0.6	100	84	5.5
-Controlled-Low NO <sub>x</sub> burners	7.6	0.6	50	84	5.5
-Controlled-Low NO <sub>x</sub> , burners/Flue gas recirculation	7.6	0.6	32	84	5.5
Large Wall-Fired Boilers (>100) -Uncontrolled (Pre-NSPS) <sup>(k)</sup>	7.6	0.6	280	84	5.5
-Uncontrolled (Post-NSPS) <sup>(k)</sup>	7.6	0.6	190	84	5.5
-Controlled-Low NO <sub>x</sub> burners	7.6	0.6	140	84	5.5
-Controlled-Flue gas recirculation	7.6	0.6	100	84	5.5

Source: AP-42, 5th Edition, Supplements A, B, C, D, and E, Tables 1.4-1 and 1.4-2.

## STATIONARY SOURCE EMISSION FACTORS - BOILERS/HEATING UNITS (Continued)

PROPANE (LPG) - CRITERIA POLLUTANTS					
Combustor Type	Emission Factor (lb/1,000 al fuel burned)				
	PM <sup>(a)</sup>	SOP <sup>(j)</sup>	NO <sub>x</sub> <sup>cc&gt;</sup>	CO	VOC <sup>~d)</sup>
Commercial Boilers <sup>(w)</sup>	0.4	0.10S	14	1.9	0.3
Industrial Boilers <sup>(s)</sup>	0.6	0.10S	19	3.2	0.3
Source: AP-42, 5th Edition, Supplements A, B, C, D, and E, Table 1.5-1.					

## STATIONARY SOURCE EMISSION FACTORS - GENERATORS

For generators rated at less than or equal to 448 kW (600 hp):

Fuel Type	Emission Factor (lb/hp-hr)				
	PM	SO <sub>2</sub>	NO <sub>x</sub>	CO	VOC
DF-2	2.20 E-03	2.05 E-03	0.031	6.68 E-03	2.51 E-03
Gasoline	7.21 E-04	5.91 E-04	0.011	0.439	0.022
Natural Gas/Propane	1.54 E-04	7.52 E-03(S)	3.53 E-03	8.6 E-04	1.92 E-04
Source: AP-42, 5th Edition, Supplements A, B, C, D, and E, Table 3.3-1 and 3.1-1					

For generators rated at greater than 448 kW (600 hp):

Fuel Type	Emission Factor (lb/hp-hr)				
	PM	SO <sub>x</sub> <sup>(b)</sup>	NO <sub>2</sub>	CO	VOC
DF-2	0.0007	(8.09 E-03)S	0.024	5.5 E-03	6.4 E-04
Source: AP-42, 5th Edition, Supplements A, B, C, D, and E, Table 3.4-1.					

## FIREPLACE EMISSION FACTORS

Fuel Type	Emission Factor (lb/ton)				
	PM <sup>(e)</sup>	SO <sub>x</sub>	NO <sub>x</sub> <sup>cc&gt;</sup>	CO	VOC
Wood	34.6	0.4	2.6	252.6	229.0
Source: AP-42, 5th Edition, Supplements A, B, C, D, and E, Table 1.9-1.					

## WOODSTOVE EMISSION FACTORS

Stove Type	Emission Factor (lb/ton)				
	PM <sup>0</sup>	SO <sub>x</sub>	NO <sub>x</sub> <sup>(c)</sup>	CO	VOC
Conventional	30.6	0.4	2.8	230.8	53
Noncatalytic	19.6	0.4	--	140.8	12
Catalytic	20.4	0.4	2.0	104.4	15

Source: AP-42, 5th Edition, Supplements A, B, C, D, and E, Table 1.10-1.

## STATIONARY SOURCE EMISSION FACTORS - SURFACE COATING OPERATIONS

Surface Coating Type	VOC Emission Factor (lb/gal)
Paint: Solvent Base	5.6
Paint: Water Base	1.3
Enamel: General	3.5
Lacquer: General	6.1
Primer: General	6.6
Varnish/Shellac: General	3.3
Thinner: General	7.36
Adhesive: General	4.4

Source: *Calculation Methods for Criteria Air Pollutant Emission Inventories*, AL/OE-TR-1994-0049, July 1994. Armstrong Laboratory.

- (a) PM = Filterable Particulate Matter.
- (b) These factors must be multiplied by the fuel sulfur content (for example, if the sulfur content is 0.05%, then S equals 0.05).
- (c) Expressed as NO<sub>2</sub>.
- (d) Emission factors given in AP-42 are actually for non-methane total organic compounds (NMTOC) which includes all VOCs and all exempted organic compounds (such as ethane, toxics and HAPs, aldehydes and semivolatile compounds) as measured by EPA reference methods.
- (e) Unit Rating <300,000 Btu/hr.
- (f) Unit Rating 3300,000 Btu/hr, but <10,000,000 Btu/hr.
- (g) Unit Rating 310,000,000 Btu/hr, but <100,000,000 Btu/hr.
- (h) Unit Rating 3100,000,000 Btu/hr.
- (i) POM = Particulate POM only.
- (j) PM = Filterable Particulate Matter + Condensable Particulate Matter.
- (k) NSPS = New Source Performance Standard as defined in 40 CFR 60 Subparts D and Db. Post-NSPS units are boilers with greater than 250 MMBtu/hr of heat input that commenced construction, modification, or reconstruction after August 17, 1971, and units with heat input capacities between 100 and 250 MMBtu/hr that commenced construction, modification, or reconstruction after June 19, 1984.
- (l) Emission factors are given on a fuel input basis (lb/MMBtu). To convert to a power output basis (lb/hp-hr), use an average brake-specific fuel consumption (BSFC) of 7,000 Btu/hp-hr.



**APPENDIX B**  
**EMISSION CALCULATIONS**

**2001 ACTUAL CRITERIA EMISSIONS FROM HEATING UNITS AT PADRE ISLAND NATIONAL SEASHORE**

Emission Source	Location	Fuel	Number of Sources	Capacity (Btu/hr)	Consumption (gal/yr)	PM <sub>10</sub> (lbs/yr)	SO <sub>2</sub> (lbs/yr)	NO <sub>x</sub> (lbs/yr)	CO (lbs/yr)	CO <sub>2</sub> (lbs/yr)	VOC (lbs/yr)	
Furnace	Headquarters	Propane	5	80,000	400,000	286	0.11	0.00	4.00	0.54	3,571	0.09
Furnace	Visitor Center	Propane	2	80,000	160,000	114	0.05	0.00	1.60	0.22	1,429	0.03
<b>Propane Totals</b>			<b>5</b>	<b>160,000</b>	<b>560,000</b>	<b>400</b>	<b>0.16</b>	<b>0.00</b>	<b>5.60</b>	<b>0.76</b>	<b>5,000.00</b>	<b>0.12</b>
Emission Factors from AP-42, Tables 1.5-1 for commercial boilers, S=.05						0.4	0.005	14	1.90	12,500	0.3	
Formula = Consumption (gal/yr) * Emission Factor (lb/1,000 gal)												

**2001 POTENTIAL CRITERIA EMISSIONS FROM HEATING UNITS AT PADRE ISLAND NATIONAL SEASHORE**

Emission Source	Location	Fuel	Number of Sources	Capacity (Btu/hr)	Consumption (gal/yr)	PM <sub>10</sub> (lbs/yr)	SO <sub>2</sub> (lbs/yr)	NO <sub>x</sub> (lbs/yr)	CO (lbs/yr)	CO <sub>2</sub> (lbs/yr)	VOC (lbs/yr)
Furnace	Headquarters	Propane	5	80,000	38,295	15	0	536	73	478,689	11
Furnace	Visitor Center	Propane	2	80,000	15,318	6	0	214	29	191,475	5
<b>Propane Totals</b>			<b>5</b>	<b>80,000</b>	<b>53,613</b>	<b>21</b>	<b>0</b>	<b>751</b>	<b>102</b>	<b>670,164</b>	<b>16</b>
Emission Factors from AP-42, Tables 1.5-1 for commercial boilers, S=.05						0.4	0.005	14	1.90	12,500	0.3
Formula = Consumption (gal/yr) * Emission Factor (lb/1,000 gal)											



## TANKS 4.0

### Emissions Report - Summary Format

### Tank Identification and Physical Characteristics

**Identification**

User Identification:	Padre Island NS
City:	Corpus Christi
State:	Texas
Company:	NPS
Type of Tank:	Horizontal Tank
Description:	1,000 gallon AST

**Tank Dimensions**

Shell Length (ft):	10.75
Diameter (ft):	4.00
Volume (gallons):	1,000.00
Turnovers:	0.00
Net Throughput (gal/yr):	10,900.00
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N

**Paint Characteristics**

Shell Color/Shade:	Gray/Medium
Shell Condition:	Good

**Breather Vent Settings**

Vacuum Settings (psig):	-0.03
Pressure Settings (psig):	0.03

Meteorological Data used in Emissions Calculations: Corpus Christi, Texas (Avg Atmospheric Pressure = 14.7 psia)

## TANKS 4.0 Emissions Report - Summary Format Liquid Contents of Storage Tank

Mixture/Component	Month	Daily Liquid Surf. Temperatures (deg F)			Liquid Bulk Temp. (deg F)	Vapor Pressures (psia)			Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
		Avg.	Min.	Max.		Avg.	Min.	Max.					
Gasoline (RVP 8)	All	81.05	70.74	91.36	74.63	6.0609	4.9914	7.3064	68.0000			92.00	Option 4: RVP=8, ASTM Slope=3

### TANKS 4.0 Emissions Report - Summary Format Individual Tank Emission Totals

#### Annual Emissions Report

Components	Losses(lbs)		Total Emissions
	Working Loss	Breathing Loss	
Gasoline (RVP 8)	106.96	457.95	564.91

**TANKS 4.0**  
**Emissions Report - Summary Format**  
**Tank Identification and Physical Characteristics**

**Identification**

User Identification:	Padre Island 1
City:	Corpus Christi
State:	Texas
Company:	NPS
Type of Tank:	Horizontal Tank
Description:	500 gallon AST

**Tank Dimensions**

Shell Length (ft):	5.50
Diameter (ft):	4.00
Volume (gallons):	500.00
Turnovers:	0.00
Net Throughput (gal/yr):	5,600.00
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N

**Paint Characteristics**

Shell Color/Shade:	Gray/Medium
Shell Condition:	Good

**Breather Vent Settings**

Vacuum Settings (psig):	-0.03
Pressure Settings (psig):	0.03

Meteorological Data used in Emissions Calculations: Corpus Christi, Texas (Avg Atmospheric Pressure = 14.7 psia)

## TANKS 4.0

### Emissions Report - Summary Format

### Liquid Contents of Storage Tank

Mixture/Component	Month	Daily Liquid Surf. Temperatures (deg F)			Liquid Bulk Temp. (deg F)	Vapor Pressures (psia)			Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
		Avg.	Min.	Max.		Avg.	Min.	Max.					
Gasoline (RVP 8)	All	81.05	70.74	91.36	74.63	6.0609	4.9914	7.3064	68.0000			92.00	Option 4: RVP=8, ASTM Slope=3

**TANKS 4.0**  
**Emissions Report - Summary Format**  
**Individual Tank Emission Totals**

**Annual Emissions Report**

Components	Losses(lbs)		
	Working Loss	Breathing Loss	Total Emissions
Gasoline (RVP 8)	54.95	234.30	289.25

**2001 ACTUAL EMISSIONS FROM BEACH FIRES AT PADRE ISLAND NATIONAL SEASHORE**

<u>Location</u>	<u>Fires/Yr</u>	<u>Tons/Yr</u>	<u>PKa</u> <u>(lbs/yr)</u>	<u>SO<sub>2</sub></u> <u>(lbs/yr)</u>	<u>NO<sub>x</sub></u> <u>(lbs/yr)</u>	<u>CO</u> <u>(lbs/yr)</u>	<u>VOC</u> <u>(lbs/yr)</u>
Beach	2,000	10	346	4	26	2,526	2,290

  

Emission factors Ohs/ton)				
<u>PM<sub>10</sub></u>	<u>SO<sub>2</sub></u>	<u>NO<sub>x</sub></u>	<u>CO</u>	<u>VOC</u>
34.6	0.4	2.6	252.6	229



TITLE: Results of FOFEM model execution on date: 4/9/2003

FUEL CONSUMPTION CALCULATIONS

Region: Interior West  
 Cover Type: SAF/SRM - SRM 720 - Sand Bluestem - Little Bluestem Dunes  
 Fuel Type: Natural  
 Fuel Reference: FOFEM 301

Fuel Component Name	FUEL CONSUMPTION TABLE				Equation Reference Number	Moisture
	Preburn Load (t/acre)	Consumed Load (t/acre)	Postburn Load (t/acre)	Percent Reduced (%)		
Litter	0.00	0.00	0.00	0.0	999	
Wood (0-1/4 inch)	0.00	0.00	0.00	0.0	999	
Wood (1/4-1 inch)	0.00	0.00	0.00	0.0	999	25.0
Wood (1-3 inch)	0.00	0.00	0.00	0.0	999	
Wood (3+ inch) Sound	0.00	0.00	0.00	0.0	999	20.0
3->6	0.00	0.00	0.00	0.0		
6->9	0.00	0.00	0.00	0.0		
9->20	0.00	0.00	0.00	0.0		
20->	0.00	0.00	0.00	0.0		
Wood (3+ inch) Rotten	0.00	0.00	0.00	0.0	999	20.0
3->6	0.00	0.00	0.00	0.0		
6->9	0.00	0.00	0.00	0.0		
9->20	0.00	0.00	0.00	0.0		
20->	0.00	0.00	0.00	0.0		
Duff	0.00	0.00	0.00	0.0	2	100.0
Herbaceous	2.25	2.03	0.22	90.0	221	
Shrubs	0.00	0.00	0.00	0.0	23	
Crown foliage	0.00	0.00	0.00	0.0	37	
Crown branchwood	0.00	0.00	0.00	0.0	38	
<b>Total Fuels</b>	<b>2.25</b>	<b>2.03</b>	<b>0.22</b>	<b>90.0</b>		

FIRE EFFECTS ON FOREST FLOOR COMPONENTS

Forest Floor Component	Preburn Condition	Amount Consumed	Postburn Condition	Percent Reduced	Equation Number
Duff Depth (in)	0.0	0.0	0.0	0.0	6
Min Soil Exp (%)	.0	21.9	21.9	21.9	10

	Emissions -- lbs/acre		
	flaming	smoldering	total
PM 10	12	0	12
PM 2.5	11	0	11
CH 4	3	0	3
CO	26	0	26
CO 2	7203	0	7203

	Consumption tons/acre	Duration hour:min:sec
Flaming:	2.03	00:01:00
Smoldering:	0.00	00:00:00
Total:	2.03	

**2001 WILDFIRE EMISSIONS AT PADRE ISLAND NATIONAL SEASHORE**

Year	Acres	PM <sub>10</sub> (lbs/yr)	PM <sub>2.5</sub> (lbs/yr)	CH <sub>4</sub> (lbs/yr)	CO (lbs/yr)	CO <sub>2</sub> (lbs/yr)	PM <sub>10</sub> (tons/yr)	PM <sub>2.5</sub> (tons/yr)	CH <sub>4</sub> (tons/yr)	CO (tons/yr)	CO <sub>2</sub> (tons/yr)
1999	3,500	42,000	38,500	10,500	91,000	25,210,500	21.00	19.25	5.25	45.50	12,605
2001	10	120	110	30	260	72,030	0.06	0.06	0.02	0.13	36

Emission Factors (lbs/acre)

Vegetation	PM <sub>10</sub>	PM <sub>2.5</sub>	CH <sub>4</sub>	CO	CO <sub>2</sub>
Sand Bluestem	12	11	3	26	7,203

**2001 ACTUAL CRITERIA EMISSIONS FROM GAS COMPRESSORS AT PADRE ISLAND NATIONAL SEASHORE**

Emission Source	Fuel	Number of Sources	Rating (hp)	Run Time (hrs/yr)	Output (hp-hr/yr)	PM (lbs/yr)	SO <sub>2</sub> (lbs/yr)	NO <sub>x</sub> (lbs/yr)	CO (lbs/yr)	CO <sub>2</sub> (lbs/yr)	VOC (lbs/yr)
Compressor	Natural Gas	1	150	8,760	1,314,000	0	0	28,908	24,966	1,011,780	406

Emission Factors from AP-42, Chapter 3.2 for natural gas compressor engines      0.00E+00   0.00E+00   2.20E-02   1.90E-02   7.70E-01   3.09E-04



#####

Padre Island NS Winter Conditions.

File 1, Run 1, Scenario 25.

#####

M584 Warning:

The user supplied area wide average speed of 35.0 will be used for all hours of the day. 100% of VMT has been assigned to a fixed combination of freeways, freeway ramps, arterial/collector and local roadways for all hours of the day and all vehicle types.

Reading PM Gas Carbon ZML Levels  
from the external data file PMGZML.CSV

Reading PM Gas Carbon DR1 Levels  
from the external data file PMGDR1.CSV

Reading PM Gas Carbon DR2 Levels  
from the external data file PMGDR2.CSV

Reading PM Diesel Zero Mile Levels  
from the external data file PMDZML.CSV

Reading the First PM Deterioration Rates  
from the external data file PMDDR1.CSV

Reading the Second PM Deterioration Rates  
from the external data file PMDDR2.CSV

User supplied gasoline sulfur content = 300.0 ppm.

M616 Comment:

User has supplied post-1999 sulfur levels.

M 48 Warning:

there are no sales for vehicle class HDGV8b

Calendar Year: 2001  
Month: Jan.  
Altitude: Low  
Minimum Temperature: 50.0 (F)

Maximum Temperature: 70.0 (F)  
 Absolute Humidity: 75. grains/lb  
 Nominal Fuel RVP: 13.5 psi  
 Weathered RVP: 13.5 psi  
 Fuel Sulfur Content: 299. ppm

Exhaust I/M Program: No  
 Evap I/M Program: No  
 ATP Program: No  
 Reformulated Gas: No

Vehicle Type:	LDGV	LDGT12	LDGT34	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
GVWR:		<6000	>6000	(All)						
VMT Distribution:	0.7002	0.1410	0.1044		0.0060	0.0008	0.0016	0.0180	0.0280	1.0000

Composite Emission Factors (g/mi):

Composite VOC :	1.130	1.202	1.061	1.142	0.861	0.382	0.420	0.248	2.60	1.155
Composite CO	15.67	20.25	18.96	19.70	9.07	1.136	0.803	2.676	11.38	16.229
Composite NOX :	0.740	1.040	1.218	1.116	4.212	1.267	1.214	16.505	1.40	1.157

Veh. Type:	LDGT1	LDGT2	LDGT3	LDGT4	LDDT12	LDDT34
VMT Mix:	0.0330	0.1080	0.0719	0.0325	0.0000	0.0016

Composite Emission Factors (g/mi):

Composite VOC :	1.144	1.220	1.039	1.111	1.825	0.386
Composite CO	19.32	20.53	18.83	19.24	3.124	0.746
Composite NOX :	0.816	1.109	1.100	1.480	2.602	1.180

Veh. Type:	HDGV2B	HDGV3	HDGV4	HDGV5	HDGV6	HDGV7	HDGV8A	HDGV8B
VMT Mix:	0.0060	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Composite Emission Factors (g/mi):

Composite VOC :	0.861	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Composite CO	9.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Composite NOX :	4.212	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Veh. Type:	HDDV2B	HDDV3	HDDV4	HDDV5	HDDV6	HDDV7	HDDV8A	HDDV8B
------------	--------	-------	-------	-------	-------	-------	--------	--------

VMT Mix: 0.0020 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

-----  
Composite Emission Factors (g/mi):

Composite VOC :	0.184	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Composite CO :	0.788	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Composite NOX :	4.069	0.000	0.000	0.000	0.000	0.000	0.000	0.000

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\* #####  
k Padre Island NS Summer Conditions.

k File 1, Run 1, Scenario 26.

\* #####

M584 Warning:

The user supplied area wide average speed of 35.0  
will be used for all hours of the day. 100% of VMT  
has been assigned to a fixed combination of freeways,  
freeway ramps, arterial/collector and local roadways  
for all hours of the day and all vehicle types.

\* Reading PM Gas Carbon ZML Levels

\* from the external data file PMGZML.CSV

\* Reading PM Gas Carbon DR1 Levels

\* from the external data file PMGDR1.CSV

\* Reading PM Gas Carbon DR2 Levels

\* from the external data file PMGDR2.CSV

\* Reading PM Diesel Zero Mile Levels

\* from the external data file PMDZML.CSV

\* Reading the First PM Deterioration Rates

\* from the external data file PMDDR1.CSV

\* Reading the Second PM Deterioration Rates

\* from the external data file PMDDR2.CSV

User supplied gasoline sulfur content = 300.0 ppm.

M616 Comment:

User has supplied post-1999 sulfur levels.





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\* Padre Island NS Winter Conditions.

\* File 1, Run 1, Scenario 25.

^ #####

Calendar Year: 2001  
 Month: Jan.  
 Gasoline Fuel Sulfur Content: 299. ppm  
 Diesel Fuel Sulfur Content: 500. ppm  
 Particle Size Cutoff: 10.00 Microns  
 Reformulated Gas: No

Vehicle Type:	LDGV	LDGT12	LDGT34	LDGT	HDGV	LDDV	LDDT	HDDV	MC	AlIVeh
GVWR:		<6000	,6000	(All)						
vMz Distribution:	0.7002	0.1410	0.1044		0.0060	0.0008	0.0016	0.0180	0.0280	1.0000
ComDoaite Emission Factors (g/mi):										
Lead:	0.0000	0.0000	0.0000	0.0000	0.0000	-----	-----	-----	0.0000	0.0000
GASPM:	0.0042	0.0047	0.0044	0.0046	0.0523	-----	-----	-----	0.0205	0.0050
ECARBON:	-----	-----	-----	-----	-----	0.1244	0.0488	0.1250	-----	0.0024
OCARBON:	-----	-----	-----	-----	-----	0.0351	0.0703	0.0997	-----	0.0019
804:	0.0028	0.0049	0.0047	0.0048	8.0118	0.0049	0.0106	0.0540	0.0010	0.0043
Total Exhaust PM:	0.0071	0.0096	0.0091	0.0094	0.0640	0.1644	0.1297	0.2786	0.0215	0.0136
Brake:	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	8.0125
Tire:	0.0080	0.0080	0.0080	0.0080	0.0088	0.0080	0.0080	0.0115	0.8040	0.8080
Total PM:	0.0376	0.0302	0.0297	0.0300	0.0846	0.1849	0.1503	0.3027	0.0380	0.0341
SO2:	0.0684	0.0804	0.1134	0.0944	0.1603	0.0939	0.2028	0.7715	0.032e	0.0872
NH3:	0.1016	0.1005	0.1015	0.1009	0.0451	0.0068	0.0068	0.0270	0.0113	0.0970
Idle Emissions (g/hr)										
PM Idle:	-----	-----	-----	-----	-----	-----	-----	1.0557	-----	0.0190

Veh. Type:	LDGT1	LDGT2	LDGT3	LDGT4	LDDT12	LDDT34
nM7 Mix:	0.0330	0.1080	0.0719	0.0325	0.0000	0.0016

ComDooite Emission Factors (g/mi):						
Lead:	0.0000	0.0000	0.0000	0.0000	-----	-----
GASPM:	0.0047	0.0047	0.0044	0.0044	-----	-----
ECARBON:	-----	-----	-----	-----	0.2u98	0.0464
oCARBmn:	-----	-----	-----	-----	0.3I56	0.0668



Total PM:	0.1426	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
S02:	0.2452	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NH3:	0.0270	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Idle Emissions (g/hr)									
PM Idle:	1.0617	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

# tF # tt # # # # # th # # # # # # # # # # tt # tt #  
 Padre Island NS Summer Conditions.  
 1, Run 1, Scenario 26.

Calendar Year: 2001  
 Month: July  
 Gasoline Fuel Sulfur Content: 299. ppm  
 Diesel Fuel Sulfur Content: 500. ppm  
 Particle Size Cutoff: 10.00 Microns  
 Reformulated Gas: No

Vehicle Type:	LDGV	LDGT12	LDGT34	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
GVWR:		<6000	>6000	(All)						
VMT Distribution:	0.7002	0.1410	0.1044		0.0060	0.0008	0.0016	0.0180	0.0280	1.0000

Composite Emission Factors (g/mi):

Lead:	0.0000	0.0000	0.0000	0.0000	0.0000	-----	-----	-----	0.0000	0.0000
GASPM:	0.0042	0.0046	0.0044	0.0045	0.0523	-----	-----	-----	0.0205	0.0050
ECARBON:	-----	-----	-----	-----	-----	0.1192	0.0485	0.1160	-----	0.0023
OCARBON:	-----	-----	-----	-----	-----	0.0336	0.0698	0.0926	-----	0.0018
S04:	0.0028	0.0049	0.0047	0.0048	0.0120	0.0049	0.0106	0.0540	0.0010	0.0042
Total Exhaust PM:	0.0070	0.0095	0.0091	0.0093	0.0643	0.1576	0.1289	0.2626	0.0215	0.0133
Brake:	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125
Tire:	0.0080	0.0080	0.0080	0.0080	0.0080	0.0080	0.0080	0.0116	0.0040	0.0080
Total PM:	0.0276	0.0300	0.0297	0.0299	0.0848	0.1782	0.1494	0.2867	0.0380	0.0338
S02:	0.0684	0.0804	0.1134	0.0944	0.1601	0.0929	0.2031	0.7714	0.0328	0.0872
NH3:	0.1016	0.1007	0.1015	0.1010	0.0451	0.0068	0.0068	0.0270	0.0113	0.0970
Idle Emissions (g/hr)										
PM Idle:	-----	-----	-----	-----	-----	-----	-----	1.0472	-----	0.0189

Veh. Type:	LDGT1	LDGT2	LDGT3	LDGT4	LDDT12	LDDT34
VMT Mix:	0.0330	0.1080	0.0719	0.0325	0.0000	0.0016

Composite Emission Factors (g/mi):

Lead:	0.0000	0.0000	0.0000	0.0000	-----	-----
GASPM:	0.0046	0.0046	0.0044	0.0044	-----	-----
ECARBON:	-----	-----	-----	-----	0.1498	0.0464
OCARBON:	-----	-----	-----	-----	0.2156	0.0668
S04:	0.0049	0.0049	0.0047	0.0047	0.0062	0.0107
Total Exhaust PM:	0.0095	0.0095	0.0091	0.0091	0.3717	0.1238
Brake:	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125
Tire:	0.0080	0.0080	0.0080	0.0080	0.0080	0.0080
Total PM:	0.0300	0.0300	0.0297	0.0297	0.3922	0.1444
SO2:	0.0804	0.0804	0.1134	0.1134	0.1196	0.2049
NH3:	0.1007	0.1007	0.1015	0.1015	0.0068	0.0068
Idle Emissions (g/hr)						
PM Idle:			-----	-----	-----	-----

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Veh. Type:	HDGV2B	HDGV3	HDGV4	HDGV5	HDGV6	HDGV7	HDGV8A	HDGV8B
VMT Mix:	0.0060	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

---

Composite Emission Factors (g/mi):

Lead:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
GASPM:	0.0523	0.0523	0.0506	0.0506	0.0506	0.0506	0.0505	0.0000
ECARBON:	-----	-----	-----	-----	-----	-----	-----	-----
OCARBON:	-----	-----	-----	-----	-----	-----	-----	-----
S04:	0.0120	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total Exhaust PM:	0.0643	0.0523	0.0506	0.0506	0.0506	0.0506	0.0505	0.0000
Brake:	0.0125	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tire:	0.0080	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total PM:	0.0848	0.0523	0.0506	0.0506	0.0506	0.0506	0.0505	0.0000
SO2:	0.1601	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NH3:	0.0451	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Idle Emissions (g/hr)								
PM Idle:	-----	-----	-----	-----	-----	-----	-----	-----

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Veh. Type:	HDDV2B	HDDV3	HDDV4	HDDV5	HDDV6	HDDV7	HDDV8A	HDDV8B
VMT Mix:	0.0020	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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Composite Emission Factors (g/mi):

Lead:  
GASPM:

ECARBON:	0.0503	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
OCARBON:	0.0523	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SO4:	0.0171	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total Exhaust PM:	0.1198	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Brake:	0.0125	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tire:	0.0080	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total PM:	0.1403	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SO2:	0.2450	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NH3:	0.0270	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Idle Emissions (g/hr)									
PM Idle:	1.0504	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
-----									

**PADRE ISLAND NATIONAL SEASHORE VISITOR VEHICLE EMISSIONS**

<u>Visitors/Yr</u>	<u>Vehicles/Yr</u>	<u>Annual VMT</u>
655,000	233,929	3,508,929

**Emission Factors (glmi) - All Vehicles**  
**PM<sub>10</sub> (Paved)**

	<u>NOx</u>	<u>CO</u>	<u>VOC</u>	<u>Exhaust, Brake, and Tire</u>	<u>Fugitive</u>	<u>Total</u>
Summer	1.175	12.527	0.796	0.0338	0.84	0.8738
Winter	1.157	16.229	1.155	0.0341	0.84	0.8741
Average	1.166	14.378	0.976			0.874

**Emissions (tons/yr) - All Vehicles**

<u>NOx</u>	<u>CO</u>	<u>VOC</u>	<u>Paved PM<sub>10</sub></u>
4.50	55.50	3.77	3.37

**Emissions (lbs/yr) - All Vehicles**

<u>NOx</u>	<u>CO</u>	<u>VOC</u>	<u>Paved PM<sub>10</sub></u>
9,001	110,993	7,531	6,747

PADRE ISLAND NATIONAL SEASHORE NPS AND GSA VEHICLES

	<u>LDGV</u>	<u>LDGT</u>	<u>LDDT</u>	<u>HDDV</u>	<u>Total</u>	
Total Miles	11,500	94,910	0	3,800	110,210	
<b>Emission Factors (glmi) - LDGV</b>						
						<u>PM<sub>10</sub></u>
				<u>Exhaust, Brake, and Tire</u>		
	<u>NOx</u>	<u>CO</u>	<u>VOC</u>	<u>Fugitive</u>		<u>Total</u>
Summer	0.7730	12.1300	0.7260	0.0276	0.8400	0.8676
Winter	0.7400	15.6700	1.1300	0.0276	0.8400	0.8676
Average	0.7565	13.9000	0.9280			0.8676
<b>Emissions (tons/yr) - LDGV</b>						
	<u>NOx</u>	<u>CO</u>	<u>VOC</u>			<u>PM<sub>10</sub></u>
	0.01	0.18	0.01			0.01
<b>Emission Factors (glmi) - LDGT</b>						
						<u>PM<sub>10</sub></u>
				<u>Exhaust, Brake, and Tire</u>		
	<u>NOx</u>	<u>CO</u>	<u>VOC</u>	<u>Fugitive</u>		<u>Total</u>
Summer	1.134	14.430	0.861	0.030	0.840	0.870
Winter	1.116	19.700	1.142	0.030	0.840	0.870
Average	1.125	17.065	1.002			0.870
<b>Emissions (tons/yr) - LDGT</b>						
	<u>NOx</u>	<u>CO</u>	<u>VOC</u>			<u>PM<sub>10</sub></u>
	0.12	1.78	0.10			0.09
<b>Emission Factors (glmi) - LDDT</b>						
						<u>PM<sub>10</sub></u>
				<u>Exhaust, Brake, and Tire</u>		
	<u>NOx</u>	<u>CO</u>	<u>VOC</u>	<u>Fugitive</u>		<u>Total</u>
Summer	1.239	0.945	0.461	0.149	0.840	0.989
Winter	1.212	0.931	0.439	0.150	0.840	0.990
Average	1.226	0.938	0.450			0.990
<b>Emissions (tons/yr) - HDGV</b>						
	<u>NOx</u>	<u>CO</u>	<u>VOC</u>			<u>PM<sub>10</sub></u>
	0.00	0.00	0.00			0.00
<b>Emission Factors (glmi) - HDDV</b>						
						<u>PM<sub>10</sub></u>
				<u>Exhaust, Brake, and Tire</u>		
	<u>NOx</u>	<u>CO</u>	<u>VOC</u>	<u>Fugitive</u>		<u>Total</u>
Summer	16.262	2.642	0.239	0.287	0.840	1.127
Winter	16.505	2.676	0.248	0.303	0.840	1.143
Average	16.384	2.659	0.244			1.135
<b>Emissions (tons/yr) - HDDV</b>						
	<u>NOx</u>	<u>CO</u>	<u>VOC</u>			<u>PM<sub>10</sub></u>
	0.07	0.01	0.00			0.00
<b>Emissions (tons/yr) - Total</b>						
	<u>NOx</u>	<u>CO</u>	<u>VOC</u>			<u>PM<sub>10</sub></u>
	0.20	1.97	0.12			0.11
<b>Emissions (lbs/yr) - Total</b>						
	<u>NOx</u>	<u>CO</u>	<u>VOC</u>			<u>PM<sub>10</sub></u>
	391	3,937	235			213

**2001 PADRE ISLAND NATIONAL SEASHORE NONROAD VEHICLE EMISSIONS**

Vehicle	No.	Emission Factors (gm/hp-hr)				hp	load	hrs/yr	Emissions (lbs/yr)				
		PM	Nox	CO	VOC				PM	Nox	CO	VOC	
Utility Cart	0	2.04	1.03	2.31	2.19	15	0.55	75	0.0	0.0	0.0	0.0	
Tractors		2.04	1.03	2.31	2.19	42.35	0.68	80	0.0	0.0	0.0	0.0	
Backhoe	1	2.04	1.03	2.31	2.19	77	0.55	660	125.4	63.3	142.0	134.7	
Riding Mower	0	1.11	10.3	4.8	1.3	15	0.55	60	0.0	0.0	0.0	0.0	
Brush Mower	0	1.11	10.3	4.8	1.3	15	<b>0.55</b>	40	0.0	0.0	0.0	0.0	
Bobcat	0	2.04	1.03	2.31	2.19	15	0.55	300	0.0	0.0	0.0	0.0	
Dozer	0	2.04	1.03	2.31	2.19	77	0.55	300	0.0	0.0	0.0	0.0	
Grader	1	1.06	9.6	3.8	1.43	172	0.61	100	24.5	221.6	87.7	33.0	
Forklift	1	1.06	9.6	3.8	1.43	172	0.61	175	42.8	387.8	153.5	57.8	
All Terrain Vehicles	18	2.04	1.03	2.31	2.19	20	0.55	75	66.6	33.7	<b>75.5</b>	71.5	
Front End Loader	1	1.11	10.3	4.8	1.3	77	0.55	630	65.2	604.6	281.7	76	
Totals:									(lbs/yr)	325	1,311	740	373
									(tons/yr)	0.16	0.66	0.37	0.19



**PADRE ISLAND NATIONAL SEASHORE PUBLIC MARINE VESSEL EMISSIONS**

**Diesel Engine Emission Factors**

Units	HC	CO	NO <sub>x</sub>	PM	SO <sub>2</sub>
(g/hp-hr)	1.26	1.91	8.92	0.563	0.352
(lb/hp-hr)	0.003	0.004	0.020	0.001	0.001

1 g = 0.002202  
BSFC = W367

<sup>1</sup> Source: Exhaust Emission Factors for Nonroad Engine Modeling -- Compression-Ignition EPA Report No., NR-009A; Table 1

**2-Stroke Gasoline Engine Emission Factors <sup>3</sup>**

Units	HC	CO	NO <sub>x</sub>	PM	SO <sub>2</sub>
(g/hp-hr)	116.38	231.26	1.19	7.7	0.000
(lb/hp-hr)	0.256	0.509	0.003	0.017	0.000

**4-Stroke Gasoline Engine Emission Factors <sup>3</sup>**

Units	HC	CO	NO <sub>x</sub>	PM	SO <sub>2</sub>
(g/hp-hr)	14.92	339.18	7.46	0.06	0.000
(lb/hp-hr)	0.033	0.747	0.016	0.000	0.000

<sup>3</sup> Source: Nonroad Emission Inventory Model, Draft, June 17, 1998

**Criteria Pollutant Emissions <sup>3</sup>**

Vessel Type	Number of Trips	No. of Engines	Engine Power	Hours of Operation	Load Factor	HC lb/r	CO lb/r	NO <sub>x</sub> lb/r	PM lb/r	SO <sub>2</sub> lb/r
2-Stroke Outboard	5,550	1	30	8,325	0.21	13,438	26,703	137	889	0
Total						13,438	26,703	137	889	0
						tons/year				
						6.72	13.35	0.07	0.44	0.00

<sup>1</sup> Assumes 2-stroke engine

Emissions = Emission Factor \* No. of Engines \* Engine Power \* Hours of Operation \* Load Factor

**PADRE ISLAND NATIONAL SEASHORE NPS MARINE VESSEL EMISSIONS**

**Diesel Engine Emission Factors\***

Units	HC	CO	NO <sub>x</sub>	PM	SO <sub>2</sub>	
(g/hp-hr)	1.26	1.91	8.92	0.563	0.352	1 g = 0.0022016 lbs
(lb/hp-hr)	0.003	0.004	0.020	0.001	0.001	BSFC = 0.367 lb/hp-hr

\* Source: Exhaust Emission Factors for Nonroad Engine Modeling -- Compression-Ignition EPA Report No., NR-009A; Table 1

**2-Stroke Gasoline Engine Emission Factors<sup>3</sup>**

Units	HC	CO	NO <sub>x</sub>	PM	SO <sub>2</sub>
(g/hp-hr)	116.38	231.26	1.19	7.7	0.000
(lb/hp-hr)	0.256	0.509	0.003	0.017	0.000

**4-Stroke Gasoline Engine Emission Factors<sup>3</sup>**

Units	HC	CO	NO <sub>x</sub>	PM	SO <sub>2</sub>
(g/hp-hr)	14.92	339.18	7.46	0.06	0.000
(lb/hp-hr)	0.033	0.747	0.016	0.000	0.000

a Source: Nonroad Emission Inventory Model, Draft, June 17, 1998

**Criteria Pollutant Emissions\***

NPS Vessel	No. of Engines	Engine Power (hp)	Hours of Operation	Load Factor	HC (lb/yr)	CO (lb/yr)	NO <sub>x</sub> (lb/yr)	PM (lb/yr)	SO <sub>2</sub> (lb/yr)
	1	200	40	0.21	430	855	4	28	0
Boats	1	150	40	0.21	323	642	3	21	0
	1	30	40	0.21	65	128	1	4	0
				<b>Total</b>	<b>818</b>	<b>1,625</b>	<b>8</b>	<b>54</b>	<b>0</b>
					<b>tons/year</b>				
					0.41	0.81	0.00	0.03	0.00

\* Assumes 2-stroke engines  
Emissions = Emission Factor \* No. of Engines \* Engine Power \* Hours of Operation \* Load Factor

**APPENDIX C**  
**PUBLIC USE DATA**



**Monthly Public Use Report**

Printed on 01 /20/2003

PADRE ISLAND NS			12/2001	7490
December 2001				
Recreational	Non-Recreational	Total	Calendar Year-To-Date	
Visits	26,878	150	27,028	658,675
Visitor Hours	194,241	1,200	195,441	4,375,278
				<b>Fiscal YTD</b>
<b>(Total Fiscal YTD Visitor Days</b>				60,436

Recreation O/N stays	Current Month	Year-To-Date		
Concessioner Lodging	0	0	<b>NPS Campgrounds</b>	
Concessioner Campgrounds	0	0	<b>Tents</b>	427
			<b>R/V's</b>	2,519
NPS Campgrounds	2,946	51,532	<b>Total</b>	2,946
NPS Backcountry	313	5,546		
NPS Miscellaneous	66	2,728		
Non Recreation O/N stays	0	0		
<b>Total Overnight stays</b>	3,325	59,806		

	This Month	Same Month Last Year	Percent Change
<b>Total Rec</b>	26,878	24,625	9.15 %
<b>Total NonRec</b>	150	150	0.00 %
<b>Total Visits</b>	27,028	24,775	9.09 %
<b>Total YTD</b>	658,675	761,395	-13.49 %

Special Use Data	This Month	Year-To-Date
BIRD ISLAND CAMPERS	292	11,192
OVERNIGHTS ON BOATS	66	2,728
NORTH BEACH CAMPERS	138	1,825
SOUTH BEACH CAMPERS	1,558	19,972
BIRD ISLAND VEHICLES	2,066	48,610
4 X 4 CAMPERS	300	5,000

## PADRE ISLAND NS

Report Date: December 2001

	<b>This Month</b>	<b>Same Month Last Year</b>	<b>% Change</b>	<b>This Year YTD</b>	<b>Last Year YTD</b>	<b>% Change YTD</b>
Visitor'sby Auto or Bus	26,748	24,495	9.2	651,325	754,045	-13.6
Visitors by Boat	130	130	0.0	5,550	5,550	0.0
NPS Campgrounds	2,946	1,823	61.6	51,532	54,635	-5.7
NPS Backcountry (4X4's)	300	300	0.0	5,000	5,000	0.0
NPS Backcountry (Boats)	13	13	-0.7	546	683	-20.1
NPS Miscellaneous (Boats)	66	67	-0.7	2,728	3,413	-20.1

**APPENDIX D**

**SELECTED TEXAS  
AIR QUALITY REGULATIONS**



**SUBCHAPTER G: COMBUSTION**  
**§§106.181 - 106.183**  
**Effective November 1, 2001**

**§106.181. Used-Oil Combustion Units.**

Small boilers and heaters burning used oil that has not been mixed with hazardous waste are permitted by rule provided that all of the following conditions are met:

(1) the combustion unit or combination of combustion units at the same account have a maximum capacity of 1.0 million Btu per hour (MMBtu/hr) and each individual combustion unit is not greater than 0.5 MMBtu/hr;

(2) the combustion gases from the combustion unit(s) are vented to the ambient air in accordance with the following requirements:

(A) through an unobstructed vent; or

(B) through a vertical vent with a cap; and

(i) a flat roof, through a minimum of a three-foot stack; or

(ii) a sloped roof, through a stack that is at least three feet higher than the highest point on the roof or three feet higher than a point extending ten feet horizontally from the roof; and

(3) the combustion unit(s) burns only used oil the owner or operator generates on-site or used oil received from household do-it-yourself used oil generators.

Adopted October 10, 2001

Effective November 1, 2001

**§106.182. Ceramic Kilns.**

Kilns used for firing ceramic ware, heated exclusively by natural gas, liquid petroleum gas, electricity, or any combination thereof are permitted by rule where the conditions of this section are met:

(1) the total heat input is ten million British thermal units per hour or less; and

(2) there are no emissions of lead, beryllium, or fluorides, and emissions of sulfur dioxide and particulate matter from both the material being fired and fuel burned do not exceed 25 tons per year of either air contaminant.

Adopted August 9, 2000

Effective September 4, 2000

**§106.183. Boilers, Heaters, and Other Combustion Devices.**

Boilers, heaters, drying or curing ovens, furnaces, or other combustion units, but not including stationary internal combustion engines or turbines are permitted by rule, provided that the following conditions are met.

- (1) The only emissions shall be products of combustion of the fuel.
- (2) The maximum heat input shall be 40 million British thermal unit (Btu) per hour with the fuel being:
  - (A) sweet natural gas;
  - (B) liquid petroleum gas;
  - (C) fuel gas containing no more than 0.1 grain of total sulfur compounds, calculated as sulfur, per dry standard cubic foot; or
  - (D) combinations of the fuels in subparagraphs (A) - (C) of this paragraph.
- (3) Distillate fuel oil shall be fired as a backup fuel only. Firing shall be limited to 720 hours per year. The fuel oil shall contain less than 0.3% sulfur by weight and shall not be blended with waste oils or solvents.
- (4) All gas fired heaters and boilers with a heat input greater than ten million Btu per hour (higher heating value) shall be designed such that the emissions of nitrogen oxides shall not exceed 0.1 pounds per million Btu heat input.
- (5) Records of hours of fuel oil firing and fuel oil purchases shall be maintained on-site on a two-year rolling retention period and made available upon request to the commission or any local air pollution control agency having jurisdiction.

Adopted August 9, 2000

Effective September 4, 2000

**SUBCHAPTER W: TURBINES AND ENGINES**  
**§106.511, §106.512**  
**Effective June 13, 2001**

**§106.511. Portable and Emergency Engines and Turbines.**

Internal combustion engine and gas turbine driven compressors, electric generator sets, and water pumps, used only for portable, emergency, and/or standby services are permitted by rule, provided that the maximum annual operating hours shall not exceed 10% of the normal annual operating schedule of the primary equipment; and all electric motors. For purposes of this section, "standby" means to be used as a "substitute for" and not "in addition to" other equipment.

Adopted August 9, 2000

Effective September 4, 2000

**§106.512. Stationary Engines and Turbines.**

Gas or liquid fuel-fired stationary internal combustion reciprocating engines or gas turbines that operate in compliance with the following conditions of this section are permitted by rule.

(1) The facility shall be registered by submitting the commission's Form PI-7, Table 29 for each proposed reciprocating engine, and Table 31 for each proposed gas turbine to the commission's Office of Permitting, Remediation, and Registration in Austin within ten days after construction begins. Engines and turbines rated less than 240 horsepower (hp) need not be registered, but must meet paragraphs (5) and (6) of this section, relating to fuel and protection of air quality. Engine hp rating shall be based on the engine manufacturer's maximum continuous load rating at the lesser of the engine or driven equipment's maximum published continuous speed. A rich-bum engine is a gas-fired spark-ignited engine that is operated with an exhaust oxygen content less than 4.0% by volume. A lean-bum engine is a gas-fired spark-ignited engine that is operated with an exhaust oxygen content of 4.0% by volume, or greater.

(2) For any engine rated 500 hp or greater, subparagraphs (A) - (C) of this paragraph shall apply.

(A) The emissions of nitrogen oxides (NO<sub>x</sub>) shall not exceed the following limits:

(i) 2.0 grams per horsepower-hour (g/hp-hr) under all operating conditions for any gas-fired rich-bum engine;

(ii) 2.0 g/hp-hr at manufacturer's rated full load and speed, and other operating conditions, except 5.0 g/hp-hr under reduced speed, 80-100% of full torque conditions, for any spark-ignited, gas-fired lean-bum engine, or any compression-ignited dual fuel-fired engine manufactured new after June 18, 1992;

**SUBCHAPTER B  
OUTDOOR BURNING**

**§§111.201, 111.203, 111.205, 111.207, 111.209, 111.211, 111.213, 111.215, 111.219, 111.221**  
**Effective June 12, 2002**

**§111.201. General Prohibition.**

No person may cause, suffer, allow, or permit any outdoor burning within the State of Texas, except as provided by this subchapter or by orders or permits of the commission. Outdoor disposal or deposition of any material capable of igniting spontaneously, with the exception of the storage of solid fossil fuels, shall not be allowed without written permission of the executive director. The term "executive director," as defined in Chapter 3 of this title (relating to Definitions), includes authorized staff representatives.

Adopted August 21, 1996

Effective September 16, 1996

**§111.203. Definitions.**

Unless specifically defined in the Texas Clean Air Act (TCAA) or in the rules of the Texas Natural Resource Conservation Commission (commission), the terms used by the commission have the meanings commonly ascribed to them in the field of air pollution control. In addition to the terms which are defined by the TCAA, the following terms, when used in this chapter, shall have the following meanings, unless the context clearly indicates otherwise.

**(1) Extinguished** - The absence of any visible flames, glowing coals, or smoke.

**(2) Landclearing operation** - The uprooting, cutting, or clearing of vegetation in connection with conversion for the construction of buildings, rights-of-way, residential, commercial, or industrial development, or the clearing of vegetation to enhance property value, access or production. It does not include the maintenance burning of on-site property wastes such as fallen limbs, branches, or leaves, or other wastes from routine property clean-up activities, nor does it include burning following clearing for ecological restoration.

**(3) Practical alternative** - An economically, technologically, ecologically and logistically viable option.

**(4) Prescribed burn** - The controlled application of fire to naturally-occurring vegetative fuels under specified environmental conditions and confined to a predetermined area, following appropriate planning and precautionary measures.

**(5) Structure containing sensitive receptor(s)'**- A man-made structure utilized for human residence or business, the containment of livestock, or the housing of sensitive live vegetation. The term "man-made structure" does not include such things as range fences, roads, bridges, hunting blinds or facilities used solely for the storage of hay or other livestock feeds. The term "sensitive live vegetation" is defined as vegetation which has potential to be damaged by smoke and heat, examples of which include, but are not limited to: nursery production, mushroom cultivation, pharmaceutical plant production, or laboratory experiments involving plants.

**(6) Sunrise/Sunset** - Official sunrise/sunset as set forth in the United States Naval Observatory tables available from National Weather Service offices.

**(7) Wildland** - Uncultivated land other than fallow, land minimally influenced by human activity, and land maintained for biodiversity, wildlife forage production, protective plant cover, or wildlife habitat.

Adopted August 21, 1996

Effective September 16, 1996

**§111.205. Exception for Fire Training.**

(a) Outdoor burning shall be authorized for training fire-fighting personnel when requested in writing and when authorized either verbally or in writing by the local air pollution control agency. In the absence of such local entities, the appropriate commission regional office shall be notified. The burning shall be authorized if notice of denial from the local air pollution control agency, or commission regional office is not received within 10 working days after the date of postmark or the date of personal delivery of the request.

(b) Facilities dedicated solely for fire-fighting training, at which training routinely will be conducted on a frequency of at least once per week, shall submit an annual written notification of intent to continue such training to the appropriate commission regional office and any local air pollution control agency.

(c) Facilities dedicated solely for fire-fighting training, at which training is conducted less than weekly, shall provide an annual written notification of intent, with a telephone or electronic facsimile notice 24 hours in advance of any scheduled training session. No more than one such notification is required for multiple training sessions scheduled within any one-week period, provided the initial telephone/facsimile notice includes all such sessions. Both the written and telephone notifications shall be submitted to the appropriate commission regional office and any local air pollution control agency.

(d) Authorization to conduct outdoor burning under this provision may be revoked by the executive director if the authorization is used to circumvent other prohibitions of this subchapter.

Adopted August 21, 1996

Effective September 16, 1996

**§111.207. Exception for Fires Used for Recreation, Ceremony, Cooking, and Warmth.**

Outdoor burning shall be authorized for fires used solely for recreational or ceremonial purposes, or in the noncommercial preparation of food, or used exclusively for the purpose of supplying warmth during cold weather. Such burning shall be subject to the requirements of §111.219(7) of this title (relating to General Requirements for Allowable Outdoor Burning).

Adopted August 21, 1996

Effective September 16, 1996

**§111.209. Exception for Disposal Fires.**

Outdoor burning shall be authorized for:

(1) Domestic waste burning at a property designed for and used exclusively as a private residence, housing not more than three families, when collection of domestic waste is not provided or authorized by the local governmental entity having jurisdiction, and when the waste is generated only from that property. Provision of waste collection refers to collection at the premises where the waste is generated. The term "domestic waste" is defined in §101.1 of this title (relating to Definitions). Wastes normally resulting from the function of life within a residence that can be burned include such things as kitchen garbage, untreated lumber, cardboard boxes, packaging (including plastics and rubber), clothing, grass, leaves, and branch trimmings. Examples of wastes not considered domestic waste which cannot be burned, include such things as tires, non-wood construction debris, furniture, carpet, electrical wire, and appliances.

(2) Diseased animal carcass burning when burning is the most effective means of controlling the spread of disease.

(3) Animal remains burning by a veterinarian if the burning is conducted on property owned by the veterinarian; the property is in a county with a population of less than 10,000; and the veterinarian does not charge for the burning. Animal remains refer to an animal that dies in the care of the veterinarian and does not include any other type of medical waste.

(4) On-site burning of trees, brush, and other plant growth for right-of-way maintenance, landclearing operations, and maintenance along water canals when no practical alternative to burning exists and when the materials are generated only from that property. Structures containing sensitive receptors must not be negatively affected by the burn. Such burning shall be subject to the requirements of §111.219 of this title (relating to General Requirements for Allowable Outdoor Burning). When possible, notification of intent to burn should be made to the appropriate commission regional office prior to the proposed burn. For a single project entailing multiple days of burning, an initial notice delineating

the scope of the burn is sufficient if the scope does not constitute circumvention of the rule for a continual burning situation. Commission notification or approval is not required.

(5) Crop residue burning for agricultural management purposes when no practical alternative exists. Such burning shall be subject to the requirements of §111.219 of this title, and structures containing sensitive receptors must not be negatively affected by the burn. When possible, notification of intent to burn should be made to the appropriate commission regional office prior to the proposed burn. Commission notification or approval is not required. This section is not applicable to crop residue burning covered by an administrative order.

(6) Brush, trees, and other plant growth causing a detrimental public health and safety condition may be burned by a county or municipal government at a site it owns upon receiving site and burn approval from the executive director. Such a burn can only be authorized when there is no practical alternative, and it may be done no more frequently than once every two months. Such burns cannot be conducted at municipal solid waste landfills unless authorized under §111.215 of this title (relating to Executive Director Approval of Otherwise Prohibited Outdoor Burning), and shall be subject to the requirements of §111.219 of this title.

Adopted May 22, 2002

Effective June 12, 2002

**§111.211. Exception for Prescribed Burn.**

Outdoor burning shall be authorized for:

(1) Prescribed burning for forest, range and wildland/wildlife management purposes, with the exception of coastal salt-marsh management burning. Such burning shall be subject to the requirements of §111.219 of this title (relating to General Requirements for Allowable Outdoor Burning), and structures containing sensitive receptors must not be negatively affected by the burn. When possible, notification of intent to burn should be made to the appropriate commission regional office prior to the proposed burn. Commission notification or approval is not required.

(2) Coastal salt-marsh management burning conducted in Aransas, Brazoria, Calhoun, Chambers, Galveston, Harris, Jackson, Jefferson, Kleberg, Matagorda, Nueces, Orange, Refugio, and San Patricio Counties. Coastal salt-marsh burning in these counties shall be subject to the following requirements:

(A) All land on which burning is to be conducted shall be registered with the appropriate commission regional office using a United States Geological Survey map or equivalent upon which are identified significant points such as roads, canals, lakes, and streams, and the method by which access is made to the site. For large acreage, the map should be divided into manageable blocks with

identification for each defined block. The information must be received for review at least 15 working days before the burning takes place.

(B) Prior to any burning, notification, either verbal or written, must be made to, and authorization must be received from the appropriate commission regional office. Notification must identify the specific area and/or block to be burned, approximate start and end time, and a responsible party who can be contacted during the burn period.

(C) Such burning shall be subject to the requirements of §111.219 of this title.

Adopted August 21, 1996

Effective September 16, 1996

**§111.213. Exception for Hydrocarbon Burning.**

Outdoor burning shall be authorized for hydrocarbon burning from pipeline breaks and oil spills only upon proper notification as set forth in § 101.6 of this title (relating to Notification Requirements for Major Upset), and if the executive director has determined that the burning is necessary to protect the public welfare. Sampling and monitoring may be required to determine and evaluate environmental impacts.

Adopted August 21, 1996

Effective September 16, 1996

**§111.215. Executive Director Approval of Otherwise Prohibited Outdoor Burning.**

If not otherwise authorized by this chapter, outdoor burning may be authorized by written permission from the executive director if there is no practical alternative and if the burning will not cause or contribute to a nuisance, traffic hazard or to a violation of any federal or state primary or secondary ambient air standard. The executive director may specify procedures or methods to control or abate emissions from outdoor burning authorized pursuant to this rule. Authorization to burn may be revoked by the executive director at any time if the burning causes nuisance conditions, is not conducted in accordance with the specified conditions, violates any provision of an applicable permit, or causes a violation of any air quality standard.

Adopted August 21, 1996

Effective September 16, 1996

**§111.219. General Requirements for Allowable Outdoor Burning.**

Outdoor burning which is otherwise authorized shall also be subject to the following requirements when specified in any section of this subchapter.

(1) Prior to prescribed or controlled burning for forest management purposes, the Texas Forest Service shall be notified.

(2) Burning must be outside the corporate limits of a city or town except where the incorporated city or town has enacted ordinances which permit burning consistent with the Texas Clean Air Act, Subchapter E, Authority of Local Governments.

(3) Burning shall be commenced and conducted only when wind direction and other meteorological conditions are such that smoke and other pollutants will not cause adverse effects to any public road, landing strip, navigable water, or off-site structure containing sensitive receptor(s).

(4) If at any time the burning causes or may tend to cause smoke to blow onto or across a road or highway, it is the responsibility of the person initiating the burn to post flag-persons on affected roads.

(5) Burning must be conducted downwind of or at least 300 feet (90 meters) from any structure containing sensitive receptors located on adjacent properties unless prior written approval is obtained from the adjacent occupant with possessory control.

(6) Burning shall be conducted in compliance with the following meteorological and timing considerations:

(A) The initiation of burning shall commence no earlier than one hour after sunrise. Burning shall be completed on the same day not later than one hour before sunset, and shall be attended by a responsible party at all times during the active burn phase when the fire is progressing. In cases where residual fires and/or smoldering objects continue to emit smoke after this time, such areas shall be extinguished if the smoke from these areas has the potential to create a nuisance or traffic hazard condition. In no case shall the extent of the burn area be allowed to increase after this time.

(B) Burning shall not be commenced when surface wind speed is predicted to be less than six miles per hour (mph) (five knots) or greater than 23 mph (20 knots) during the burn period.

(C) Burning shall not be conducted during periods of actual or predicted persistent low-level atmospheric temperature inversions.

(7) Electrical insulation, treated lumber, plastics, non-wood construction/demolition materials, heavy oils, asphaltic materials, potentially explosive materials, chemical wastes, and items containing natural or synthetic rubber must not be burned.

**§111.221. Responsibility for Consequences of Outdoor Burning.**

The authority to conduct outdoor burning under this regulation does not exempt or excuse any person responsible from the consequences, damages, or injuries resulting from the burning and does not exempt or excuse anyone from complying with all other applicable laws or ordinances, regulations, and orders of governmental entities having jurisdiction, even though the burning is otherwise conducted in compliance with this regulation.

Adopted August 21, 1996

Effective September 16, 1996