COMMONWEALTH OF PUERTO RICO
OFFICE OF THE GOVERNOR

ENVIRONMENTAL QUALITY BOARD

Kenny
Callahan
Canero
cc: Mugdan (w/att.)
Lapesta
Soderberg
Casey

February 6, 2004

Jane M. Kenny
Regional Administrator
USEPA
Region 2
290 Broadway
New York, NY 10007-1866

Dear Ms. Kenny:

The Puerto Rico Environmental Quality Board (PREQB), submit the recommendations areas as attainment the National Ambient Air Quality Standard (NAAQS) for fine particle matter, also known as PM2.5. This designation is based on air quality data collected since 2000 to 2002, three year of data as required on the 1990 Clean Air Act.

The procedure follow in this document are based on the Guidance and Memorandum sent on April 1, 2003 from Jeffrey R. Holmstead, Assistant Administrator for Air and Radiation.

Do not hesitate to contact us if you have any questions.

Cordially,

Esteban Mujica Cotto
Chairman

Cc:

Mr. Raymond Werner	EPA
Walter Mugdan	DEPP
John Filippelli	EPA
Kirk Wieber	EPA
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OPM/PPEB
04 FEB 17 PM 3:11
US EPA
04 FEB 17 PM 4:53
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DESIGNATION FOR THE FINE PARTICLE (PM2.5) NATIONAL AMBIENT AIR QUALITY FOR PUERTO RICO

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1.0 Introduction

On July 18, 1997, (62 Federal Register 38652) the United States Environmental Protection Agency (EPA) promulgated the air quality standards for fine particulate matter (known as PM 2.5). The annual standard for PM2.5 was set at a level of 15 μg/m3, based on 3-year average of annual arithmetic mean PM2.5. The 24 hr-hour standard was set at a level of 65 μg/m3, based on the 3-year average of the 98th percentile of 24 hour PM2.5 concentrations. The standards were based in a number of health studies showing that increased exposure to PM 2.5 is correlated with increased mortality and a range of serious health effects, including aggravation of lung disease, asthma attacks and heart problems. Pursuant to Section 107 (d) and 301 (d) of the Clean Air Act, states are require to recommend and submit to EPA areas that should be designated as attainment and non attainment for the fine particulate matter (PM2.5). The purpose of this document is to comply with the regulation of the Clean Air Act by submitting the Puerto Rico Designations and Recommendations the Fine Particle National Ambient Quality Standards.

2.0 Puerto Rico Physical Setting[1]

Puerto Rico is surrounded by the Atlantic Ocean at the north and the Caribbean Sea at the south. Its coast measures approximately 580 km and if the adjacent islands Vieques y

[1] Taken from the 1997 Local Climatological Data/Annual Summary with Comparative Data (National Climatic Data Center.

Culebra are included the coast measures approximately 700 Km. Puerto Rico is very mountainous (cover 60%), except in the regional coasts, but offers astonishing variety: rain forest, deserts, beaches, cave, ocean and rivers. Puerto Rico has three main physiographic regions: the mountainous interior, the coastal lowlands and the karst area. It capital San Juan is located on the north coast. Local custom assigns the name San Juan to the old city which lies right on the coast, but the modern metropolitan area extends inland about 12 miles. These inland sections have a temperature and rainfall regime significantly different from the coastal area. Luis Muñoz Marín Airport, where whether observations are made lies on the coastal about 7 miles east of old San Juan, surrounding terrain is level with a gradual upslope inland. Mountain ranges, with peaks elevation of 4,000 feet, extend east and west through the central portion of Puerto Rico, and are located 15 to 20 miles east and south of San Juan. These mountain ranges have a decided influence on the rainfall of the San Juan metropolitan area, and on the current island in general.

The climate is tropical maritime, characteristic of all tropical islands. The predominant easterly trade winds, modified by local effects such as land and sea breeze and the particular island topography, are a primary feature of the climate of San Juan and have a significant influence on the temperature and rainfall. During daylight hours the wind blows almost constantly off the ocean. Usually, after sunset the wind shifts to the south or southeast, off land. This daily wind variation is a contributing factor to the delightful climate of the city. The annual temperature range is small with about a 5-6 degree difference between the temperatures of warmest and coldest months. The inland sectors

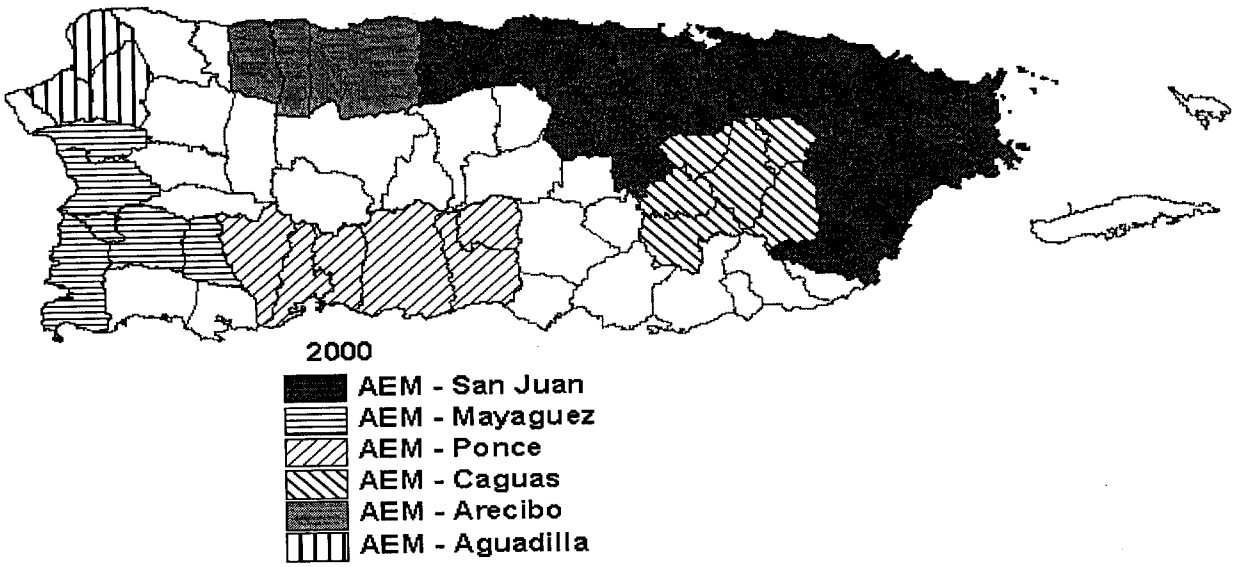
have warmer afternoons and cooler nights. In the interior mountain and valley regions even greater daily and annual ranges of temperature occur. The highest temperatures recorded in Puerto Rico have exceeded 105 degrees and the lowest have been near 40. Sea water temperatures range from 78 degrees in March to about 83 degrees in September.

Although rainfall in San Juan is nearly 60 inches, the geographical distribution of rainfall over the island shows the heaviest rainfall, about 180 inches per year, in the Luquillo Range, only 23 miles distant from San Juan. The dries area, with annual rainfall of 30 to 35 inches, is located in the southwest corner of the island. Rain showers occur mostly in the afternoon and at night. The nocturnal showers, usually light, are a characteristic feature of San Juan rainfall pattern. Rainfall is generally of the brief showery type except for the continuous rains occurring with the passage of tropical disturbances, or when the trailing edge of a cold front out of the United States reaches Puerto Rico. This normally occurs from about November to April. Mild temperature, refreshing sea breezes in the daytime, plenty of sunshine, and adequate rainfall make a climate of San Juan most enjoyable for tourist and residents alike.

3.0 Major Metropolitan Areas

As defined by the Puerto Rico Census Office, the Island has three Primary Metropolitan Statistical Areas (PMSA) and three Metropolitan Statistical Areas (MSA). The PMSA are Arecibo, Caguas and San Juan-Bayamón. Arecibo and Caguas were incorporated to San Juan-Bayamón MSA to form a Consolidated Metropolitan Statistical Area (CMSA)

with 899,051 people[2]. Aguadilla, Mayaguez and Ponce are the three MSA's, each one has over 349,594 people. (See map bellow).



3.1 Primary Metropolitan Statiscal Areas (PMSA)

3.1.1 Arecibo PMSA

Arecibo PMSA includes Hatillo, Camuy and Arecibo. It is in the central north area and has a population of 174,300. Most of its, habitants live in the Arecibo Municipality but all the population has high socioeconomic integration within the San Juan Metropolitan Area. Arecibo has three Regional Campus for the three Island larger universities: University of Puerto Rico, Interamerican University and Catholic University. It also has a physical science investigation center where a 300-meter radio telescope is located. Its is built in a natural bowl among hills. Camuy has an important cavern system with a subterranean river. This PMSA is part of the aquiferous recharge zone. Large areas are

[2] Source: Census 2000 Planning Board of Puerto Rico

dedicated to pasture growth and dairy farms. Pineapple crops are an important industry in this area.

The Regional Hospital is located at Arecibo. A very active commerce is held in this PMSA. The power plant known as PREPA Cambalache is a major source located at Garrochales Ward. Other major sources at Barceloneta are pharmaceuticals. The sources locations is important because even some wind vectors are interfering, the east trade winds are the predominant. Arecibo is connected to other metropolitan centers throughout PR-2 and PR 52, which is a highway.

3.1.2. Caguas PMSA

Caguas PMSA is in the central east zone of the Island with 308,365 people. It consists of three different geographical areas. An open valley former by Gurabo Municipality, a hilly area where San Lorenzo, Cidra and Cayey municipalities are settled and Caguas. This is a big city in a valley surrounded by mountains. Because it geography, accumulation of pollutants can take place.

Caguas has Regional Hospital, and HIMA Hospital. Turabo University, which is a private one, is located in the Turabo Valley at Caguas. One UPR Regional Campus is located at Cayey. Caguas is the biggest commerce of the area. New commercial and housing projects are planned or under development. One of these projects includes the construction of a hotel. Other developments include sewage facilities and roads.

3.1.3 San Juan PMSA

The large PMSA is San Juan-Bayamón. San Juan is Puerto Rico Capital. Governmental activities are held in this area. The main offices of Government Departments are in San Juan.

Tourist industry is of significance, specially Old San Juan, Condado, Carolina with Luis Muñoz Marín International Airport, Dorado and Fajardo. All of them have hotels and good beaches for entertainment, as well as other activities related to this industry. Many universities and colleges have their principal campus in this PMSA. The Principal Medical Center is located at Río Piedras. This PMSA has many hospitals. It also has industries that include major sources like power plants, pharmaceuticals, grains mills, asphalt plants and others. The most important port area is the San Juan Port. It moves millions of tons per year and moves peoples as well in its tourist port.

The commerce and the bank are one of the most important activities of the area. There are many major avenues with heavy traffic specially the ones that connect with areas of great economic activities. New transportation ways are under construction, including an urban train that will connect Bayamón and Hato Rey (banks area).

3.2 Metropolitan Statistical Areas (MSA)

Mayaguez MSA consist of five municipalities (Añasco, Cabo Rojo, Hormigueros, Mayaguez y San Germán). It has a population of 227,412 habitants. The most important activities in this area is the UPR Campus at Mayaguez and the Interamerican University at San Germán.

There are four major sources in Mayaguez and one Regional Hospital. Cabo Rojo moves the internal tourist in the summer time attracted by the good beaches in the area. In this area the fishing industry is very active. Part of the land is used for agriculture specially minor fruits and pasture. There are some swine and dairy farms.

3.2.2 Ponce MSA

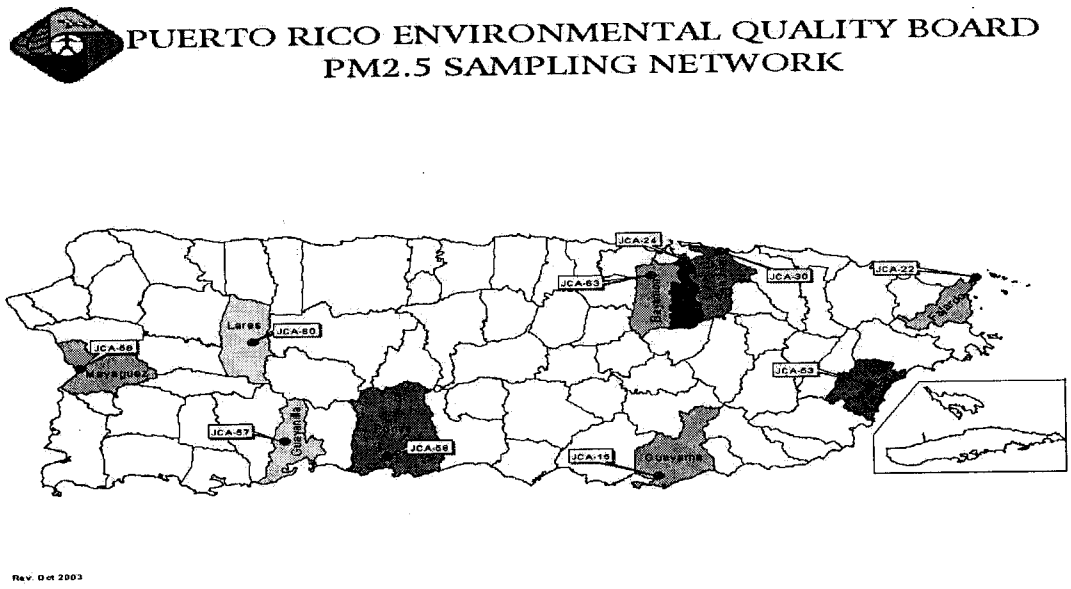
Ponce MSA has 361,094 people. It is located at the south part of the area. Guayanilla, Peñuelas, Villalba, Juana Díaz, Ponce and Yauco are the municipalities integrated in this area. Guayanilla and Ponce are the most industrialized of these municipalities with seven major sources. There is different type of sources, sugarcane refinery, thermoelectric plant, cement products, rum distillery and others. The tourist industry, swine farm and cattle ranch are of relatively importance. The fishing industry is of concern. Ponce has a Regional Hospital. It also has two more which privates. It has a port zone and some heavy traffic avenues. This area is part of the direst zone of the Island, usually with low rainfall and high temperatures.

3.2.3 Aguadilla MSA

Aguadilla, Aguada and Moca integrate the Aguadilla MSA, with a population of 146,424. This area us the northwest corner of the Island. It has the attractive of the surfing beaches and bread and breakfast lodge which promote the internal tourist industry.

4.0 Defining State Monitoring Planning Areas

The MPA's boundaries were determined based on (1) the 1990 census data by census tract, (2) the boundaries of the existing MSA's and (3) the surrounding geography. According to the 1990 the San Juan-Bayamón PMSA has a population of 1,836,302. Even this PMSA is composed of 30 municipalities it people are concentrated in the metropolitan area, specially at San Juan and Bayamón.



Air Quality Data Used for Designations

Area designations are based on air quality data measured at each monitoring site within the area under consideration.

Criteria for Designations an Area as Attainment

1. Data for record show that no standard for that pollutant was no violated at any site in the area.
2. Air quality data collected in the area during 2000 to 2002 period has not been violated.

Criteria for Determining data Representative

Air quality measurements and statistic are considered representative if a minimum of 75 percent of all the potential short term values are included and are distributed thorough the entire statistical spatial time period.

Criteria for Representativeness of Air Quality Measurements and Statistics

Representative Calendar Statistics	Sampling Time Period	Basis of Statistics or Requirement	Number of Representative Periods Required
Year	Any		4 representative calendar quarters
Quarter	24- hour	Based on a daily sample	3 representative months
Month	24 - hour	Based on a daily statistics	23 or more representative calendar days
Day	24 – hour	Based on daily sample	22 but not more than 25 hours sampling

Attainment

For each SMA approved sampler PREQB calculated the annual average PM2.5 concentration for 2000, 2001 and 2002.

An area is attainment for the State annual PM2.5 standard if:

1. The calculated maximum representative annual PM2.5 concentration for any site in the area during each of the three years is equal to or less than 15 $\mu g/m^3$.

Puerto Rico has an adequate PM2.5 monitoring data that do not violate the standards and will be considered to have healthful air and will be designated as attainment.

Calculation of the 3- Year Average of the Spatially Average Annual Means

San Juan MA

ANNUAL MEANS ($\mu g/m^3$)				
Year	**Bayamón**	**San Juan**	**Guaynabo**	**Annual Spatial Mean**
2000	7.26	9.79	9.5	8.85
2001	7.11	9.12	9.8	8.68
2002	6.60	9.16	9.58	8.45

The three years average spatial mean:

$$8.85 + 8.68 + 8.45 / 3 = \mathbf{8.66}$$

Mayaguez MA

Year	ANNUAL MEANS ($\mu g/m^3$)
Mayaguez	
2000	7.91
2001	8.40
2002	7.84

The three years average spatial mean:

$$7.91 + 8.40 + 7.84 / 3 = \mathbf{8.05}$$

Ponce MA

Year	Ponce	Guayanilla	Annual Spatial Mean
2000	7.68	6.84	7.26
2001	7.56	7.45	7.51
2002	7.45	7.26	7.36

The three years average spatial mean:

$$7.26 + 7.51 + 7.36 / 3 = \mathbf{7.38}$$

Humaco MA

Year	ANNUAL MEANS ($\mu g/m^3$)
Humacao	
2000	5.47
2001	5.90
2002	5.66

The three years average spatial mean:

$$5.47 + 5.90 + 5.66 / 3 = \mathbf{5.68}$$

Guayama MA

Year	ANNUAL MEANS ($\mu g/m^3$)
Guayama	
2000	7.67
2001	7.19
2002	6.24

The three years average spatial mean:

$$7.67+ 7.19 + 6.24 / 3 = \mathbf{7.03}$$

Fajardo

Year	ANNUAL MEANS ($\mu g/m^3$)
Fajardo	
2000	5.09
2001	5.24
2002	5.22

The three years average spatial mean:

$$5.09+ 5.24 + 5.22 / 3 = \mathbf{5.18}$$

Lares

Year	ANNUAL MEANS ($\mu g/m^3$)
Lares	
2000	5.85
2001	6.02
2002	6.21

The three years average spatial mean:

$$5.85+ 6.02 + 6.21 / 3 = \mathbf{6.03}$$

Calculation of the 3-Year Average 98th Percentile for PM2.5

Metropolitan Area	Site	2000		2001		2002	
		Rank	µg/m^3	Rank	µg/m^3	Rank	µg/m^3
Guayama MA	EQB # 15 Guayama	75	19.2	108	19.7	100	13.9
Fajardo MA	EQB # 22 Fajardo	233	14.9	316	13.4	319	12.3
San Juan MA	EQB # 24 Guaynabo	277	17.8	322	18.1	270	19.2
	EQB # 30 San Juan	287	20.4	309	17.4	274	18.8
	EQB # 63 Bayamón	103	18.1	111	15.3	107	12.0
Humacao MA	EQB # 53 Humacao	82	18.4	73	12.9	64	12.9
Ponce MA	EQB # 56 Ponce	104	17.3	114	15.5	99	15.5
	EQB # 57 Guayanilla	95	18.6	109	17.4	98	15.1
Mayaguez MA	EQB # 58 Mayaguez	98	16.4	99	16.3	95	16.7
Lares MA	EQB # 60 Lares	91	17.1	102	16.4	88	15.0

Calculation of the 3-Year Average 98th Percentile for PM2.5

Standard: 65 μg/m^3

Metropolitan Area	Site	Three year 98th percentile
Guayama MA	EQB # 15 Guayama	18
Fajardo MA	EQB # 22 Fajardo	14
San Juan MA	EQB # 24 Guaynabo	18
	EQB # 30 San Juan	19
	EQB # 63 Bayamón	15
Humacao MA	EQB # 53 Humacao	15
Ponce MA	EQB # 56 Ponce	16
	EQB # 57 Guayanilla	17
Mayaguez MA	EQB # 58 Mayaguez	16
Lares MA	EQB # 60 Lares	16

As demonstrated above Puerto Rico has adequate PM2.5 monitoring data that do not violate the standards and will be considered to have healthful air and will be designate as attainment.