



December 6, 2010

MRS JUDITH A ENCK
REGIONAL ADMINISTRATOR
USEPA – REGION II
290 BROADWAY 25TH FLOOR
NEW YORK NY 10007-1866

RE: PUERTO RICO DESIGNATION TO THE REVISED NEW SHORT-TERM STANDARD BASED ON THE 3-YEAR AVERAGE OF THE 98TH PERCENTILE OF THE YEARLY DISTRIBUTION ON 1-HOUR DAILY MAXIMUM CONCENTRATIONS FOR NO₂

Dear Mrs. Enck:

In compliance with the Clean Air Act, the Puerto Rico Environmental Quality Board (PREQB) as representative agency of the Government of Puerto Rico, hereby provides its recommendations for area designation and boundaries. These recommendations are made under the revised new short-term standard based on the 3-year average of the 98th percentile of the yearly distribution of 1-hour daily maximum concentrations at 100 Ppb.

These new provisions require monitors to be installed at locations where maximum NO₂ concentrations are expected to occur, including those within 50 meters of major roadways, as well as monitors that will be sited to measure the area-wide NO₂ concentrations that occur more broadly across communities.

The PREQB is herein designating all other areas of Puerto Rico as *unclassifiable*, until sufficient air quality data from the newly NO₂ monitoring station is available and a final determination is made based on said data. PREQB recommendations are based on the fact that the current NO₂ network is not designed in requirements of the revised NAAQS, and a new network will be put in place.

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Once the new network is in place, Puerto Rico will collect data for the three years thereafter, in order to determine compliance with the revised NAAQS. The new network full set air quality data will be available sometime in 2015.

Included is the new NO₂ network design.

Please feel free to contact me at (787) 767-8181 if you have any questions regarding these recommendations, or call our staff contact Mrs. Lucía Fernández Fontán, Chief, Data Validation and Air Dispersion Model Division, at (787) 767-8181 extension 3254.

Cordially,



Pedro J. Nieves Miranda
Chairman

Attachment: New NO₂ Network Design

c: George Pavlou

EPA REGION 2
CORRESPONDENCE
CONTROL OFFICE
2010 DEC 17 PM 3:24

Nitrogen Dioxide (NO₂) Monitoring Network

Puerto Rico Environmental
Quality Board



Validation and Data Services &
Air Modeling Division

August, 2010



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Acronyms and Abbreviations

AADT: Annual Average Daily Traffic

CBSAs: Core Based Statistical Areas

CFR: Code Federal Register

EPA: Environmental Protection Agency

FRM: Federal Reference Method

NAAQS: National Air Ambient Quality Standards

NO₂: Nitrogen Dioxide

ppm: parts per million

PR: Puerto Rico

PREQB: Puerto Rico Environmental Quality Board

PREPA: Puerto Rico Power Electrical Authority

RCPA: Regulation for the Control of Atmospheric Pollution of Puerto Rico



Introduction

The NO₂ Air Monitoring Network Plan meets the requirements of 40 CFR 50 and 58, Primary National Ambient Air Quality Standards for Nitrogen Dioxide. The purpose of this plan is to deploy NO₂ monitors in accordance with a required network design focused on providing protection to susceptible and vulnerable population.

A complete description of each station is on file at the Air Monitoring Area and is available for review upon request. The plan also includes several appendices to complete the supporting documentation as: emissions inventory and the results of the air dispersion model to NO₂.

Monitoring Methods

PREQB will continue to use the NO₂ chemiluminescence Federal Reference Method (FRM).

To meet the primary objective of monitoring maximum NO₂ concentrations in an area, EPA is requiring NO₂ monitors to be placed in locations of expected high concentrations. The required monitors resulting from the network design discussed in Section III.B will require monitors to be placed near fresh NO_x sources or in areas of dense NO_x emissions, where NO₂ concentrations are expected to be at a maximum, and interference from NO₂ species is at a minimum.

According with the requirements, EPA proposed a two-tier network design composed of:

1. near-road monitors which would be placed in locations of expected maximum 1-hour NO₂ concentrations near heavily trafficked roads in urban areas and,
2. monitors located at the neighborhood and larger spatial scales to characterize areas with the highest expected NO₂ concentrations. Also referred to as *area-wide* monitors, are needed to implement the 1-hour NO₂ NAAQS and support the annual NAAQS. The area-wide sites serve multiple monitoring objectives aside from NAAQS comparison to both the 1-hour and the annual NAAQS, including photochemical pollutant assessment, aiding in ozone forecasting, particulate matter precursor analysis and particulate matter forecasting. The regulations require one area-wide monitoring site in each CBSA with a population greater than or equal to 1,000,000.



PREQB proposed that a minimum of one near road NO₂ monitor be required in Core Based Statistical Areas (CBSAs) with a population greater than or equal to 350,000 people based on 2008 Census Bureau statistics. PREQB also proposed that a second near road monitor be required in CBSAs with a population greater than or equal to 2,500,000 persons, or in any CBSAs with one or more road segments with an Annual Average Daily Traffic (AADT) count greater than or equal to 250,000.

PREQB proposed to require monitors to characterize the expected maximum NO₂ concentrations at the neighborhood and larger (area wide) spatial scales in an area. The area-wide sites serve multiple monitoring objectives aside from NAAQS comparison to both the 1-hour and the annual NAAQS, including photochemical pollutant assessment, aiding in ozone forecasting, aiding in particulate matter precursor analysis and particulate matter forecasting. The regulations require one area-wide monitoring site in each CBSA with a population greater than or equal to 1,000,000.

According with the requirements for the selection of the locations of the near road NO₂ monitoring stations, PREQB is ranking all road segments within a CBSA by AADT and is identifying locations adjacent to those highest ranked road segments where maximum hourly NO₂ concentrations are expected to be highest and where sitting criteria can be met in accordance with what being proposed for 40 CFR Part 58 Appendix E (discussed in III.B.7).

PREQB identifies three acceptable sites where maximum hourly NO₂ concentrations are expected to occur. Also, PREQB take into account the population exposure in the criteria utilized to select the final site location.

- ✓ In the San Juan CBSA where is requiring to have two near-road NO₂ monitoring stations, PREQB differentiated the sites from each other by the geographic area factor.
- ✓ In the industrial Area of Guayama, requiring monitors located to characterize areas with the maximum expected NO₂ concentrations at the neighborhood and larger spatial scales.

PREQB proposes new sites for the NO₂ monitors using air quality modeling to determine the areas with maximum impacts concentrations.

In the memorandum of June 28, 2010, Applicability of Appendix W Modeling Guidance for the 1-hour NO₂ National Ambient Quality Standard, three tiers were recommended for the modeling of the standard. For this study, Tier 1 and Tier 2 were considered to have a conservative scenario, the Tier 1 for the new 1-hour NO₂ standard and Tier 2 for the current annual standard.



The model used was AERMOD with the EPA default options¹. The modeling study was performed in three areas: San Juan, Guayama and Barceloneta. One year of site-specific data was used in each case. AERMOD was not run in other areas of the island due to the lack of meteorological data.

The meteorological data used in San Juan was from the National Weather Service collected in 1994. The data for Barceloneta and Guayama was collected on-site, in 1992 and 1994 respectively.

The modeled inventory was multi-source. Using the recommendations in the Appendix W of the 40CFR Part 51, the modeled 1-hour emission rate was computed with the source allowable emissions or the maximum design capacity.

For the annual standard, the 2009 actual emissions were used to compute the modeled emission rate.

NO₂ NETWORK SITE DESCRIPTION:

The locations of the near-road NO₂ monitor are according with the following sitting criteria:

1. required near-road NO₂ monitor probes shall be as near as practically to the outside nearest edge of the traffic lanes of the target road segment; but shall not be located at a distance greater than 50 meters, in the horizontal, from the outside nearest edge of the traffic lanes of the target road segment,
2. required near-road NO₂ monitor probes shall have an unobstructed air flow, where no obstacles exist at or above the height of the monitor probe and between the probe and the outside nearest edge of the traffic lanes of the target road segment,
3. required near-road NO₂ monitors are required to have sampler inlets between 2 and 7 meters above ground level, and
4. residence time of NO₂ in the sample line between the inlet probe and the analyzer shall not exceed 20 seconds.

Also, the site of the second tier of the NO₂ monitoring network design, known as the area-wide monitoring component, shall be sited to characterize the highest expected NO₂ concentrations at the neighborhood and larger (area-wide) spatial scales in a CBSA. The monitors will be sited to characterize the highest expected NO₂ concentrations at the neighborhood and larger (area-wide) spatial scales in a CBSA.

¹ OIm And Pvmrm Option Were Not Used



The air quality modeling results in the San Juan CBSA exceeded the NO₂ short-term standard. The violations were registered near PREPA Palo Seco, PREPA San Juan, and Tradewinds and in the Buchanan area, near the highway. The maximum impact was near PREPA Palo Seco and it was 621ug/m³. The annual standard was not exceeded. The maximum impact was 30.75ug/m³ near PREPA San Juan. The Appendix 1 shows the results.

In Guayama area the modeling results for the 1-hour NO₂ standard were exceeded. The maximum impact was 473ug/m³, near PREPA Aguirre and this industry had the major contribution to this concentration. There were no violations of the annual standard. The Appendix 1 shows the results.

According with these results, EQB proposed to establish two monitors in the San Juan CBSA: one site in Buchanan Area and the other one in Caguas Area. Also, EQB proposes to establish another site at the industrial area of Guayama in the existing site AIRS Num. 72-057-0009 at Guayama and maintain the existing site in Cataño AIRS Num. 72-033-0008 as area-wide site. This site will be used to multiple monitoring objectives aside from NAAQS comparison to both the 1-hour and the annual NAAQS.

BUCHANAN SITE DESCRIPTION:

- ✓ Coordinates: Long: 18°25'17" Lat: 66°07'06"
- ✓ Classification of site: Micro scale
- ✓ Horizontal Distances from the structures: 42.48 meters
- ✓ Point source emissions inventory: The emissions details are included at the emissions inventory of Puerto Rico.
- ✓ Climatological summaries: The wind rose demonstrates that the winds come from the south.
- ✓ Distance from nearest roadway to probe: 50 meters
- ✓ Traffic count for roadways surrounding the site: 70,543
- ✓ Distance from trees: 30 meters

SITTING CRITERIA BUCHANAN SITE:

- ✓ CBSA Area: San Juan
- ✓ Population : 1,838,270
- ✓ Emissions NO₂ Area: 24,176 tons/yr
- ✓ Monitoring Objective: near road monitors to expected maximum 1- hour NO₂ concentrations near heavily trafficked roads in urban areas
- ✓ Sampling Method: instrumental
- ✓ Analysis Method : chemiluminescence
- ✓ Schedule: continuous



MAP BUCHANAN SITE



PHOTO 1: BUCHANAN





PHOTO 2: BUCHANAN



CAGUAS SITE DESCRIPTION:

- ✓ Coordinates: Long: 18° 16' 36" Lat: 66° 02' 03'
- ✓ Classification of site: Micro scale
- ✓ Horizontal distance from structures: 24.4 meters
- ✓ Point source emissions inventory: The emissions details are included at the emissions inventory of Puerto Rico.
- ✓ Climatological summaries: The wind rose demonstrates that the winds come from the south.
- ✓ Distance from nearest roadway to probe: 51.8 meters
- ✓ Traffic count for roadways surrounding the site: 55,168
- ✓ Distance from trees: 17.8 meters



SITTING CRITERIA CAGUAS SITE:

- ✓ CBSA Area: San Juan -Caguas
- ✓ Population : 1,838,270
- ✓ Emissions NO₂ Area: 24,176 tons/yr
- ✓ Monitoring Objective: near road monitors to expected maximum 1- hour NO₂ concentrations near heavily trafficked roads in urban areas
- ✓ Sampling Method: instrumental
- ✓ Analysis Method : chemiluminescence
- ✓ Schedule: continuous

MAP CAGUAS SITE





PHOTO 3: CAGUAS



PHOTO 4: CAGUAS





GUAYAMA SITE DESCRIPTION:

- ✓ Coordinates: Long: 17°57'55" Lat: 66°11'16"
- ✓ Classification of site: Micro scale (4.28 meters)
- ✓ Horizontal distance from structures: 23.2 meters
- ✓ Point source emissions inventory: PREPA Aguirre.
- ✓ The emissions details are included at the emissions inventory of Puerto Rico.
- ✓ Climatological summaries: The wind rose demonstrates that the winds come from the south.
- ✓ Distance from nearest roadway to probe: 51.7 meters
- ✓ Traffic count for roadways surrounding the site: 28,510
- ✓ Distance from trees: 41.9 meters

SITTING CRITERIA GUAYAMA SITE:

- ✓ CBSA Area: Industrial
- ✓ Population : 186,552
- ✓ Emissions NO₂ Area: 39,369 tons/yr
- ✓ Monitoring Objective: monitors located to characterize areas with the maximum expected NO₂ concentrations at the neighborhood and larger spatial scales
- ✓ Sampling Method: instrumental
- ✓ Analysis Method : chemiluminescence
- ✓ Schedule: continuous



Map Guayama Site

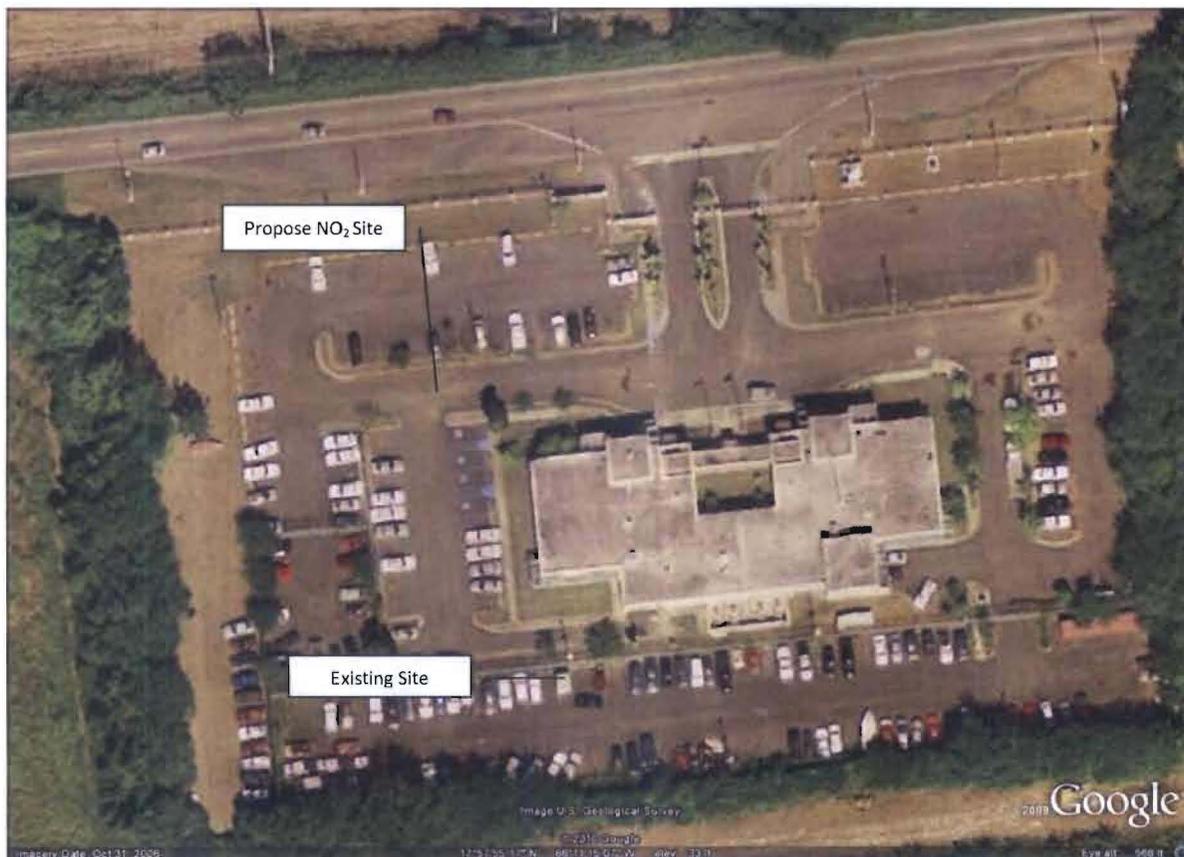




Photo 5: Guayama





Conclusions

The actual NO₂ network is not according with the revised NAAQS. The monitors need to be placed at near-road and at locations of expected maximum 1-hour NO₂ concentrations near heavily trafficked roads in urban areas.

EQB proposes to establish a new revised NO₂ network monitoring according with the new regulation with two new stations in San Juan Area, one station in Guayama area and maintain the existing site in Cataño. The quantity of stations and locations was based on the NO₂ air modeling results. The 1-hour NO₂ standard was exceeded in all modeled areas. The annual standard results remained below the NAAQS. The modeling scenario for the 1-hour standard is very conservative and should be validated using air quality monitoring near the areas of maximum impacts.

EQB plans that the NO₂ monitoring network implementation begins in January 2013 as established in the air monitoring regulation.



Appendices

Appendix I: *Modeling for the 1 Hour NO₂ National Ambient Quality Standard*

Appendix 1

MODELING FOR THE 1-HOUR NO₂ NATIONAL AMBIENT QUALITY STANDARD

INTRODUCTION

EPA announced the new 1-hour standard for NO₂ on January 22, 2010. This standard is attained when the 3-year average of the 98th percentile of the annual distribution of daily maximum 1-hour concentrations does not exceed 100 ppb or 188.67 ug/m³.¹ The Environmental Quality Board is proposing new sites for the NO₂ monitors using air quality modeling to determine the areas with maximum impacts concentrations.

In the memorandum of June 28, 2010, Applicability of Appendix W Modeling Guidance for the 1-hour NO₂ National Ambient Quality Standard, three tiers were recommended for the modeling of the standard. For this study, Tier 1 and Tier 2 were considered to have a conservative scenario. Tier 1 for the new 1-hour NO₂ standard and Tier 2 for the current annual standard.

AIR QUALITY MODEL

The model used was AERMOD with the EPA default options². The modeling study was performed in three areas: San Juan, Guayama and Barceloneta. One year of site-specific data was used in each case. AERMOD was not run in other areas of the island due to the lack of meteorological data.

The meteorological data used in San Juan was from the National Weather Service and was collected in 1994. The data for Barceloneta and Guayama was collected on-site, in 1992 and 1994 respectively, with the upper data from the National Weather Service in San Juan.

¹ Conversion from the EPA SCRAM Notice Regarding Modeling for New Hourly NO₂ NAAQS.

² OLM and PVMRM options were not used.

EMISSION INVENTORY

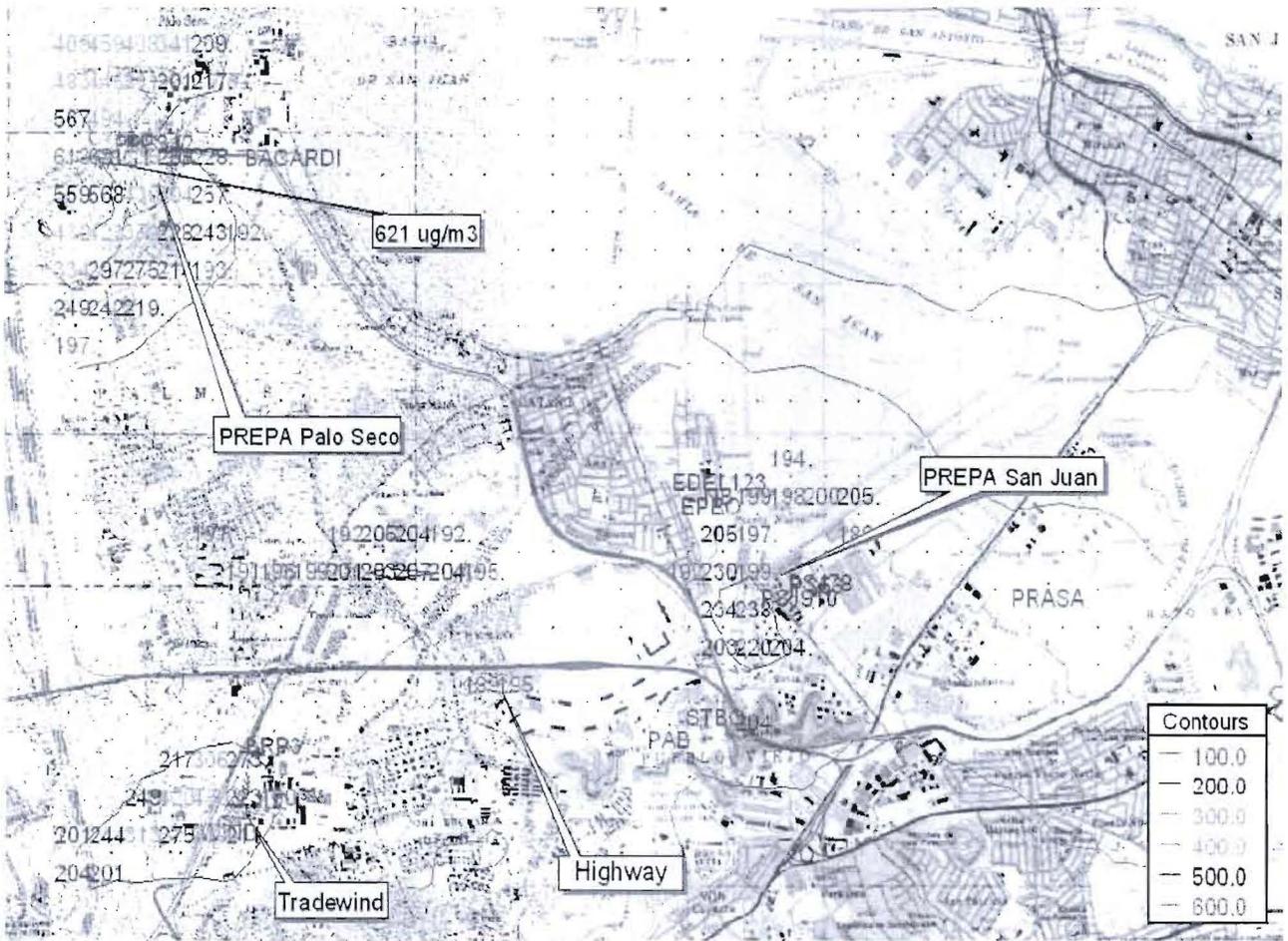
The modeled inventory was multi-source. Using the recommendations in the Appendix W of the 40CFR Part 51, the modeled 1-hour emission rate was computed with the source allowable emissions or the maximum design capacity.

For the annual standard, the 2009 actual emissions were used to compute the modeled emission rate.

RESULTS

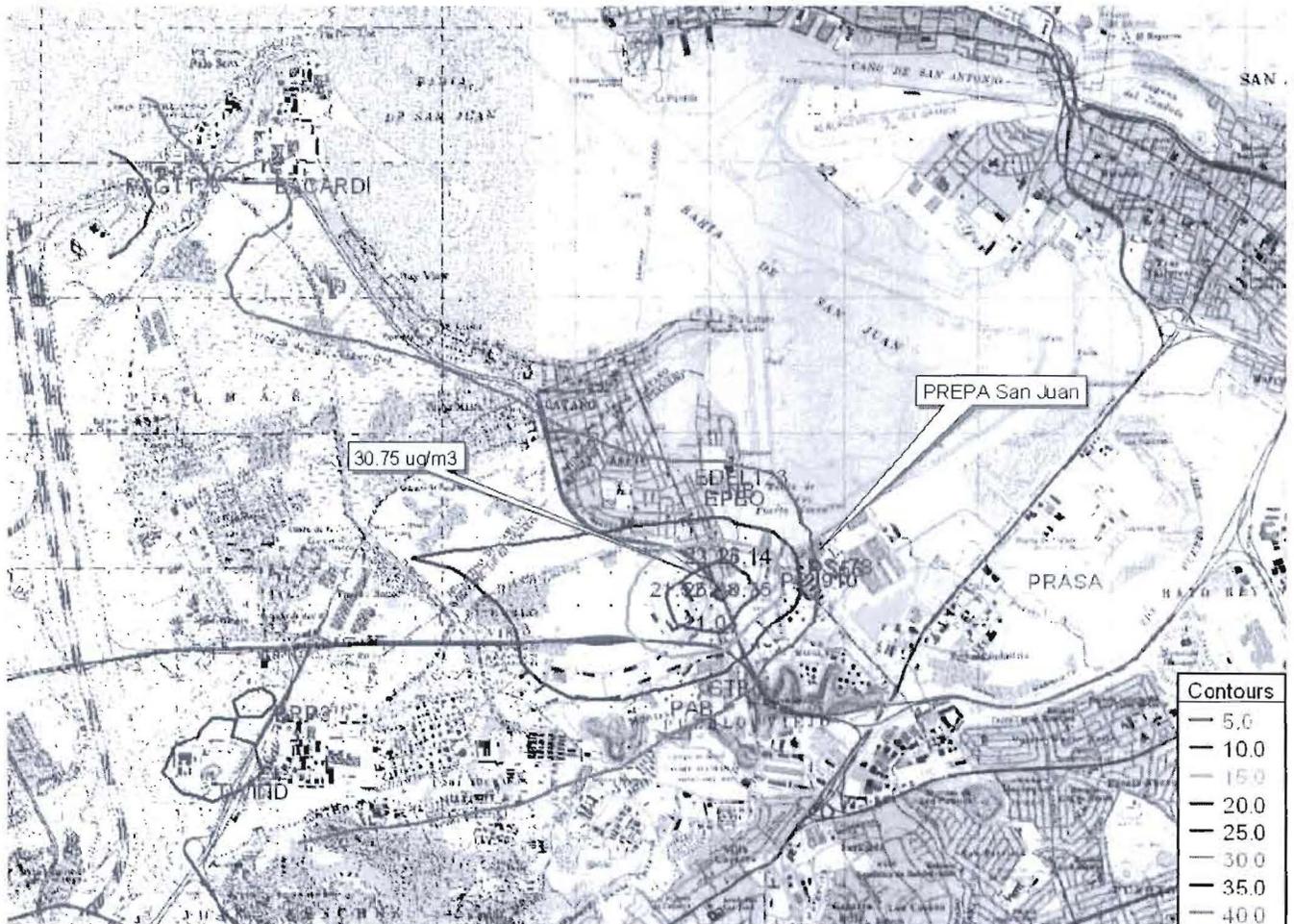
San Juan: The results in San Juan area exceed the NO₂ short-term standard. Violations were registered near PREPA Palo Seco, PREPA San Juan, Tradewinds and in the Buchanan area, near the highway. The maximum impact was near PREPA Palo Seco and it was 621 ug/m³. The PREPA Palo Seco units with the major contribution to this result were the gas turbines. The Figure 1 shows the results.

Figure 1: AERMOD 1-hour NO₂ Modeling Results, San Juan



The annual standard was not exceeding. The maximum impact was 30.75 $\mu\text{g}/\text{m}^3$ near PREPA San Juan. The Figure 2 shows the results for this period.

Figure 2: AERMOD Annual NO₂ Modeling Results, San Juan



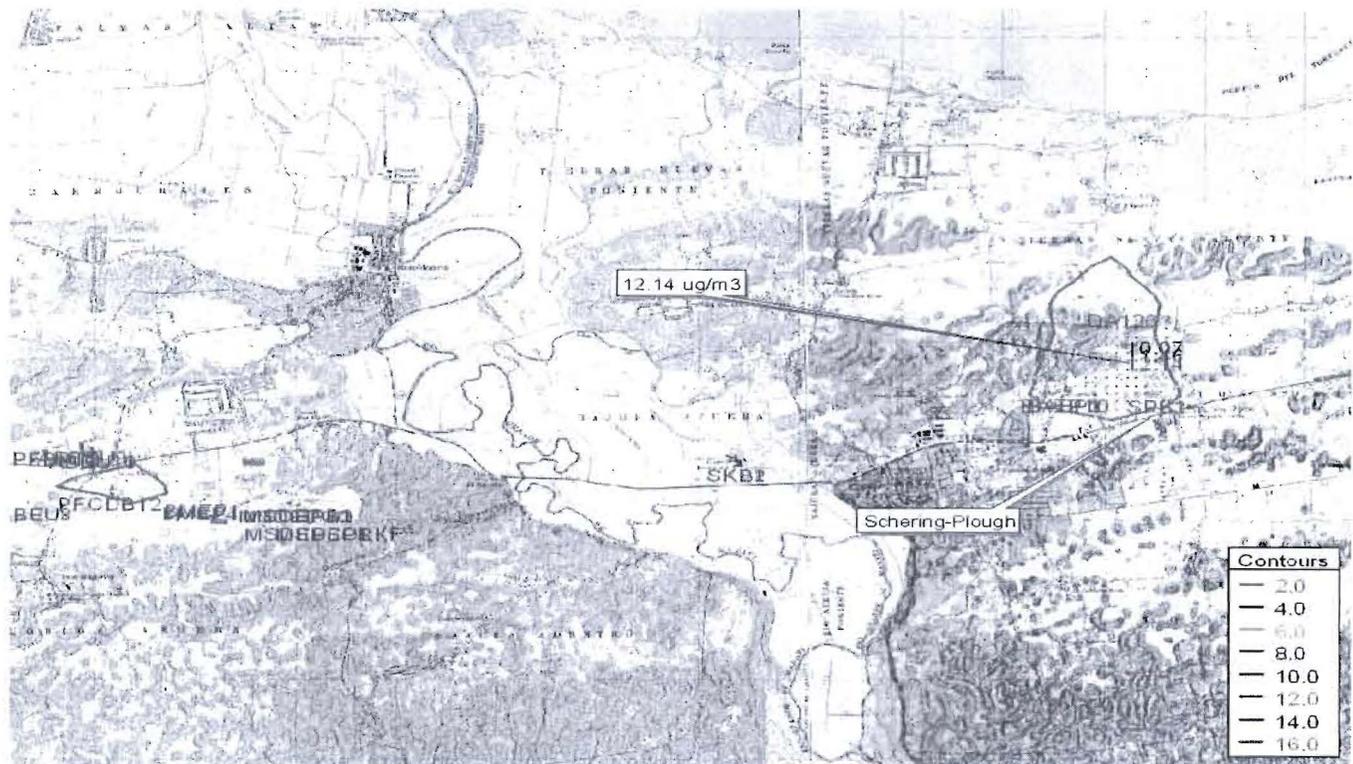
Barceloneta: The NO₂ modeling results exceed the 1-hour standard. Maximum impact was 487 ug/m³, registered near Schering-Plough. This industry has the major contribution to this concentration. Figure 3 present the Barceloneta results for 1-hour NO₂.

The annual standard was not exceeding. The maximum impact was 12.14 ug/m³ registered in the same area as the 1-hour concentration. Figure 4 presents the results.

Figure 3: AERMOD 1-hour NO₂ Modeling Results, Barceloneta



Figure 4: AERMOD Annual NO₂ Modeling Results, Barceloneta



Guayama: The modeling results for the 1-hour NO₂ standard were exceeded. The maximum impact was 473 ug/m³, near PREPA Aguirre and this industry had the major contribution to this concentration. There were no violations of the annual standard. Figures 5 and 6 present the results.

Figure 5: AERMOD 1-hour NO₂ Modeling Results, Guayama

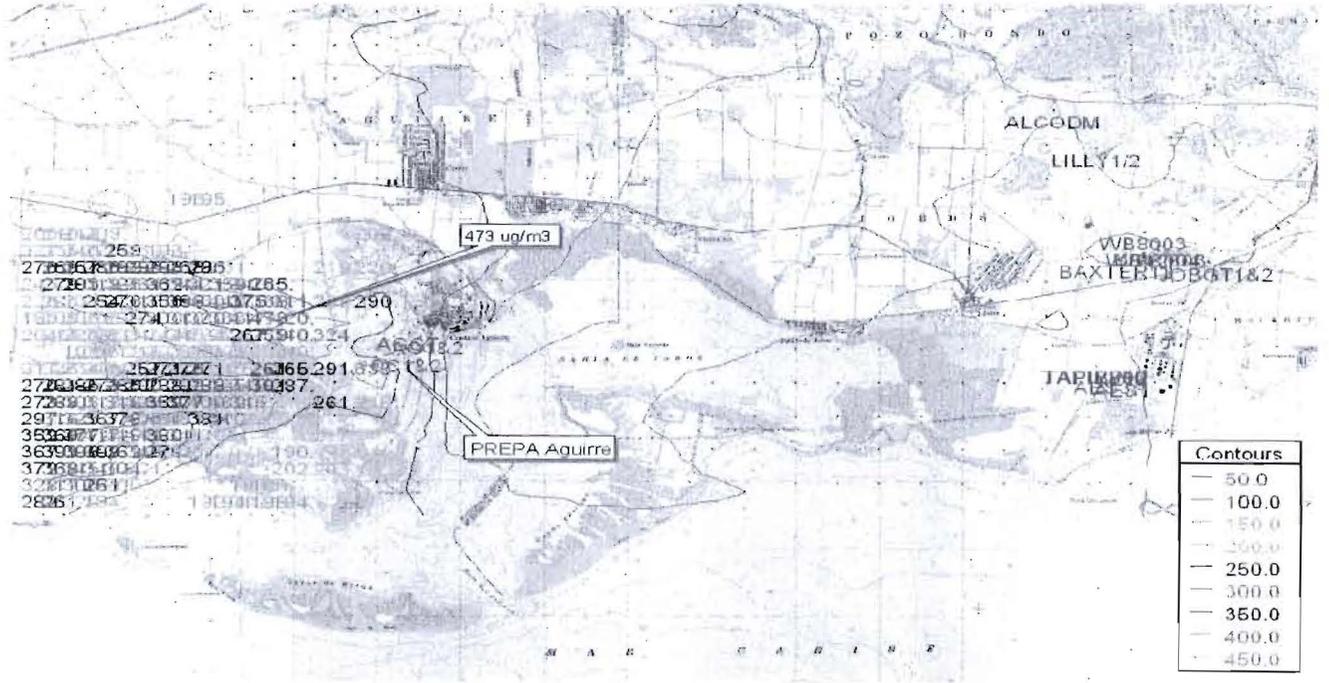
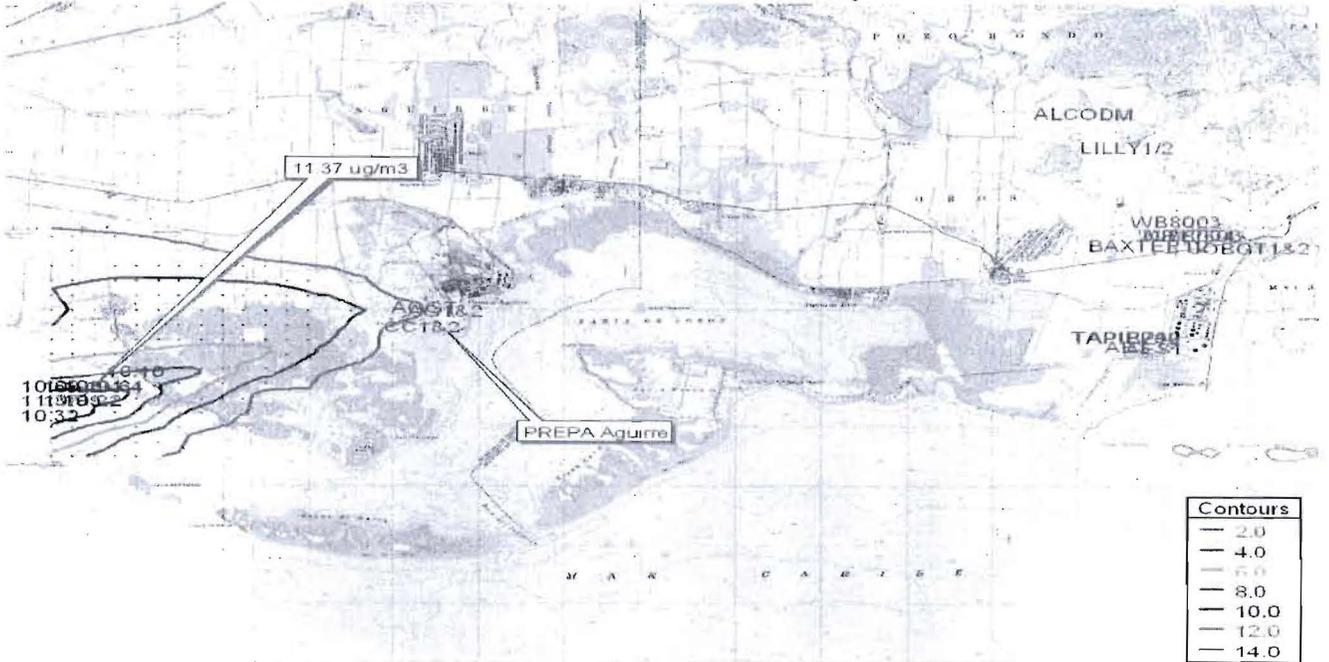


Figure 6: AERMOD Annual NO₂ Modeling Results, Guayama



The 1-hour NO₂ standard was exceeded in all modeled areas. Annual standard results remained below the NAAQS. The modeling scenario for the 1-hour standard is very conservative and should be validated using air quality monitoring near the areas of maximum impacts.

APPENDIX A
EMISSION INVENTORIES