

Puerto Rico Environmental Quality Board

Puerto Rico Designation for the new 1-hour SO₂ NAAQS



Validation And Data Services & Air Modeling Division
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Acronyms and Abbreviations

AIRS: Aerometric Information Retrieval System

CBSAs: Core Based Statistical Areas

CFR: Code Federal Register

EPA: Environmental Protection Agency

FRM: Federal Reference Method

FEMs: Federal Equivalent Methods

NAAQS: National Air Ambient Quality Standards

SO₂: Sulfur Dioxide

ppm: parts per million

PR: Puerto Rico

PREQB: Puerto Rico Environmental Quality Board

PREPA: Puerto Rico Power Electrical Authority

PWEI: Population Weighted Emissions Index

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

Introduction

Puerto Rico Environmental Quality Board (PREQB) as representative agency of the Government of Puerto Rico submit the recommendations for the Puerto Rico area designations on the new 1-hour SO₂ NAAQS, as required under the Federal Clean Air Act.

The Puerto Rico Designation for the new 1-hour SO₂ NAAQS, 2010 serves as technical and support document of SO₂ designation to PR areas. The document includes the data availability for air quality and, the location of the existing monitoring stations, air dispersion model results.

Procedure

EQB use the hybrid analytic approach that would combine the use of monitoring and modeling to assess compliance with the new 1-hour SO₂ NAAQS as recommended by EPA.

According with the regulation EQB use the monitoring data from the existing SO₂ network for the years 2007 to 2009 and the results of the air dispersion models for the areas that have the potential to cause or contribute to a NAAQS violation to classify the areas of Puerto Rico for the initial designation. The designation will be temporary until the PR SO₂ network complies with the new regulation. EQB will need to make some adjustments to the EQB SO₂ network to ensure that monitors meeting today's network design regulations for the new 1-hour. EQB expected compliance with the new NAAQS to be determined based on 3 years of complete, quality assured, certified monitoring data. EQB intended to complete designations by June 2013 based on 3 years of complete, quality assured, certified air quality monitoring data as generated from the adjusted monitoring network.

EQB further explained that PR did not expect newly-cited monitors for the proposed network to generate sufficient monitoring data for us to use in determining whether areas complied with the new NAAQS by the statutory deadline to complete initial designations. Consequently, we discussed our expectations to base initial designations on air quality data from the years 2008- 2010 or 2009-2011, from SO₂ monitors operating at current locations, which we expected to continue through 2011.

Designation to the Areas:

EQB anticipate that the identification of NAAQS violations and compliance with the 1-hour SO₂ NAAQS would primarily be done through refined, source-oriented air quality dispersion modeling analyses, supplemented with a new, limited network of ambient air quality monitors. Under our approach EQB recommend to designate the areas as follow:

- An area that has monitoring data or refined modeling results showing a violation of the NAAQS would be designated as “*nonattainment*.”
- An area that has both monitoring data and appropriate modeling results showing no violations would be designated as “*attainment*.”
- All other areas, including those with SO₂ monitors showing no violations but without modeling showing no violations, would be designated as “*unclassifiable*.”
- Areas with no SO₂ monitors at all *i.e.*, “rest of State,” would be designated as “*unclassifiable*” as well.

Monitoring Results:

3- Year Average of the 99 th percentile of the annual distribution of daily 1-hour average concentrations ¹				
Stations	2007	2008	2009	3 -year Average
Juncos: 72-033-0008		0.003	0.003	0.003
Guayama: 72-057-0009	0.003	0.004	0.004	0.004
Cataño: 72-033-0004	0.009	0.011	0.023	0.014
Salinas: 72-123-0002			0.007	0.007
Bayamón: 72-021-0006	0.006	0.008	0.029	0.014

¹ Source: AQS data

SO₂ Modeling Results:

The modeling study was performed according to the recommendations presented by EPA in the memorandum, Applicability of Appendix W Modeling Guidance for the 1-hour SO₂ National Ambient Air Quality Standard.

The model used was AERMOD with the EPA default options. The modeling study was performed in four areas: San Juan, Guayama, Guayanilla and Barceloneta. One year of site-specific data was used in each case. The highest second highest value was used as a maximum impact result. 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 collected in 1994 by the National Weather Service. 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. The data used in Guayanilla was collected on-site in 1993 with the upper air and cloud cover data from the National Weather Service in San Juan.

The emission source inventory was multi-source. Using the recommendations in the Appendix W of the 40 CFR Part 51, the modeled emission rate for the short-term 1-hour and 3-hour standard was computed with the source allowable emissions or the maximum design capacity. This is a conservative approach and ensures the modeling of the worst-case scenario. Copies of the emission inventory data are included in Appendix I.

Industrial Areas:

Guayama - Salinas

The modeling results for the 1-hour SO₂ standard were exceeded. The maximum impact was 643 µg/m³, near PREPA Aguirre and this industry had the major contribution to this concentration with 642 µg/m³. There were no violations of the 3-hour standard and the maximum impact was 354 µg/m³ near PREPA Aguirre. This industry had the major contribution to the 3-hour result with 353 µg/m³. Figures 1, 2, 3 and 4 present the results.

Figure 1: AERMOD 1-hour SO₂ Modeling Results, Guayama

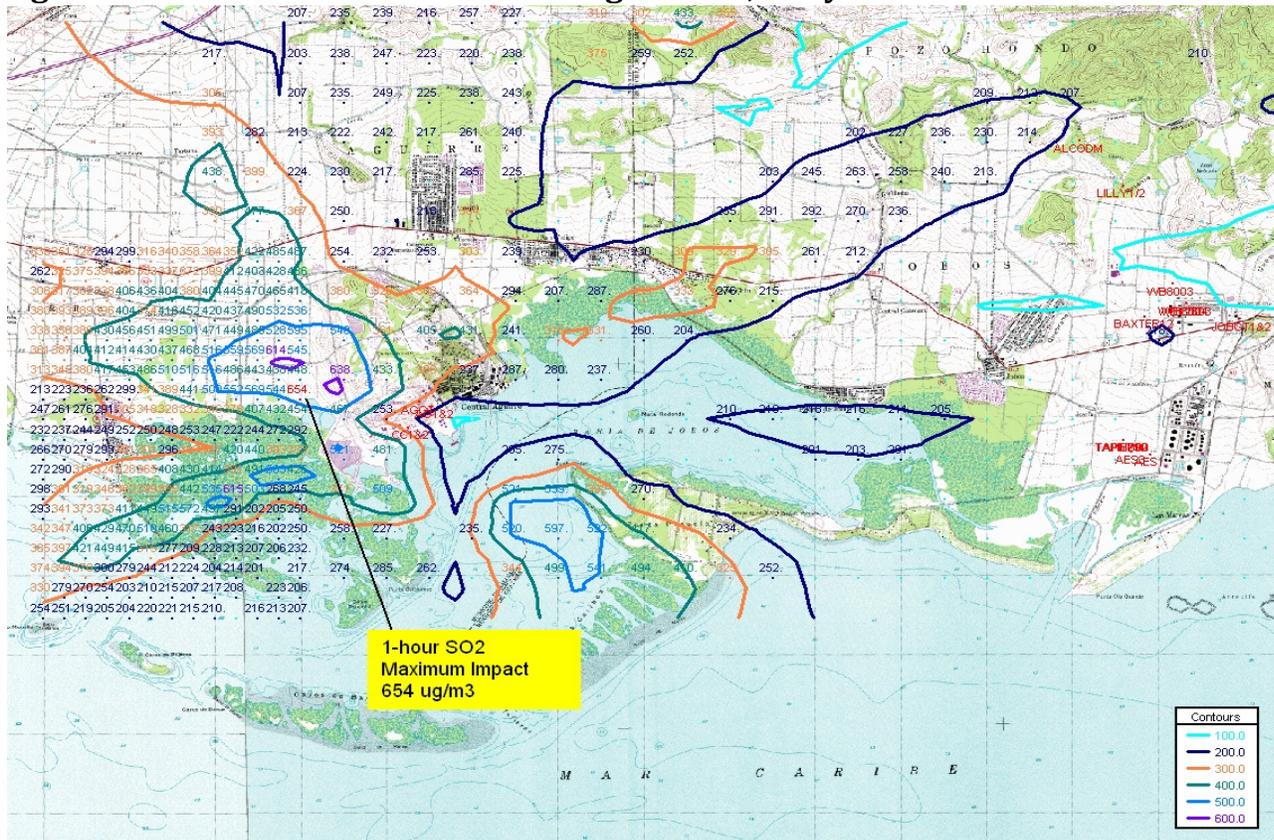


Figure 2: AERMOD 1-hour SO₂ Modeling Results, PREPA Aguirre

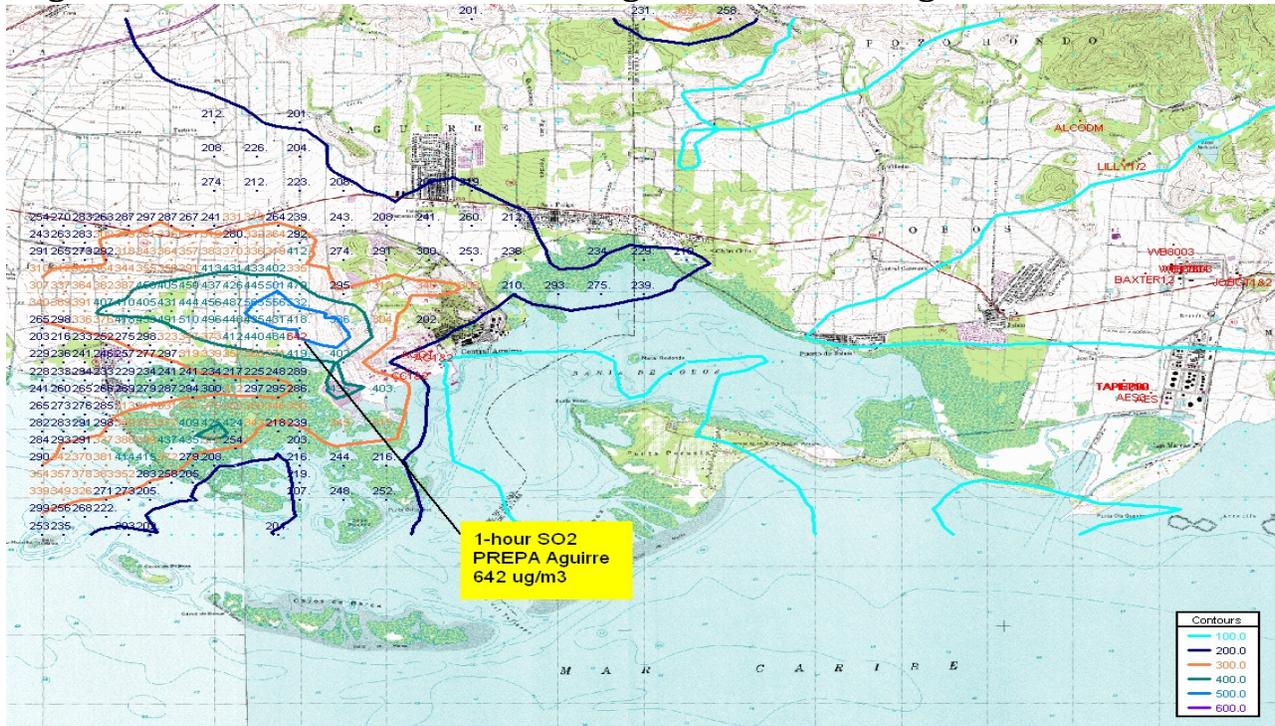
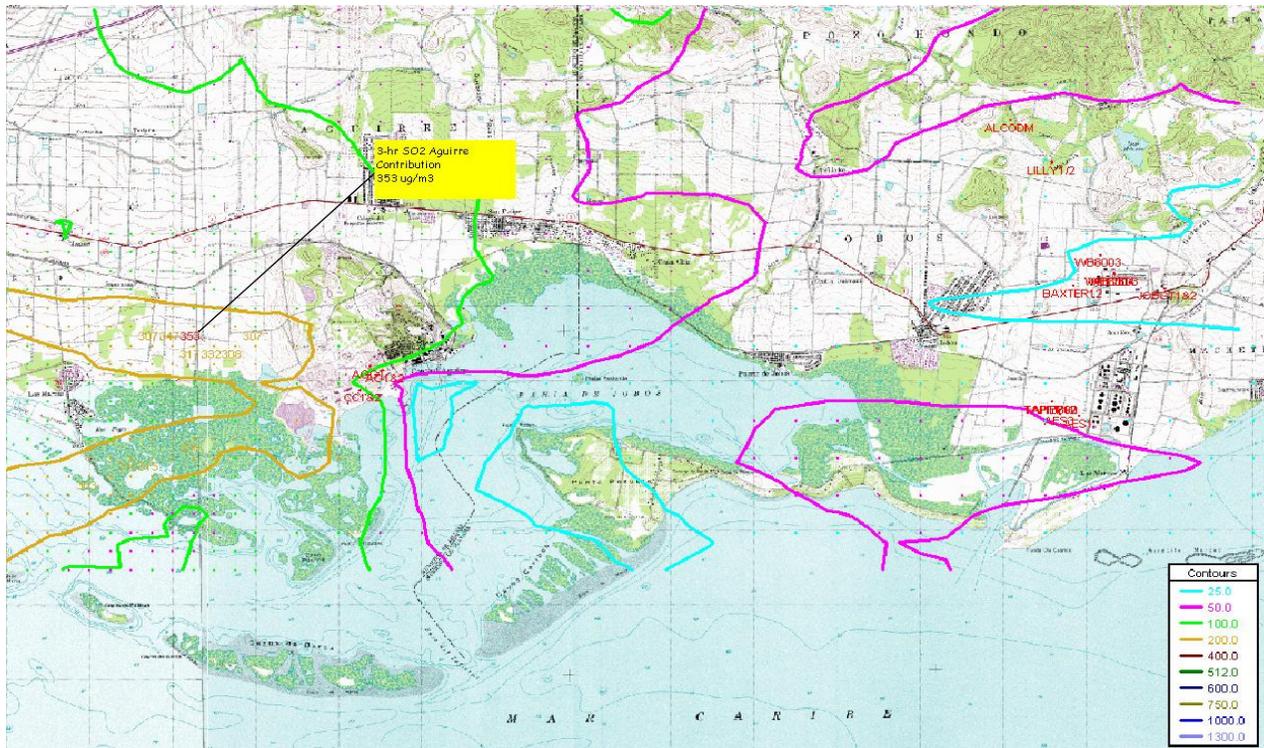


Figure 3: AERMOD 3-hour SO₂ Modeling Results, Guayama



Figure 4: AERMOD 3-hour SO₂ Modeling Results, PREPA Aguirre



Guayanilla-Ponce:

The modeling results for the 1 and 3 hour SO₂ standard were exceeded. The 1-hour result was 4854 ug/m³ and PREPA Costa Sur had the major contribution to this concentration with 4851 ug/m³. For the 3-hour standard the maximum impact was near PREPA Costa Sur and the concentration was 1839 ug/m³. PREPA Costa Sur had the major contribution to this result with 1837 ug/m³. In the Ponce area CEMEX has the major concentration to the 1-hour standard with 1619 ug/m³. Figures 5, 6, 7, 8 and 9 present the results.

Figure 5: AERMOD 1-hour SO₂ Modeling Results, Guayanilla

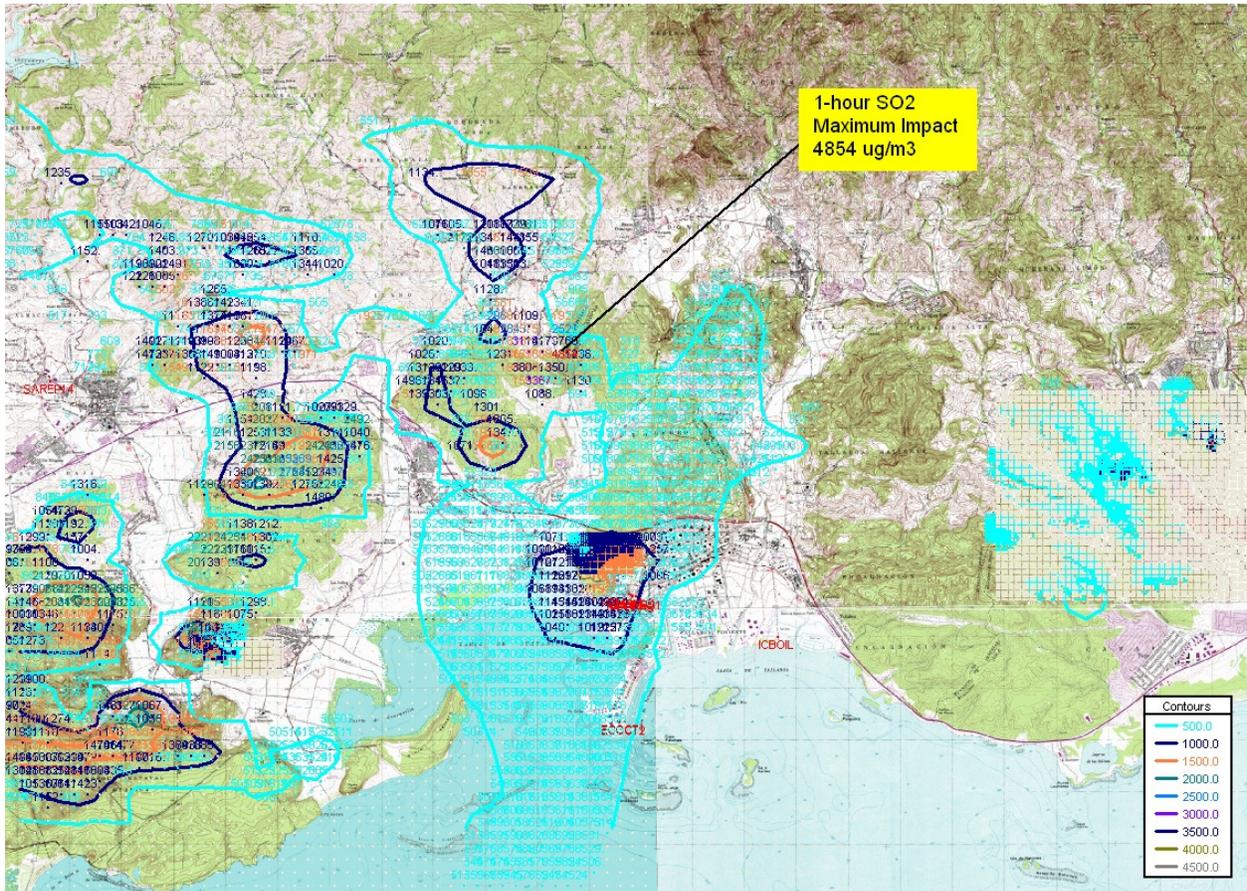


Figure 6: AERMOD 1-hour SO₂ Modeling Results, PREPA Costa Sur

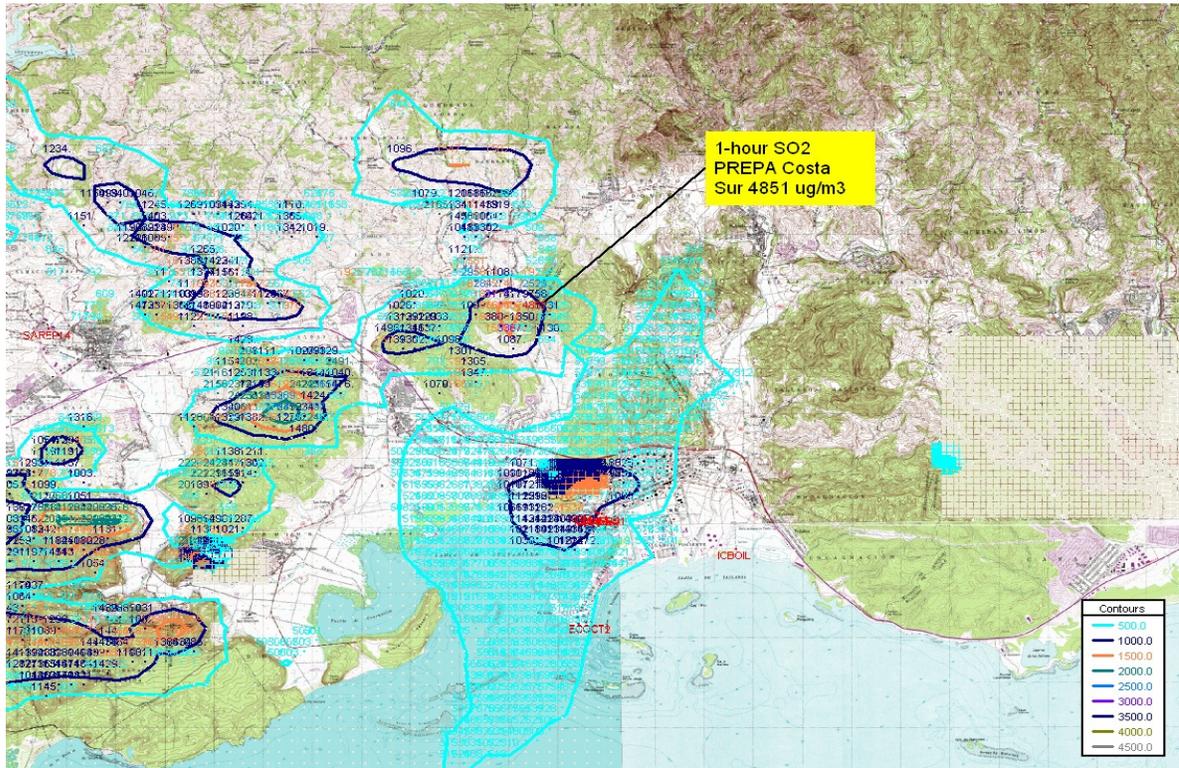


Figure 7: AERMOD 3-hour SO₂ Modeling Results, Guayanilla

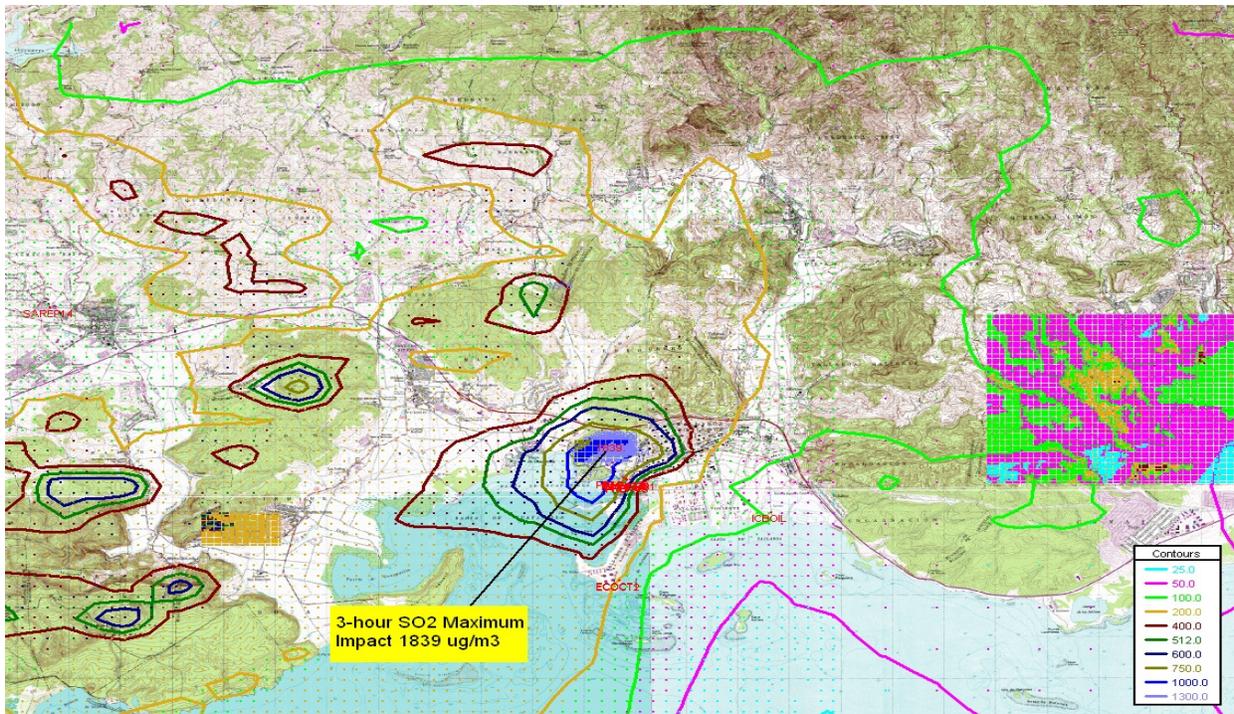
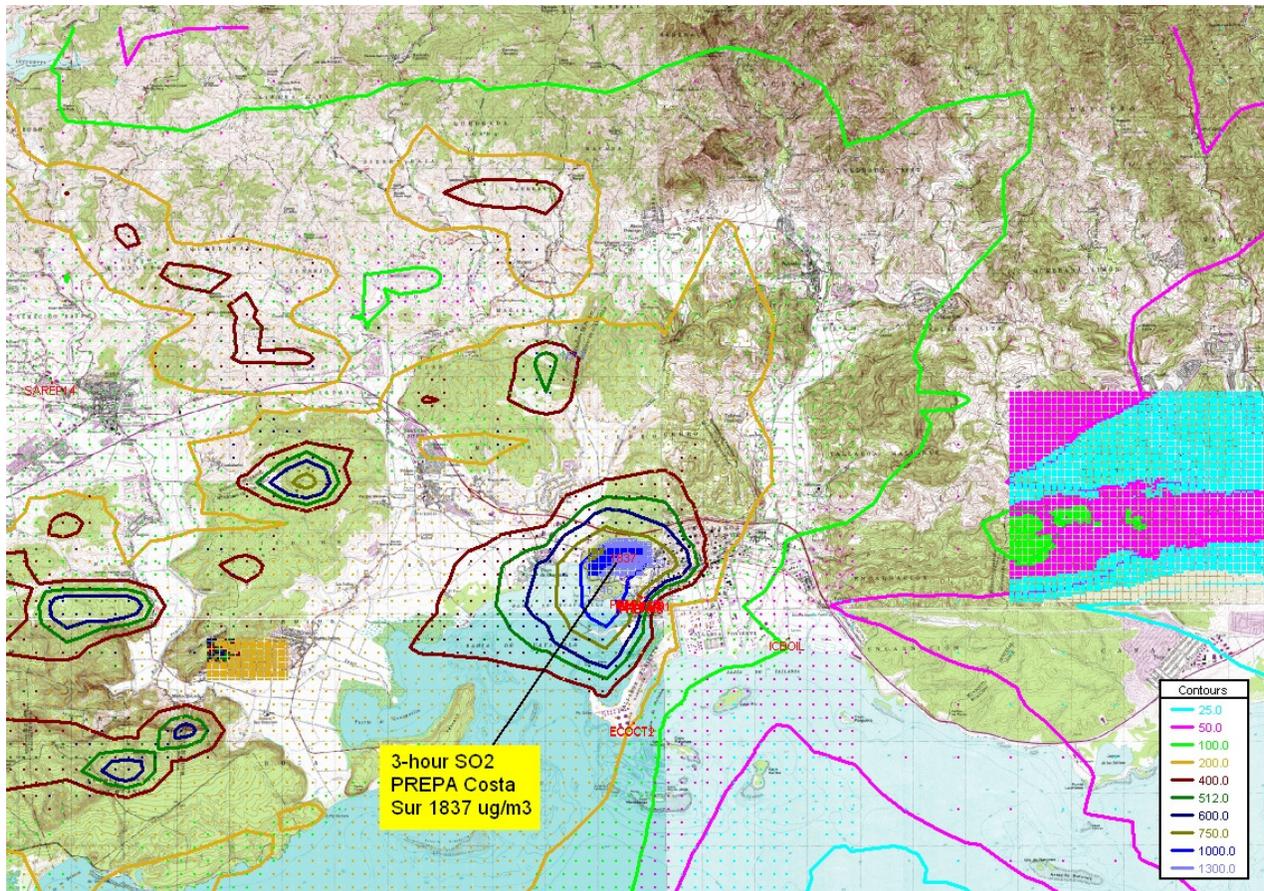
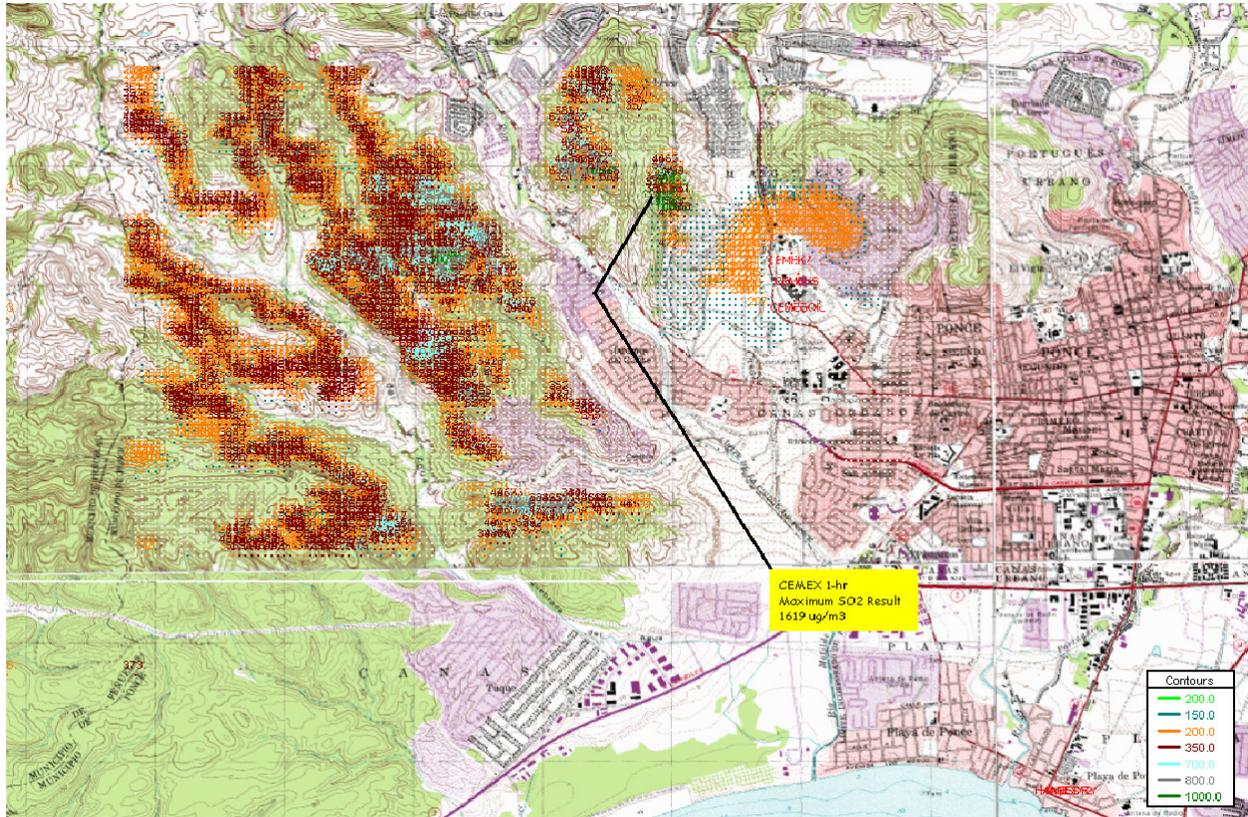


Figure 8: AERMOD 3-hour SO₂ Modeling Results, Costa Sur



Another area with SO₂ violations was in Ponce. The major impact was near CEMEX with 1-hour result of 1619 ug/m³. The 3-hour standard was in the same area but was not exceeded. Figure 16 show the 1-hour result.

Figure 9: AERMOD 1-hour SO₂ Modeling Results, CEMEX



Violations of the 1-hour standard were registered in all modeled areas. The highest one hour values were registered in Guayanilla-Ponce and Barceloneta. The 3-hours standard was exceeding in Guayanilla but not in other modeled areas.

It is recommended to place air quality monitors near the areas of maximum SO₂ impacts to confirm the modeling results.

Barceloneta

The SO₂ modeling results exceeded the 1-hour standard. Maximum impact was 2833 µg/m³, registered near Schering-Plough. The industry has the major contribution to this concentration with a result of 2833 µg/m³. Figure 10 and 11 presents the Barceloneta results for 1-hour SO₂.

Figure 10: AERMOD 1-hour SO₂ Modeling Results, Barceloneta

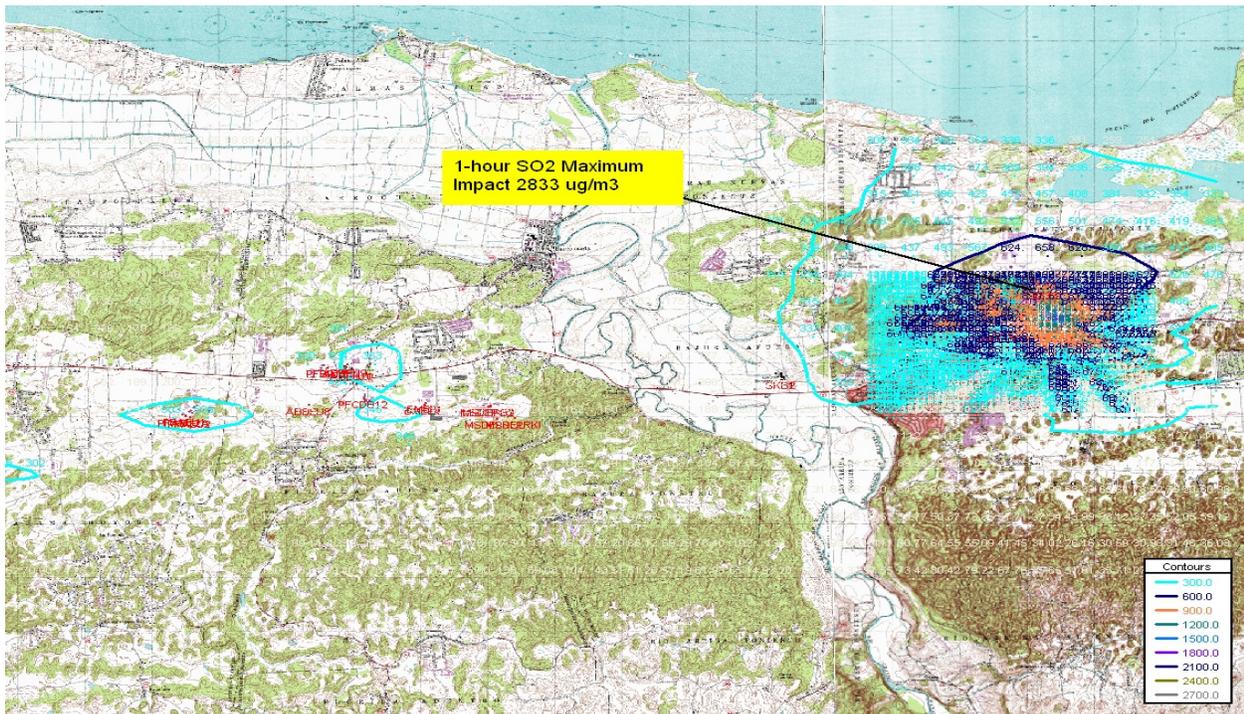
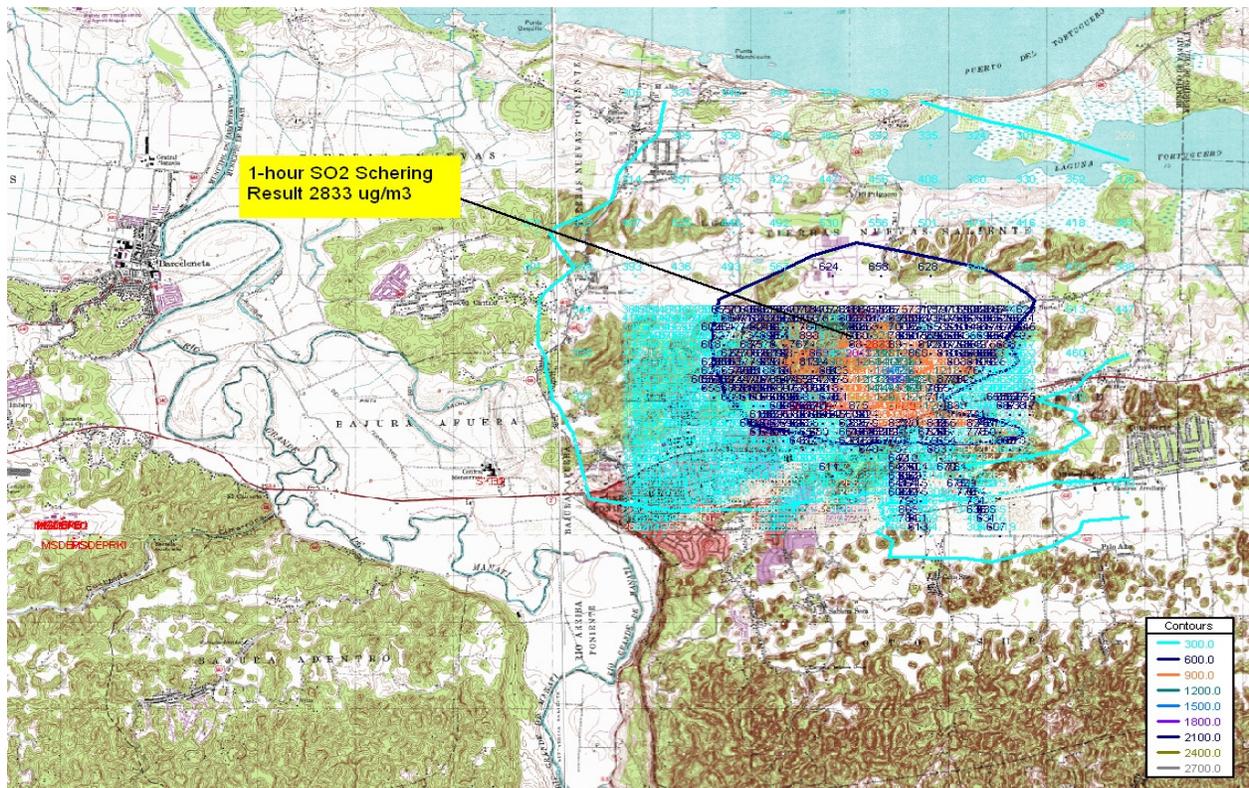


Figure 11: AERMOD 1-hour SO₂ Modeling Results, Schering-Plough



The 3-hour standard was not exceeding. The maximum impact was 1203 $\mu\text{g}/\text{m}^3$ registered in the same area as the 1-hour concentration with the major contribution of Schering-Plough. Figure 12 and 13 presents the results.

Figure 12: AERMOD 3-hour SO₂ Modeling Results, Barceloneta

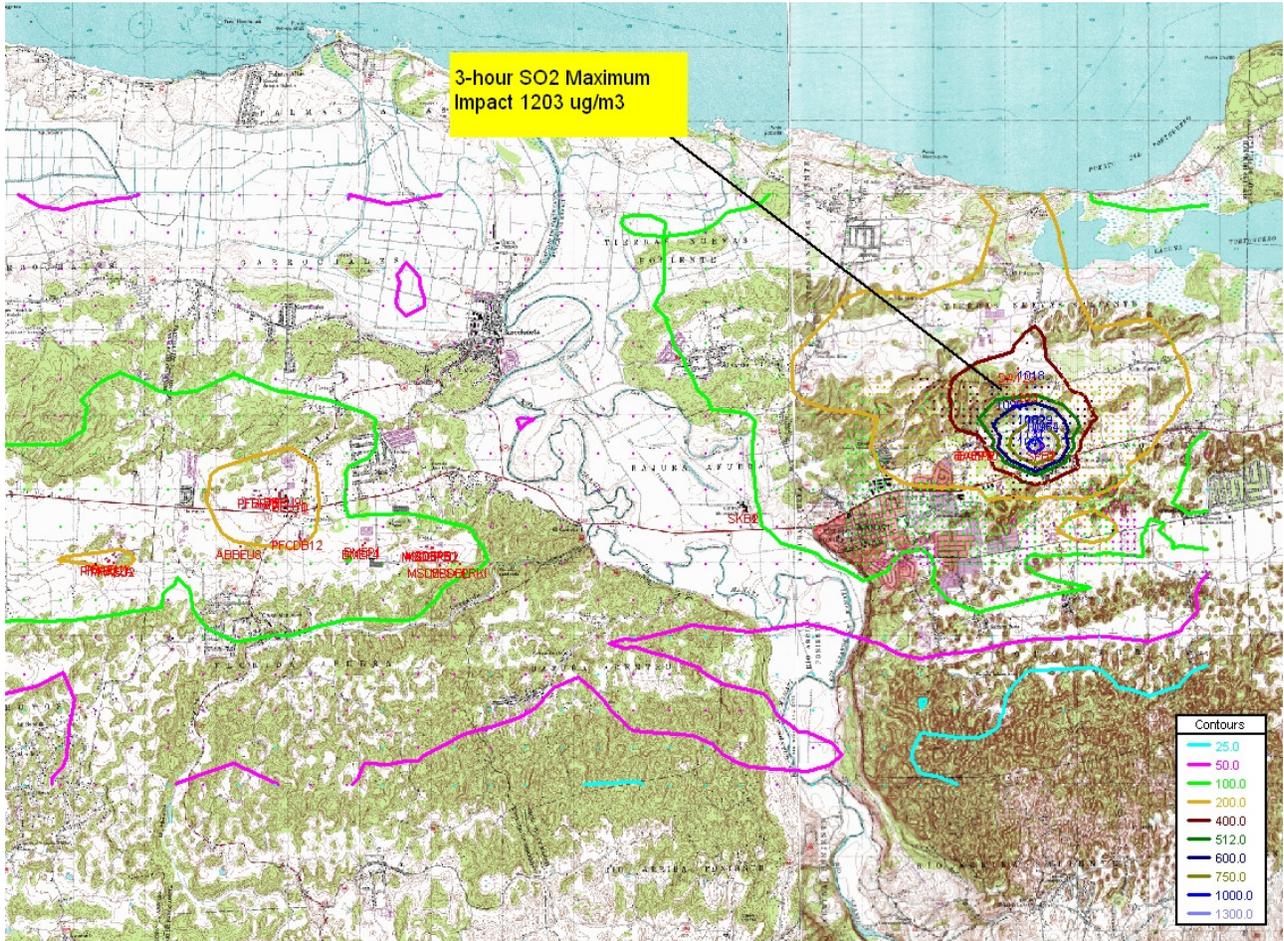


Figure 13: AERMOD 3-hour SO₂ Modeling Results, Schering-Plough



Metropolitan Area – San Juan

The results in San Juan area exceed the SO₂ 1-hour standard. Violations of the 1-hour standard were registered in almost all modeling area. The maximum impact was near PREPA Palo Seco and it was 666 µg/m³. PREPA Palo Seco had the total contribution to this result with 666 µg/m³. Figure 14 and 15 shows the results.

Figure 14: AERMOD 1-hour SO₂ Modeling Results, San Juan

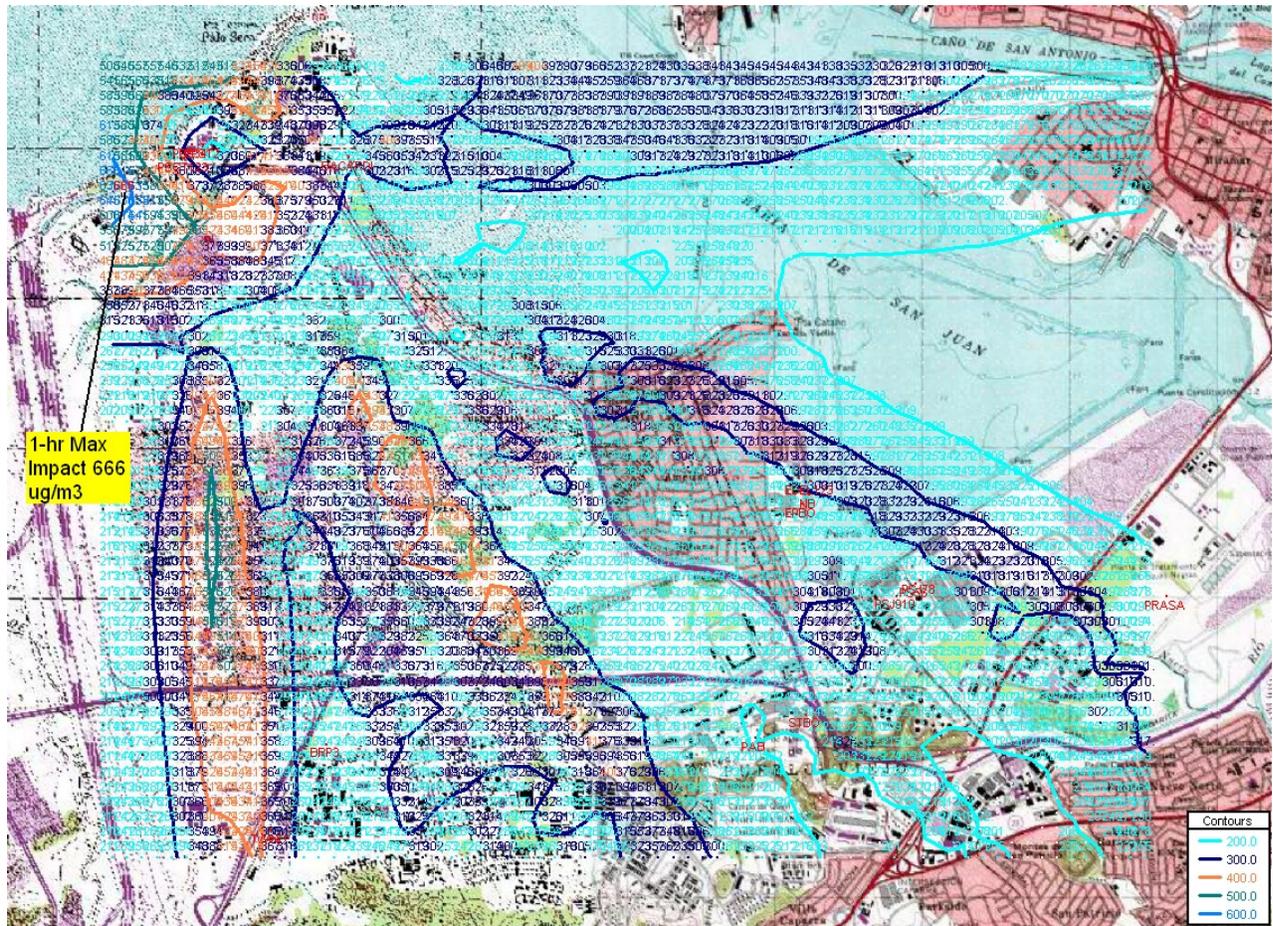
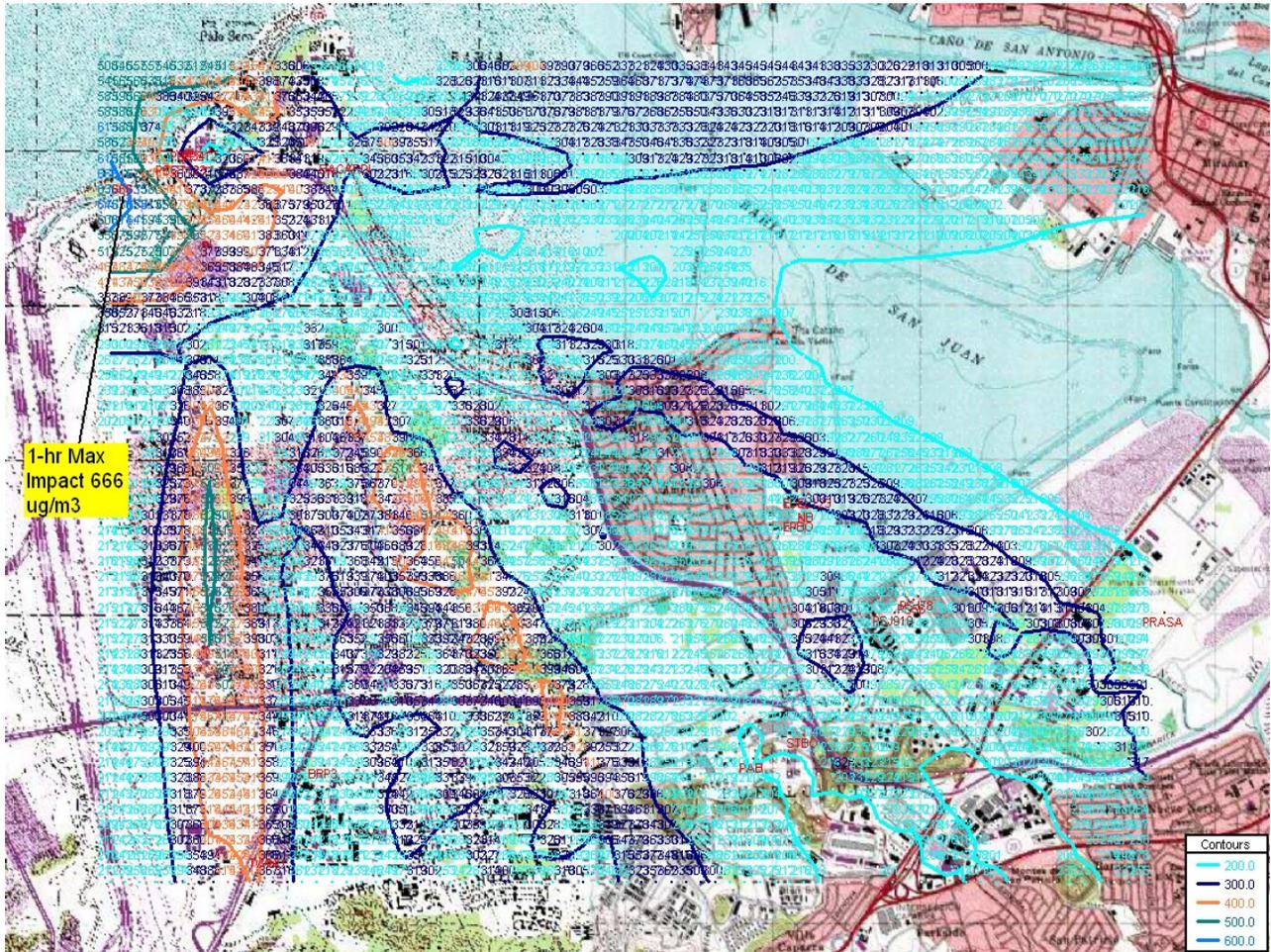
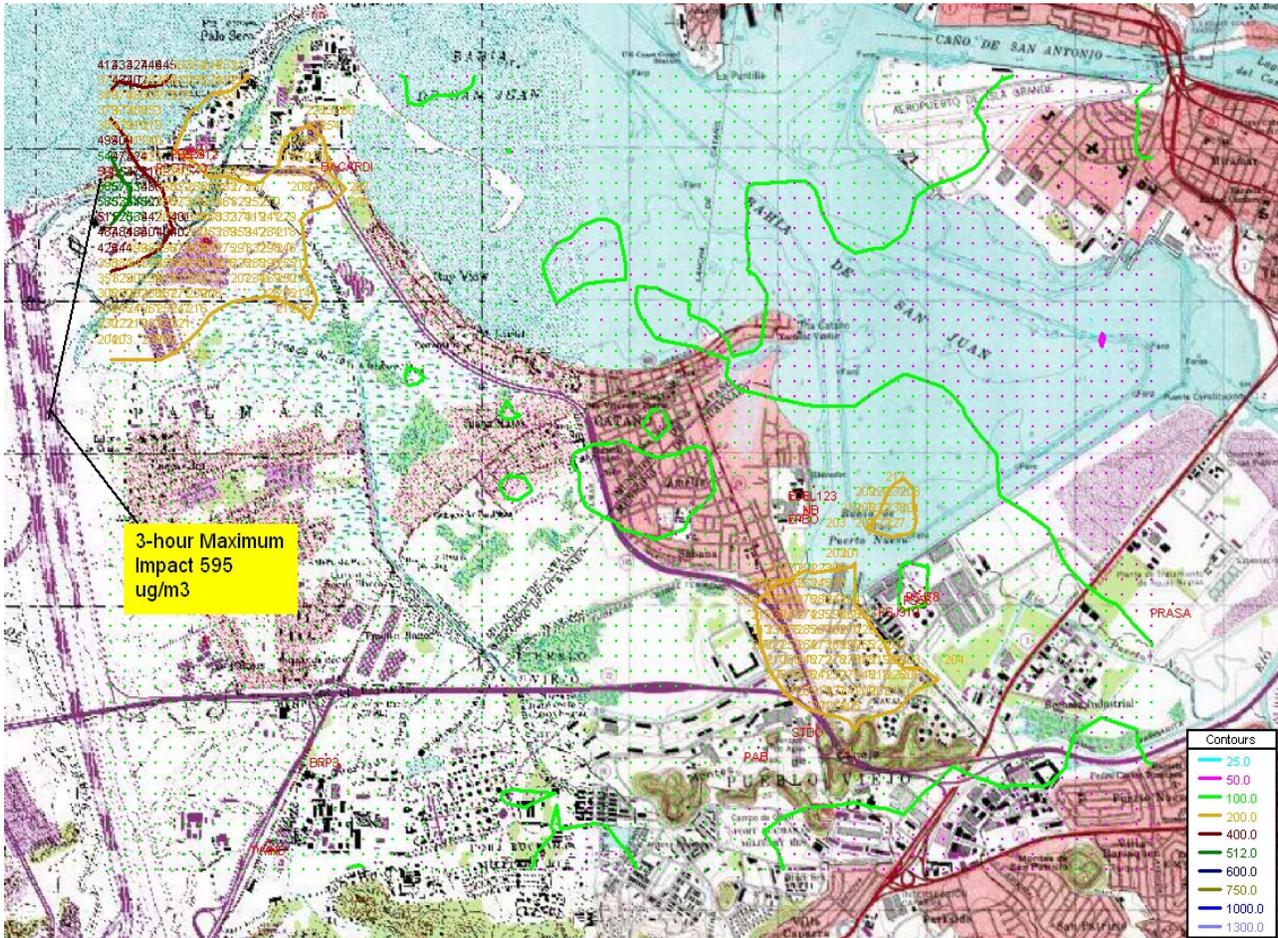


Figure 15: AERMOD 1-hour SO₂ Modeling Results, PREPA Palo Seco



The 3-hour standard was not exceeding. The maximum impact was 595 $\mu\text{g}/\text{m}^3$ near PREPA Palo Seco and this industry had the major contribution to the result with 592 $\mu\text{g}/\text{m}^3$. The Figure 16 shows the results for this period.

Figure 16: AERMOD 3-hour SO₂ Modeling Results, San Juan



Violations of the 1-hour standard were registered in all modeled areas. The highest one hour values were registered in Guayanilla and Barceloneta. The 3-hours standard was exceeding in Guayanilla but not in other modeled areas.

It is recommended to place air quality monitors near the areas of maximum SO₂ impacts to confirm the modeling results.

Conclusions

According with modeling and monitoring results for the new 1-hour SO₂ NAAQS the areas are designed as follow:

Non-Attainment:

- Barceloneta - Manatí Area
- Guayama Area
- San Juan Area
- Guayanilla - Ponce Area

Unclassified:

- Mayaguez Area
- Fajardo-Humacao Area