

Air Quality Impact Assessment

PORT OF THE AMERICAS

PREPARED FOR:

Port of the Americas Authority



PREPARED BY:



CSA GROUP

Appendix H: Air Quality Impact Assessment

1.0 Impacts on Air Quality

The potential impacts on the quality of the air from the development of the PTA alternatives were analyzed as part of this SDEIS. Air emissions into any of the Project sites would increase from the current levels due to four different activities:

- Temporary generation of fugitive dust from construction of the docks, piers, parking areas and value-added sites (i.e., clearing, grading earth movement, excavation, etc.), and volatile organic compounds emitted during paving and painting activities.
- Intermittent generation of exhaust gases from heavy equipment, vehicles and other equipment during construction and operation of the ports.
- Generation of exhaust gases from operation equipment, such as gantry cranes, container lift cranes and tractors, and emergency power generators that operate with diesel fuel.
- Generation of exhaust gases during maneuvering and harboring of additional vessels at both ports.

1.1.1 No - Action Alternative

Under the No-Action Alternative, there would be no new air emission sources on the proposed Project areas. The air quality regime would remain as described in Chapter 3.

1.1.2 Ponce & Guayanilla-Peñuelas Terminals

Under this alternative, air emissions would increase in the Project areas from current levels:

Additional emissions that would be generated from construction and operation of this alternative were divided as follows:

Construction

- Fugitive Dust Emissions from heavy construction and vehicular traffic
- Volatile Organic Emissions Associated to Paint Solvent and Paving Emissions
- Construction Equipment Emissions

Operation

- Emissions from Stationary Sources during Operation
- Emissions from Additional Vessels (Mobile Sources) during Operation

Estimates of emissions were based on the USEPA AP-42 Air Pollutant Emission Factors for Stationary Point and Area Sources. A summary of the assumptions is included in the sections below.

- **Fugitive Dust Emissions:** An estimate was obtained of fugitive dust emissions from heavy construction applying an emission factor utilized by EPA. This emission factor is 1.2 tons per acre of construction per month of construction activity (EPA, 1995). This is a conservative factor and is based on total particulate matter rather than the fraction of particulate matter with an aerodynamic diameter equal of less than 10 microns (PM₁₀). It was assumed that construction activities would take 30 days in any given month and implementation of control measures with an efficiency of 50 percent.
 - The area of the project in the Ponce Terminal that would be subject to heavy construction is estimated at 44 acres, and would be located in the areas proposed for value-added activities. Heavy construction would take 6-months to be completed.
 - The areas of the project in the Guayanilla Terminal that would be subject to heavy construction are estimated at 110 acres of submerged land reclamation by fill at the Guayanilla Bay and 10 percent of the construction area for the value added activities within the UCC parcel at Peñuelas. Heavy construction would take 12 months for the port area and 6 months for the value added area.
 - Vehicular traffic would also generate fugitive emissions. Estimates consider 50 percent emissions control, based on cleaning the construction vehicles and wetting of roads.
 - A summary of fugitive dust emissions, assuming 50 percent reduction from implementation of emission controls, from heavy construction and vehicular traffic for both sites of the Project is presented below (Table 1-1).

Table 1-1.Fugitive Dust Emissions: Construction and Vehicular Traffic

Ponce Site	Dust emissions from heavy construction	158 tons
	Dust emissions from on site vehicular traffic	13.1 tons
Guayanilla-Peñuelas Site	Dust emissions from heavy construction	1,265 tons
	Dust emissions from on site vehicular traffic	19.2 tons

- **Volatile Organic Emissions Associated to Paint Solvent and Paving Emissions:** Emissions of volatile organic compounds from construction related activities were also calculated. Volatile Organic Compounds (VOC's) are organic chemicals that have a high vapor pressure and easily form vapors at normal temperature and pressure. The term is generally applied to organic solvents, certain paint additives, aerosol spray can propellants, fuels (such as gasoline, and kerosene), petroleum distillates, dry cleaning products and many other industrial and consumer products ranging from office supplies to building materials. VOC's are also naturally emitted by a number of plants and trees. Volatile organic compounds will be emitted during painting and paving activities. The section below includes the estimated VOC's that would be emitted from the Project.

- **Paint Solvent Emissions:** It was assumed that 5,000 gallons of paint would be applied at the Ponce site and 10, 000 gallons at the Guayanilla site. Results of this analysis are presented in Table 1-2.

Table 1-2. Total VOC Emissions from Paint Solvent

SITE	VOC EMISSIONS
Ponce	11 tons
Guayanilla-Peñuelas	22.1 tons

- **Paving Emissions:** Following is an estimate of emission of volatile organic compounds from paving activities for the Ponce site. Parking areas and internal roads at the Ponce site, the paved area yielded approximately 212, 961 yd². and 909, 924 yd². Table 1-3 summarizes the total VOC's emissions associated to paving activities.

Table 1-3. Total VOC's Emissions from Paving Activities

SITE	VOC EMISSIONS
Ponce	204 tons
Guayanilla-Peñuelas	873 tons

- **Construction Equipment Emissions:** The emissions from construction equipment were calculated using information on motor horsepower, the AP-42 emission factors, and an equipment operating time. Emissions from construction equipment at the port zone and value-added areas at the Ponce and Guayanilla-Peñuelas sites are summarized in Table 1-4.

Table 1-4. Emissions from Construction Equipment at the Ponce Port Zone and Value-Added Area

Port Zone		
Pollutant	Ton/day	Ton/month
Nitrogen Oxides	0.36	10.84
Carbon Monoxide	0.08	2.34
Sulfur Oxides	0.02	0.72
Particulate matter with an aerodynamic diameter equal or lower than 10 microns	0.03	0.77
Total Organic Carbon	0.03	0.88
Value-Added Area		
Pollutant	ton/day	ton/month
Nitrogen Oxides	0.28	8.26
Carbon Monoxide	0.06	1.78
Sulfur Oxides	0.02	0.55
Particulate matter with an aerodynamic diameter equal or lower than 10 microns	0.02	0.59
Total Organic Carbon	0.02	0.67

Table 1-5. Emissions from Construction Equipment at the Guayanilla-Peñuelas Port Zone and Value-Added Area

Port Zone		
Pollutant	Ton/day	Ton/month
Nitrogen Oxides	1.36	40.68
Carbon Monoxide	0.30	8.94
Sulfur Oxides	0.13	4.02
Particulate matter with an aerodynamic diameter equal or lower than 10 microns	0.07	1.97
Total Organic Carbon	0.09	2.65
Value-Added Area		
Pollutant	ton/day	ton/month
Nitrogen Oxides	0.28	8.26
Carbon Monoxide	0.06	1.78
Sulfur Oxides	0.02	0.55
Particulate matter with an aerodynamic diameter equal or lower than 10 microns	0.02	0.59
Total Organic Carbon	0.02	0.67

Emissions from Stationary Sources during Operation: Following are estimates of potential emissions due to operation of stationary sources for this alternative at the port zones.

Under this alternative, each Gantry crane uses electric power for normal operation and is connected to an emergency generator to assure continuous operation during power loss events. In calculating potential emissions the generators were assumed to operate simultaneously and for a maximum of 500 hours per year. Table 1-6 describes the stationary sources under this alternative.

Table 1-6. Stationary Sources in the Ponce and Guayanilla-Peñuelas Terminals

EQUIPMENT	NÚMBER OF UNITS	HORSEPOWER (HP)	TOTAL MAXIMUM HP
Port Components at Ponce			
Emergency Generators for Gantry Cranes	6	500	3,000
Port Components at Guayanilla Peñuelas			
Emergency Generators for Gantry Cranes	12	500	6,000

The emissions were calculated using AP-42, Section 3-3 Gasoline and Diesel Industrial Engines (10/1996) factors. Potential emissions from the operation of emergency generators at the Ponce and Guayanilla-Peñuelas terminals are summarized in Table 1-7.

Table 1-7. Emissions from Stationary Sources during Operation at Ponce

POLLUTANT	EMISSION FACTOR LB/HP-HR ¹	POTENTIAL EMISSIONS (TON/YEAR)
Nitrogen Oxides	0.0310	23.25
Carbon Monoxide	0.0068	5.01
Sulfur Oxides	0.0025	1.54
Particulate matter with an aerodynamic diameter equal or lower than 10 microns	0.0020	1.65
Total Organic Carbon	0.0025	1.89

¹Source: USEPA, 1996

Table 1-8. Emissions from Stationary Sources at Guayanilla Peñuelas

POLLUTANT	EMISSION FACTOR LB/HP-HR ¹	POTENTIAL EMISSIONS (TON/YEAR)
Nitrogen Oxides	0.0310	46.50
Carbon Monoxide	0.0068	10.02
Sulfur Oxides	0.0025	3.08
Particulate matter with an aerodynamic diameter equal or lower than 10 microns	0.0020	3.30
Total Organic Carbon	0.0025	3.77

¹Source: USEPA, 1996

Under this alternative, and based on the potential emissions calculations, the emergency generators at both the port zone at Ponce and Guayanilla-Peñuelas would be considered minor sources of air pollution for the purpose of construction and operating permits. Each port facility would require a construction and operating permit of air emissions sources under Rules 203 and 204 of the Air Quality Regulations from the EQB.

- **Emissions from Additional Vessels (Mobile Sources) during Operation:** Estimates on exhaust emissions from the large containerships that would dock at each port were performed. The emission factors used in the calculations were obtained from an EPA report entitled “Analysis of Commercial Marine Vessels Emissions and Fuel Consumption Data” EPA420-R-00-002, February 2000. The following reasonable worst-case assumptions were used for the estimates:
 - The maximum number of ships in port would be equal to the number of berths to be constructed. This result in two (2) additional ship calls (arrival and departure) for Ponce and four (4) for Guayanilla-Peñuelas.
 - Ships only use their main engine for a short transient period of 30 minutes during maneuvering.
 - The load factor during maneuvering is 15 percent. (The load factor is defined as the ratio of actual output to rated output based on the maximum continuous rating of the ship’s main engine)
 - The maximum continuous engine rating of the additional vessels that would dock at Ponce and Guayanilla Peñuelas is and 20,000 kw and 30,000 kw, respectively.
 - Ships in port (known as docking or hoteling) only operate auxiliary engines with a capacity of 1000 kw at full load for a period of twelve (12) hours.

Table 1-9 provides a summary of the total emissions from maneuvering and hoteling of additional vessels at the Ponce and Guayanilla-Peñuelas sites.

Table 1-9. Total Exhaust Emissions from Maneuvering and Hoteling of Additional Vessels at the Ponce Port Zone at Ponce

Pollutant	Emission Factors g/kw-hr		Total Emissions (Ton/day)
	Maneuvering	Hoteling	
Particulate Matter	0.3567	0.2610	0.01
Nitrogen Oxides	12.6099	10.5751	0.36
Sulfur Dioxide	10.6043	10.6043	0.35
Carbon Monoxide	5.5843	0.8376	0.06
Hydrocarbons	1.1481	0.0667	0.01

Table 1-10. Total Exhaust Emissions from Maneuvering and Hoteling of Additional Vessels at the Guayanilla-Peñuelas Port

Pollutant	Emission Factors g/kw-hr		Total Emissions (Ton/day)
	Maneuvering	Hoteling	
Particulate Matter	0.3567	0.2610	0.03
Nitrogen Oxides	12.6099	10.5751	0.81
Sulfur Dioxide	10.6043	10.6043	0.77
Carbon Monoxide	5.5843	0.8376	0.16
Hydrocarbons	1.1481	0.0667	0.03

Based on the emissions estimates presented on the previous tables, the emissions from increased ship traffic are considered negligible, and therefore, not expected to have a negative impact on air quality.

1.1.3 Applicant's Preferred Alternative

The Applicant's Preferred Alternative would result in additional emissions to the air. A determination was made by the Applicant of the additional emissions that would be generated in the Ponce Port area for the following elements:

Emissions that would be generated from the Applicant's Preferred Alternative were divided as follows:

Construction

- Fugitive Dust Emissions from heavy construction and vehicular traffic
- Volatile Organic Emissions Associated to Paint Solvent and Paving Emissions
- Construction Equipment Emissions

Operation

- Emissions from Stationary Sources during Operation
- Emissions from Additional Vessels (Mobile Sources) during Operation

Estimates of emissions were based on the USEPA AP-42 Air Pollutant Emission Factors for Stationary Point and Area Sources (<http://www.epa.gov/ttn/chief/ap42/>). A summary of the assumptions is included in the sections below.

- **Fugitive Dust Emissions:** An estimate was obtained of fugitive dust emissions from heavy construction applying an emission factor utilized by EPA. This emission factor is 1.2 tons per acre of construction per month of construction activity (EPA, 1995). This is a conservative factor and is based on total particulate matter rather than the fraction of particulate matter with an aerodynamic diameter equal of less than 10 microns (PM₁₀). It was assumed that construction activities would take 30 days in any given month and implementation of control measures with an efficiency of 50 percent.

- The area of the project in the Ponce Terminal that would be subject to heavy construction is estimated at 204 acres, and would be located in the areas proposed for value-added activities, and the harbor. Heavy construction would take 12-months to be completed.
- Vehicular traffic would also generate fugitive emissions. Estimates consider 50 percent emissions control, based on cleaning the construction vehicles and wetting of roads.
- A summary of fugitive dust emissions, assuming 50 percent reduction from implementation of emission controls, from heavy construction and vehicular traffic for both sites of the Project is presented below (Table 1-11).

Table 1-11. Fugitive Dust Emissions

PONCE SITE	Dust emissions from heavy construction	1,468.8 tons
	Dust emissions from on site vehicular traffic	11.7 tons

- The Applicant would provide control measures such as wetting the active construction area and maintaining the vehicles in optimal operating condition to control fugitive dust emissions. Also, a washing area for pneumatics would be provided at the Project entrance to minimize the dust carried outside of the Project.
- **Volatile Organic Emissions Associated to Paint Solvent and Paving Emissions:** Emissions of volatile organic compounds from construction related activities were also calculated. Volatile Organic Compounds (VOC's) are organic chemicals that have a high vapor pressure and easily form vapors at normal temperature and pressure. The term is generally applied to organic solvents, certain paint additives, aerosol spray can propellants, fuels (such as gasoline, and kerosene), petroleum distillates, dry cleaning products and many other industrial and consumer products ranging from office supplies to building materials. VOC's are also naturally emitted by a number of plants and trees. Volatile organic compounds will be emitted during painting and paving activities. The section below includes the estimated VOC's that would be emitted from the Project.
 - **Paint Solvent Emissions:** It is assumed that 8,000 gallons of paint would be applied at the Ponce site. Results of this analysis are presented in Table 1-12

Table 1-12. Total VOC Emissions from Paint Solvent

Site	VOC Emissions
Ponce	17.7 tons

- **Paving Emissions:** Following is an estimate of emission of volatile organic compounds from paving activities for the Ponce site. Parking areas and internal roads at the Ponce site, the paved area yielded approximately 556,603 yd². Table 1-13 summarizes the total VOC's emissions associated to paving activities.

Table 1-13. Total VOC's Emissions from Paving Activities

Site	VOC Emissions
Ponce	534 tons

- **Construction Equipment Emissions:** The emissions from construction equipment were calculated using information on motor horsepower, the AP-42 emission factors, and an equipment operating time. Emissions from construction equipment at the port zone and value-added areas at the Ponce site are summarized in

**Table 1-14. Emissions from Construction Equipment at the Ponce Port Zone
and Value-Added Area**

Port Zone		
Pollutant	Ton/day	Ton/month
Nitrogen Oxides	0.66	19.83
Carbon Monoxide	0.14	4.27
Sulfur Oxides	0.046	1.37
Particulate matter with an aerodynamic diameter equal or lower than 10 microns	0.047	1.407
Total Organic Carbon	0.054	1.61
Value-Added Area		
Pollutant	ton/day	ton/month
Nitrogen Oxides	0.28	8.26
Carbon Monoxide	0.06	1.76
Sulfur Oxides	0.02	0.55
Particulate matter with an aerodynamic diameter equal or lower than 10 microns	0.02	0.59
Total Organic Carbon	0.02	0.67

- Emissions from Stationary Sources during Operation:** It was estimated that the main pieces of equipment that will be used during the operation of the PTA, the gantry cranes, were to operate with electrical power, as indicated by E. Frankel in his viability study (Frankel, 1999). However, current preliminary design of the PTA calls for diesel-operated gantry cranes, the operation of which will be a source of air emissions that must be considered accordingly. Following are estimates of potential emissions due to the operation of proposed stationary sources at the elements of the Project at the Ponce Bay.

Table 1-15. Stationary Sources in the Ponce Port Zone

EQUIPMENT	NÚMBER OF UNITS	POWER (HP)	TOTAL MAXIMUM HP
Initial Operation			
Gantry Cranes	4	1,500	6,000
Emergency Generators	1	1000	1,000
Total			7,000
Full Operation			
Gantry Cranes	12	1,500	18,000
Emergency Generators	3	1000	3,000
Total			21,000

The emissions were calculated using AP-42, Section 3.4 Large Stationary Diesel and All Stationary Dual-fuel Engines (10/1996) emission factors and limiting the combined hours of operation for the gantry cranes to a total of 11,680 hours in a year. Potential emissions from the operation of the stationary sources at the Ponce site are summarized in Table 1-16 and Table 1-17.

Table 1-16. Emissions from Stationary Sources during Initial Operation – Ponce

POLLUTANT	EMISSION FACTOR LB/HP-HR¹	POTENTIAL EMISSIONS (TON/YEAR)
Nitrogen Oxides	0.0240	216.2
Carbon Monoxide	0.0055	49.6
Sulfur Oxides	0.00809	72.9
Particulate matter	0.0007	6.3
Total Organic Carbon	0.00075	6.8

¹Source: USEPA, 1996

Table 1-17. Emissions from Stationary Sources during Full Operation - Ponce

POLLUTANT	EMISSION FACTOR LB/HP-HR¹	POTENTIAL EMISSIONS (TON/YEAR)
Nitrogen Oxides	0.0240	648.7
Carbon Monoxide	0.0055	148.7
Sulfur Oxides	0.00809	218.7
Particulate matter	0.0007	18.9
Total Organic Carbon	0.00075	20.3

¹Source: USEPA, 1996

Except for the nitrogen oxides emissions, the potential emissions of criteria pollutants will be less than 250 tons per year. The nitrogen oxides potential emissions for full operation are estimated at 648.7 tons per year.

It should be noted that the emission factor for Nitrogen Oxides (0.0240 lb/hp-hr) does not consider control measures. According to EPA (USEPA 1997), there are control measures capable of reducing NOx emissions up to 95 percent. After initial operation, and before installing additional gantry cranes units, available emission control measures for NOx should be analyzed to determine its applicability and capability to maintain potential NOx emissions below the 250 tons per year level.

The implementation of effective control measures would allow the Ponce port facility to maintain its classification as a minor air emission source from a construction-permitting standpoint. The Ponce port facility would then be required to apply and obtain a construction permit under Rule 203 of the Regulation for the Control of Atmospheric Pollution from the Environmental Quality Board (EQB).

If after initial operations effective control measures for NOx emissions capable of maintaining the facility's potential emissions less than 250 tons per year could not be implemented, the Ponce port facility would then be considered as a major stationary source for the purpose of construction. Installation of additional gantry cranes would first require to a construction permit under EPA's 40 CFR Part 52 Prevention of Significant Deterioration Rules and compliance with Rule 201 from the EQB.

From an operating standpoint, and assuming that no effective control measures for NOx are implemented for the initial operation of the Ponce Port, the facility would require to obtain a Title V operating permit before start of operation since the estimated potential emissions for NOx would be above the 100 tons per year regulatory level.

The construction of the PTA would not induce the construction of new electrical power generating facilities that would represent emission sources. The Costa Sur power plant operated by the Puerto Rico Power and Energy Authority (PREPA) located in the Guayanilla-Peñuelas area is adequate to provide the needs of the Project for the foreseeable future, subject to the construction of a power substation in the Ponce area. The existing infrastructure would not have the capacity to supply the additional electrical power demand for the Project. For this reason, the 38 KV radial line should be upgraded to increase its capacity. However, such improvements would not become air emission sources. It is expected that companies to be located in the value-added areas would be classified as light industries and not be considered as major sources of air pollution as defined in Rule 102 of EQB's Regulation for the Control of Air Pollutants and USEPA's Regulations.

The Applicant has indicated that industries that would be established on the value-added zone include:

1. Electronic appliance/computer assembly, customizing, packaging, technology adaptation, etc.
2. Automotive part and component manufacturing and supply chain activities to support Caribbean, Central and South American assembly plant networks, and distribution. Customizing automobiles for the Caribbean and Latin America Market.
3. Food processing and packaging.
4. Biotechnological processing of food, feed and medications.
5. Heavy equipment assembly, construction, such as cargo handling, materials transfer, agricultural, power plant, etc. Equipment assembly testing and delivery.
6. Energy efficiency equipment assembly, such as solar power generation, fuel cells, etc., for delivery and installation in Caribbean and Latin America.
7. Water processing treatment and recovery equipment assembly and delivery.
8. Telecommunications/information systems equipment assembly and installation, transmission equipment, etc.
9. Logistic activities (FedEx, UPS, DHL, etc.) supply chain management.

The industries to be established in the value-added zones of the Project must obtain the necessary permits including the permit for the construction and operation of air emissions sources as required on EQB's Regulation for the Control of Air Pollutants.

- ***Emissions from Additional Vessels (Mobile Sources) during Operation:*** Estimates on exhaust emissions from the large containerships that would dock at each port were performed. The emission factors used in the calculations were obtained from an EPA report entitled "Analysis of Commercial Marine Vessels Emissions and Fuel Consumption Data" EPA420-R-00-002, February 2000. The following reasonable worst-case assumptions were used for the estimates:
 - The maximum number of ships in port would be equal to the number of berths to be constructed. This result in five (5) additional ship calls (arrival and departure) for Ponce (three (3) Post Panamax and two (2) Panamax ship calls).
 - Ships only use their main engine for a short transient period of 30 minutes during maneuvering.
 - The load factor during maneuvering is 15 percent. (The load factor is defined as the ratio of actual output to rated output based on the maximum continuous rating of the ship's main engine)
 - The maximum continuous engine rating of the additional vessels that would dock at Ponce is 55,000 kw for a Post Panamax ship and 30,000 kw, for a Panamax ship.
 - Ships in port (known as docking or hoteling) only operate one auxiliary engine kwat full load for a period of twelve (12) hours. The capacity of the auxiliary engine for the Post Panamax will be 3000 kw and 1000 kw for the Panamax ship.

Table 1-18 provides a summary of the total emissions from maneuvering and hoteling of additional vessels at the Ponce site.

Table 1-18. Total Exhaust Emissions from Maneuvering and Hoteling of Additional Vessels at the Ponce Port Zone at Ponce

Pollutant	Emission Factors g/kw-hr		Total Emissions (Ton/day)
	Maneuvering	Hoteling	
Particulate Matter	0.3567	0.2610	0.05
Nitrogen Oxides	12.6099	10.5751	2.01
Sulfur Dioxide	10.6043	10.6043	1.94
Carbon Monoxide	5.5843	0.8376	0.33
Hydrocarbons	1.1481	0.0667	0.05

Based on the emissions estimates presented on the previous tables, the emissions from increased ship traffic are considered negligible, and therefore, not expected to have a negative impact on air quality.