

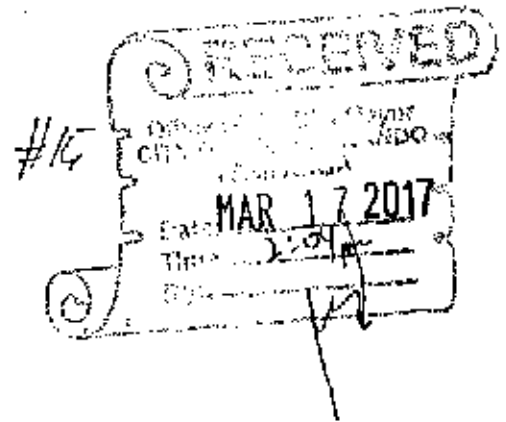


Republic of the Philippines  
**DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES**  
**ENVIRONMENTAL MANAGEMENT BUREAU**

Regional Office No. III  
 Turquoise Street, Zone 2, Ramar Village  
 San Agustin, City of San Fernando, Pampanga  
 Tel. Nos. (045) 455-3316, 455-3080, 455-4840, 961-5200

28 February 2017

**HON. EDWIN D. SANTIAGO**  
 Mayor, City Of San Fernando  
 Pampanga



Dear Honorable Mayor Santiago,

In line with our commitment and duty to provide data gathered at our monitoring station in the City of San Fernando, attached is a copy of the 2016 Ambient Air Quality Assessment Report of the Differential Optical Absorption Spectroscopy (DOAS) Station located at Heroes Hall, City of San Fernando, Pampanga.

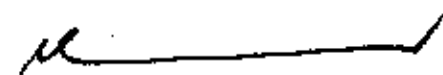
Below is the summary of the results and annual geometric mean of the two (2) parameters monitored as compared to the National Ambient Air Quality Guideline Value (NAAQGV) from Part II Section 1 of DAO 2000-81 "Implementing Rules and Regulations for RA 8749":

Parameter	Annual Geometric Mean ( $\mu\text{g}/\text{Ncm}$ )	NAAQGV ( $\mu\text{g}/\text{Ncm}$ )	Remarks
PM <sub>10</sub>	10	150	Passed
PM <sub>2.5</sub>	6	50	Passed

May we also remind your Office to provide an electronic billboard and/or any similar IEC materials for the display where real time ambient air monitoring results could be displayed for the information of the public pursuant to *Article I, Section B (9)* of the Memorandum of Agreement (MOA) entered into by and between our Offices on 04 May 2015.

Thank you for being our partner in environmental protection and management.

Very truly yours,

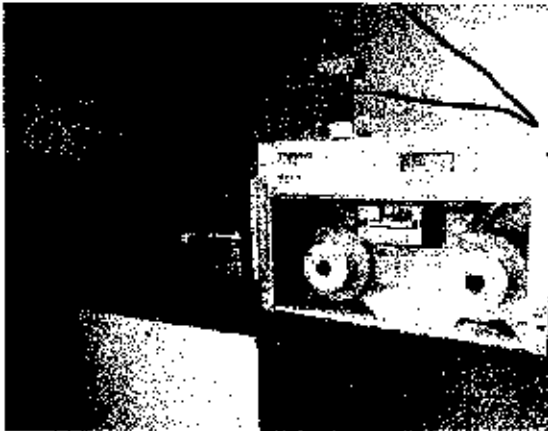
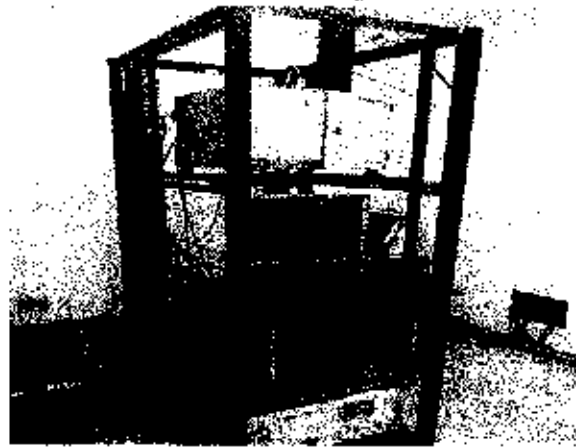
  
**LORMELYN E. CLAUDIO, CESO IV**  
 Regional Director



# **AMBIENT AIR QUALITY ANNUAL ASSESSMENT REPORT**

## **CY 2016**

### **Continuous Ambient Air Quality Monitoring Stations (CAAMS)**



**DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES  
ENVIRONMENTAL MANAGEMENT BUREAU  
REGION 3  
City of San Fernando City, Pampanga**

## SAN FERNANDO STATION

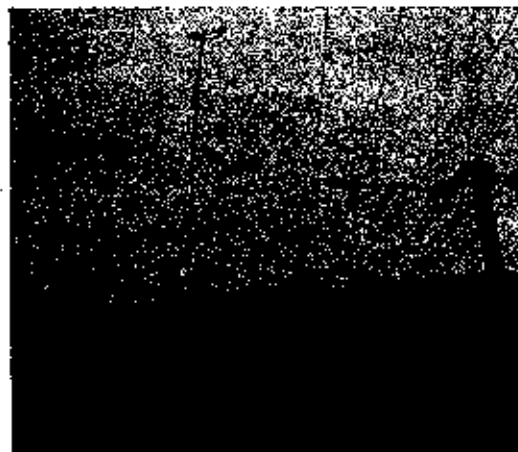
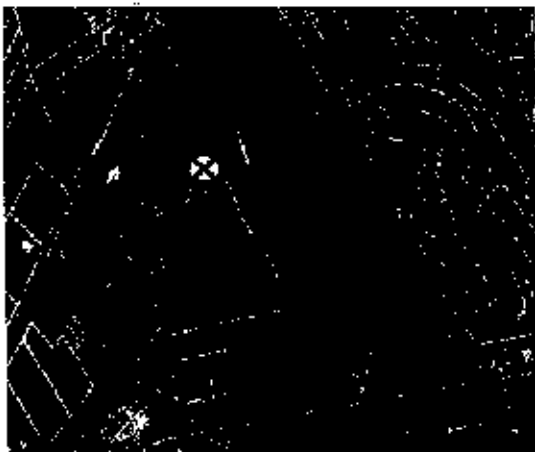
### Brief description of the sampling site:

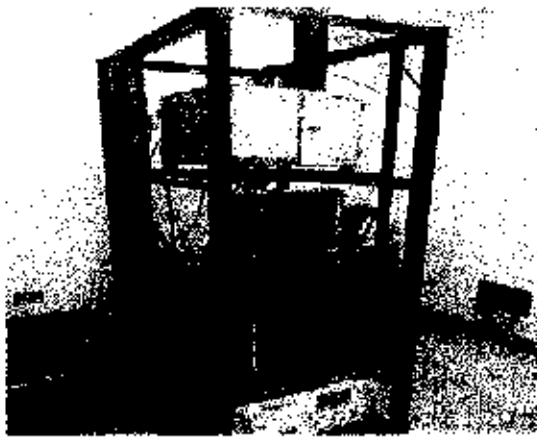
The sampling site is located at an open field at the back of the Heroes Hall of the City Hall of San Fernando, Pampanga. It is about 800 meters away from the San Fernando City Junction (the busiest intersection of the City), 2.0 kilometers from San Fernando Exit of North Luzon Expressway and 2.5 kilometers away from the two (2) big Commercial Malls: SM City Pampanga and Robinson's Star Mills.

- **Location:** Heroes Hall, City of San Fernando, Pampanga
- **Coordinates:** N 15 01' 34.56" E 120 40' 35.64"
- **Population:** 50,208 (according to the 2011 census)
- **Area:** General Ambient
- **Estimated number of industries within 5km:** 25 industries/factories, 450 commercial establishments (malls, restaurants, banks, gasoline stations, hotels, etc )
- **Parameters Monitored:** PM 10, PM 2.5, SO<sub>2</sub>, NO<sub>2</sub>, CO, O<sub>3</sub>, BTEX and MET data.

### Objectives:

To monitor the General Ambient Air Quality for PM 10, PM 2.5, SO<sub>2</sub>, NO<sub>x</sub>, CO, Ozone and BTEX concentrations within the commercial and residential area. Different sources of air pollutants generally include those from the emissions of the motor vehicles like tri-cycles, PUJs, PUBs, Delivery vans, FX-taxi, UV Express and trucks passing the busy roads and hi-ways. Open burning of municipal solid waste and emissions from the buildings and road construction activities, asphalt, concreted and unpaved roads are also possible sources of air pollutants.





### **Methods of Sampling**

Differential Optical Absorption Spectroscopy, or DOAS, is a widely used method to determine concentrations of atmospheric species. DOAS Stations in Region 3 which are located in Balanga City, Bataan; City of San Fernando, Pampanga and SBMA, Zambales monitor nine (9) hazardous criteria pollutants namely: Carbon Monoxide (CO), photochemical oxidants such as Ozone ( $O_3$ ), Sulfur Dioxide ( $SO_2$ ), Nitrogen Dioxide ( $NO_2$ ), Particulate Matter 10 and Particulate Matter 2.5, Benzene, Toluene and Xylene. The process flow in determining value/amount of pollutant concentration starts from the Emitter which produces light rays received by the Receiver. Opsis AR 500 System detects and analyzes  $SO_2$ ,  $NO_2$ ,  $O_3$ , and H1X; Model 48i NDIR analyzes CO concentration and TEOM 1405-D analyzes PM10 and PM 2.5. After the equipment analyzed the pollutant concentration, the Analogue Web logger Enviman automatically transfers results from the Data Acquisition System to regional offices monitoring networks. Results are monitored in real time.

Particulate Matter

Particulate Matter 10 (PM10) 24 - Hour Average

Table 1 below reflects the annual average and geometric values for PM10 of 15 µg/Ncm and 10 µg/Ncm respectively. Minimum value ranges from 3.87 µg/Ncm to 8.1 µg/Ncm while maximum ranges from 14.94 µg/Ncm to 48.14 µg/Ncm. The recorded values are below the NAAQCV of 150 µg/Ncm for 24-hour averages. Figure 1 below presents the Monthly Series Plot for PM10.

Table 1. PM10, 24-Hour Average Annual Data

Month	No. Data Captured (No. of Hours)	Data coverage %	Average	Geomean	Max	Min
January	724	100	14.21	9.78	29.74	3.87
February	226	34.48	10.26	6.94	14.94	5.69
March	ND	ND	ND	ND	ND	ND
April	ND	ND	ND	ND	ND	ND
May	ND	ND	ND	ND	ND	ND
June	681	100	19.59	13.85	42.73	7.69
July	744	100	15.96	11.61	31.39	8.16
August	744	100	14.07	8.24	48.14	4.26
September	720	100	14.43	10.79	21.51	4.09
October	361	51.61	12.98	9.18	23.05	4.99
November	ND	ND	ND	ND	ND	ND
December	ND	ND	ND	ND	ND	ND
Total	4200	84	15	10	48	4

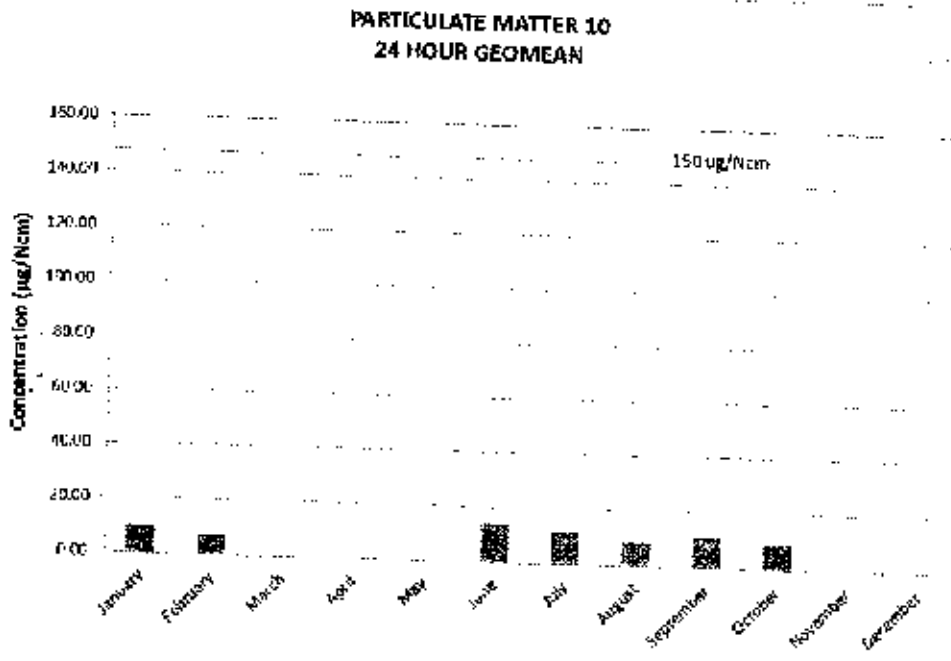
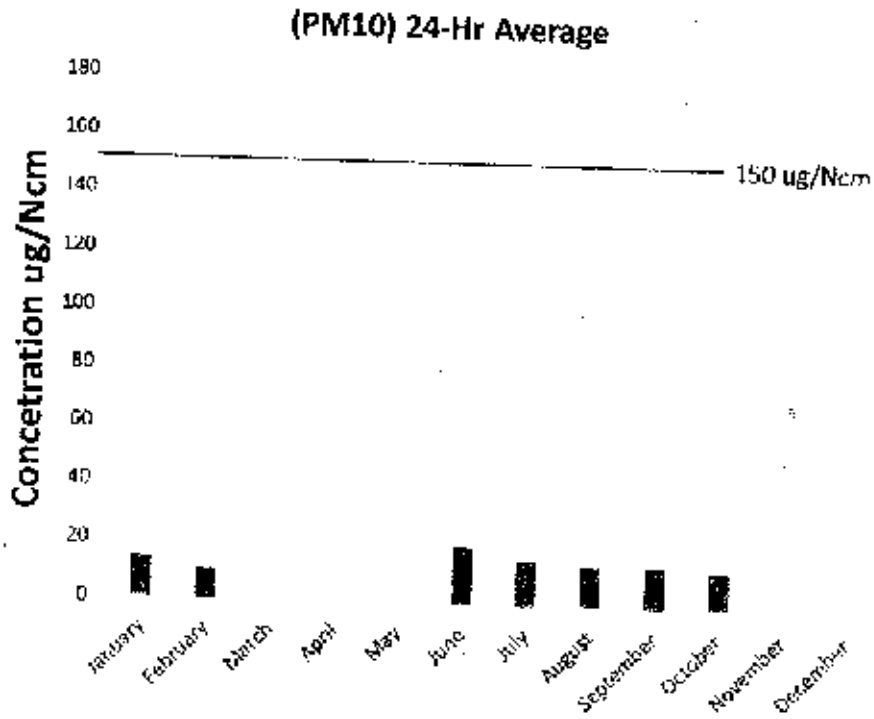


Figure 1. Monthly Series Plot for PM<sub>10</sub>

**Particulate Matter 2.5 (PM<sub>2.5</sub>) 24 - Hour Average**

Table 2 below reflects the annual average and geomean values of PM<sub>2.5</sub> of 9 µg/Nem and 6 µg/Nem respectively. Minimum value ranges from 1.8 µg/Nem to 7.55 µg/Nem while maximum value ranges from 10.58 µg/Nem to 42.43 µg/Nem. The recorded values are way below the **NAAQS** of 50 µg/Nem for 24-hour averages. Figure 2 below presents the Monthly Series Plot for PM<sub>2.5</sub>.

**Table 2. PM<sub>2.5</sub> 24 - Hours Average Annual Data**

Month	No. Data Captured (No. of Hours)	Data coverage %	Average	Geomean	Max	Min
January	742	100	6.6	5.07	10.58	1.8
February	ND	ND	ND	ND	ND	ND
March	ND	ND	ND	ND	ND	ND
April	ND	ND	ND	ND	ND	ND
May	ND	ND	ND	ND	ND	ND
June	681	100	7.55	5.94	17.55	3.9
July	744	101	10.46	6.15	42.43	1.68
August	744	102	6.37	5.02	15.97	2.51
September	720	103	11.27	6.94	47.71	1.75
October	361	51.61	14.03	7.39	22.48	7.55
November	ND	ND	ND	ND	ND	ND
December	ND	ND	ND	ND	ND	ND
<b>Total</b>	<b>3992</b>	<b>93</b>	<b>9</b>	<b>6</b>	<b>48</b>	<b>2</b>

### (PM2.5) 24-Hr Average

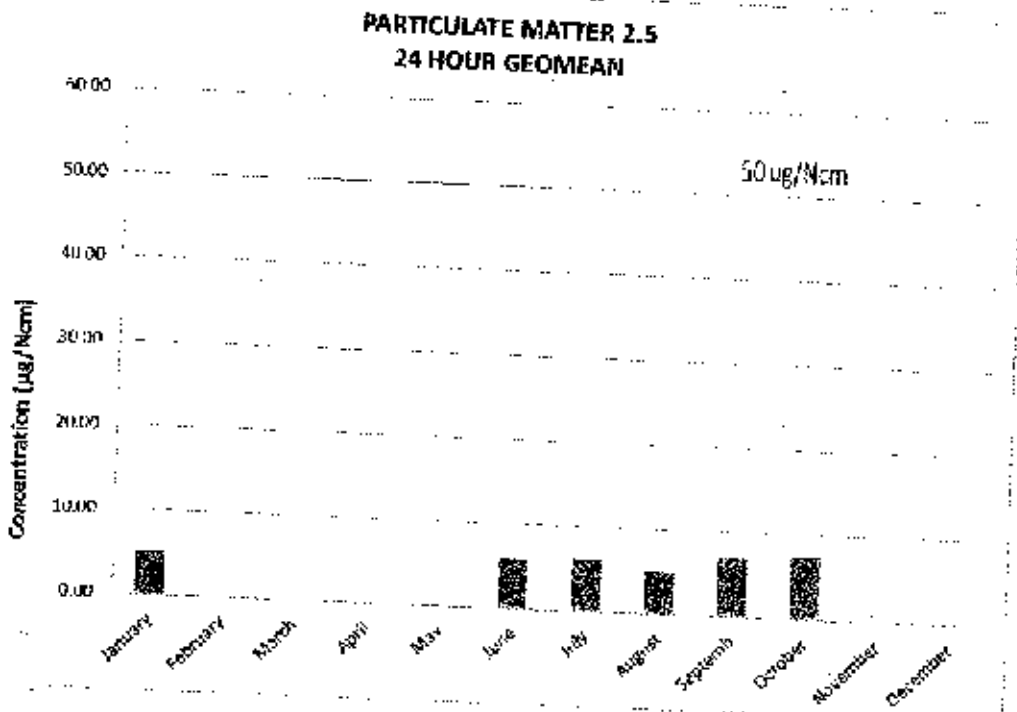
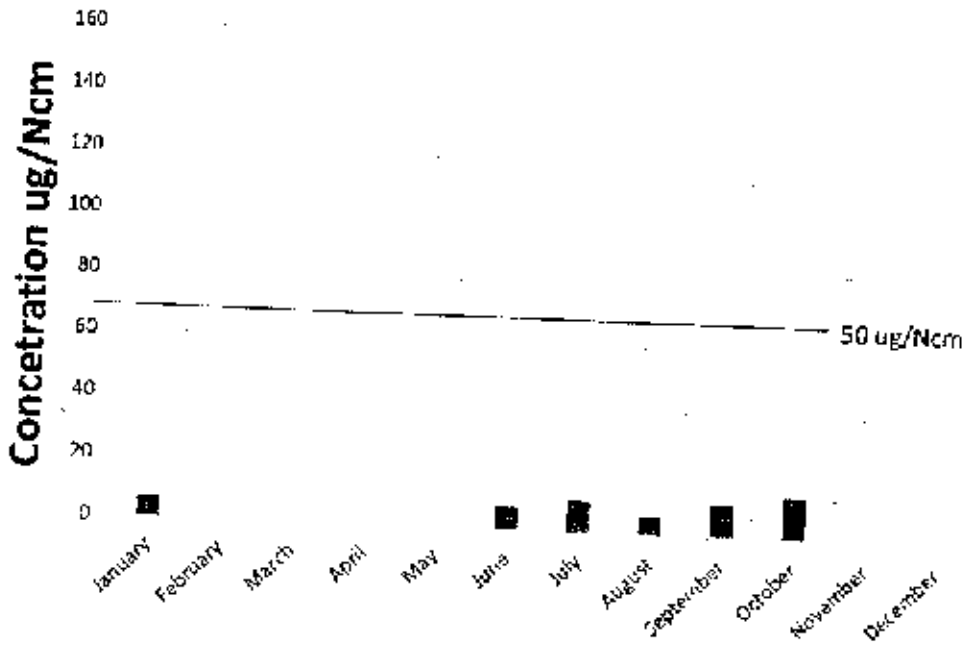


Figure 2. Monthly Series Plot for PM<sub>2.5</sub>



**Remarks:**

1. Particulate Matter 10 (**PM<sub>10</sub>**) recorded values were *below the NAAQGV of 150 µg/Ncm* for 24-hour average.
2. Particulate Matter 2.5 (**PM<sub>2.5</sub>**) recorded values were *below the NAAQGV of 50 µg/Ncm*.
3. No available data for the DOAS parameters (Gases) and NDIR for the whole year of 2016 due to the corrupted data logger and defective 186 Card of AR 500.
4. Repair and maintenance were done by EMB Region 3, EMB Central Office and Electrobite; however, data logger problem cannot be fixed.

**Recommendations:**

1. Replacement of Data Logger and 186 Card of AR 500;
2. Continuous evaluation of the DOAS recorded data;
3. Establishment of regular quarterly preventive maintenance of the equipment and its accessories;
4. Regular quarterly submission of reports to EMB Central Office.

Department of Environment and Natural Resources  
**Environmental Management Bureau - (Region III)**  
 Quarterly Assessment of Continuous Ambient Air Quality Monitoring Station (CAMS)  
 for the (3rd Quarter) (July - September) (2016)

**Station: San Fernando Station**

**Location/Address: Heroes Hall, San Fernando, Pampanga**

**Geographical Coordinates: North - 15°01'34.56"N**

**East - 120°40'35.64"E**

**Area Type: General Ambient**

**Station Type: CAMS - Differential Optical Absorption Spectroscopy (DOAS)**

Criteria Pollutant Monitored	Month	Monthly Average	No. of hour	No. of days	Data capture rate%	Concentration (1-hour Average)		Concentration (8-hour Average)		Concentration (24-hour Average)		Quarter Average
						Min	Max	Min	Max	Min	Max	
Carbon Monoxide (CO) (ppm)	July	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	August	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	September	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Photochemical Oxidants as Ozone (O <sub>3</sub> ) (µg/Ncm)	July	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	August	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	September	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Sulfur Dioxide (SO <sub>2</sub> ) (µg/Ncm)	July	ND	ND	ND	ND					ND	ND	ND
	August	ND	ND	ND	ND					ND	ND	
	September	ND	ND	ND	ND					ND	ND	
Nitrogen Dioxide (NO <sub>2</sub> ) (µg/Ncm)	July	ND	ND	ND	ND					ND	ND	ND
	August	ND	ND	ND	ND					ND	ND	
	September	ND	ND	ND	ND					ND	ND	
Particulate Matter 10 (PM <sub>10</sub> ) (µg/Ncm)	July	15.96	744	31	100					8.16	31.39	14.79
	August	14.07	711	31	100					4.24	48.14	
	September	14.34	720	30	100					4.09	21.51	
Particulate Matter 2.5 (PM <sub>2.5</sub> ) (µg/Ncm)	July	10.64	744	31	100					1.68	42.33	9.43
	August	6.35	711	31	100					2.31	15.97	
	September	11.27	720	30	100					1.75	49.71	
Benzene (µg/Ncm)	July	ND	ND	ND	ND					ND	ND	ND
	August	ND	ND	ND	ND					ND	ND	
	September	ND	ND	ND	ND					ND	ND	
Toluene (µg/Ncm)	July	ND	ND	ND	ND					ND	ND	ND

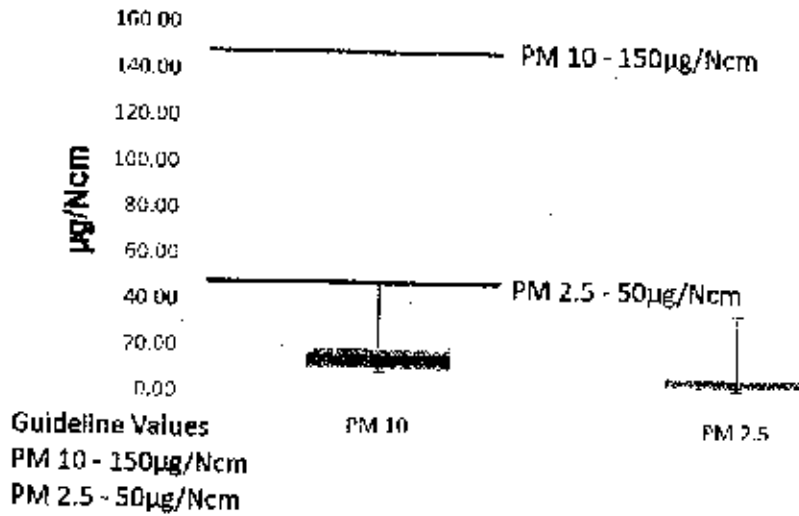
Xylene ( $\mu\text{g}/\text{Ncm}$ )	August	ND	ND	ND	ND							ND	ND	
	September	ND	ND	ND	ND							ND	ND	
	July	ND	ND	ND	ND							ND	ND	ND
	August	ND	ND	ND	ND							ND	ND	
	March	ND	ND	ND	ND							ND	ND	

**Samples exceeded the National Ambient Air Quality Guideline Value**

Month	Carbon Monoxide (ppm)		Photochemical Oxidants as Ozone ( $\mu\text{g}/\text{Ncm}$ )				Sulfur Dioxide ( $\mu\text{g}/\text{Ncm}$ ) 24-Hour		Nitrogen Dioxide ( $\mu\text{g}/\text{Ncm}$ ) 24-Hour		Particulate Matter 10 ( $\mu\text{g}/\text{Ncm}$ ) 24-Hour		Particulate Matter 2.5 ( $\mu\text{g}/\text{Ncm}$ ) 24-Hour	
	1-Hour		8-Hour		1-Hour		8-Hour							
	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
October														
November														
December														

*National Ambient Air Quality Guideline Value for:*

3rd Quarter 2016



- Particulate Matter 10: 24-hour: 150  $\mu\text{g}/\text{Ncm}$ .
- Particulate Matter 2.5: 24-hour: 75  $\mu\text{g}/\text{Ncm}$ .

Monitoring Equipment:	Status of Operation			Remarks:
	(July)	(August)	(September)	
Opsis AR 500 System	Operational	Operational	Operational	Data cannot be retrieve due to corrupted Data Logger. (already reported to EMB-CO for repair)
Model 48i Trace Level-Enhanced (CO Analyzer)	Operational	Operational	Operational	Data cannot be retrieve due to corrupted Data Logger. (already reported to EMB-CO for repair)
TEOM 1405-D: Dichotomous Ambient Particulate Monitor	Operational	Operational	Operational	Data cannot be retrieve due to corrupted Data Logger. (already reported to EMB-CO for repair)
Others: W/S - W/D Sensor, Ambient Temp Sensor, Barometric Pressure Sensor, Humidity Sensor, Etc.	Operational	Operational	Operational	Data cannot be retrieve due to corrupted Data Logger. (already reported to EMB-CO for repair)

General Remarks:

1. No data available on DOAS results and CO analyzer because of corrupted Data Logger. (Corrupted Data Logger already reported EMB-CO for repair and maintenance).
2. PM 10 and PM 2.5 results were retrieved manually on the Station thru the USB port of TEOM 1405.
3. **PM 10 and PM 2.5 results were noted within the NAAQGV standards.**

Prepared By:

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EMS I

*[Signature]*  
NESTY MENDIOLA  
ENGR. III

Reviewed by:

  
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Approved By:

  
ENGR. VICENTE DELA CRUZ  
OIC EMED

Department of Environment and Natural Resources  
**Environmental Management Bureau - (Region III)**  
 Quarterly Assessment of Continuous Ambient Air Quality Monitoring Station (CAMS)  
 for the (4th Quarter) – (October - December) (2016)

**Station: San Fernando Station**

**Location/address: Heroes Hall, San Fernando, Pampanga**

**Geographical Coordinates: North - 15°01'34.56"N**

**East - 120°40'35.64"E**

**Area Type: General Ambient**

**Station Type: CAMS – Differential Optical Absorption Spectroscopy (DOAS):**

Criteria Pollutant Monitored	Month	Monthly Average	No. of hour	No. of days	Data capture rate%	Concentration (1-hour Average)		Concentration (8-hour Average)		Concentration (24-hour Average)		Quarter Average
						Min	Max	Min	Max	Min	Max	
Carbon Monoxide (CO) (ppm)	October	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	November	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	December	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Photochemical Oxidants as Ozone (O3) (µg/Ncm)	October	ND	ND	ND	ND							ND
	November	ND	ND	ND	ND							
	December	ND	ND	ND	ND							
Sulfur Dioxide (SO2) (µg/Ncm)	October	ND	ND	ND	ND					ND	ND	ND
	November	ND	ND	ND	ND					ND	ND	
	December	ND	ND	ND	ND					ND	ND	
Nitrogen Dioxide (NO2) (µg/Ncm)	October	ND	ND	ND	ND					ND	ND	ND
	November	ND	ND	ND	ND					ND	ND	
	December	ND	ND	ND	ND					ND	ND	
Particulate Matter 10 (PM10) (µg/Ncm)	October	12.98	361	36	51.61					4.99	33.05	12.98
	November	ND	ND	ND	ND					ND	ND	
	December	ND	ND	ND	ND					ND	ND	
Particulate Matter 2.5 (PM2.5) (µg/Ncm)	October	14.03	361	36	51.61					7.55	22.48	14.03
	November	ND	ND	ND	ND					ND	ND	
	December	ND	ND	ND	ND					ND	ND	
Benzene (µg/Ncm)	October	ND	ND	ND	ND					ND	ND	ND
	November	ND	ND	ND	ND					ND	ND	

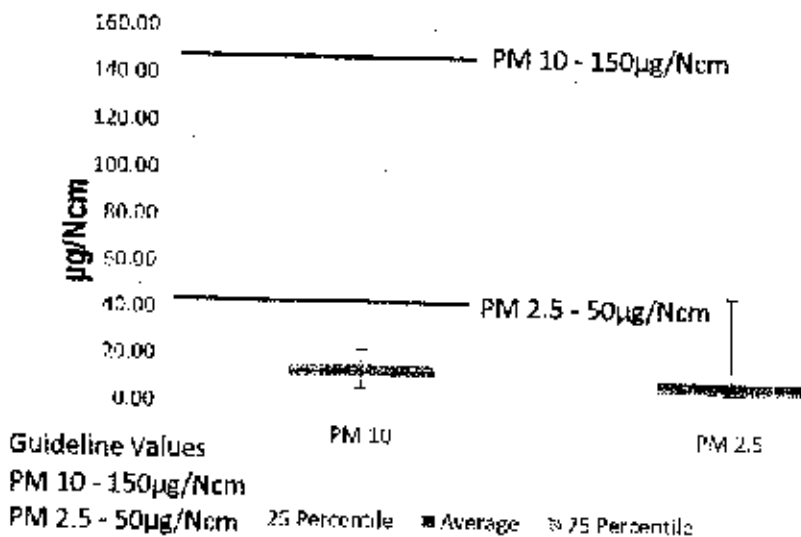
Toluene ( $\mu\text{g}/\text{Ncm}$ )	December	ND	ND	ND	ND							ND	ND
	October	ND	ND	ND	ND							ND	ND
	November	ND	ND	ND	ND							ND	ND
	December	ND	ND	ND	ND							ND	ND
Xylene ( $\mu\text{g}/\text{Ncm}$ )	October	ND	ND	ND	ND							ND	ND
	November	ND	ND	ND	ND							ND	ND
	December	ND	ND	ND	ND							ND	ND
	December	ND	ND	ND	ND							ND	ND

**Samples exceeded the National Ambient Air Quality Guideline Value**

Month	Carbon Monoxide (ppm)				Photochemical Oxidants as Ozone ( $\mu\text{g}/\text{Ncm}$ )				Sulfur Dioxide ( $\mu\text{g}/\text{Ncm}$ ) 24-Hour		Nitrogen Dioxide ( $\mu\text{g}/\text{Ncm}$ ) 24-Hour		Particulate Matter 10 ( $\mu\text{g}/\text{Ncm}$ ) 24-Hour		Particulate Matter 2.5 ( $\mu\text{g}/\text{Ncm}$ ) 24-Hour	
	1-Hour		8-Hour		1-Hour		8-Hour		Number	%	Number	%	Number	%	Number	%
	Number	%	Number	%	Number	%	Number	%								
October																
November																
December																

\*National Ambient Air Quality Guideline Value for

**4th Quarter 2016**



- Particulate Matter 10: 24-hour: 150  $\mu\text{g}/\text{Ncm}$ .
- Particulate Matter 2.5: 24-hour: 75  $\mu\text{g}/\text{Ncm}$ .

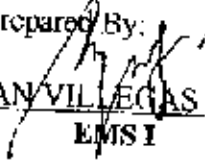
Monitoring Equipment:	Status of Operation			Remarks:
	(October)	(November)	(December)	
Opsis AR 500 System	Temporary shut down (For repair)	Temporary shut down (For repair)	Temporary shut down (For repair)	1. Defective 186 Card (part of AR 500).
Model 48i Trace Level-Enhanced (CO Analyzer)	Operational	Operational	Operational	1. Data cannot be retrieve due to corrupted Data Logger. (already reported to EMB-CO for repair) 2. Defective 186 Card (part of AR 500).
TEOM 1405-D: Dichotomous Ambient Particulate Monitor	Operational	Operational	Operational	1. Data cannot be retrieve due to corrupted Data Logger. (already reported to EMB-CO for repair) 2. Defective 186 Card (part of AR 500).
Others: W/S - W/D Sensor, Ambient Temp Sensor, Barometric Pressure Sensor, Humidity Sensor, Etc.	Operational	Operational	Operational	1. Data cannot be retrieve due to corrupted Data Logger. (already reported to EMB-CO for repair) 2. Defective 186 Card (part of AR 500).

**General Remarks:**

1. No data available on DOAS results and CO analyzer because of corrupted Data Logger. (Corrupted Data Logger and defective 186 Card of AR 500 already reported EMB-CO for repair and maintenance).
2. PM 10 and PM 2.5 results were retrieved manually on the Station thru the USB port of TEOM 1405.
3. PM 10 and PM 2.5 results were noted within the NAAQGV standards.



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