

Presentation of Student Paper and Annual Conference and Exhibition Experience

Federico Portillo
AWMA Louisiana Section
Baton Rouge
Fall Conference
Session 5
November 19th of 2008



THE UNIVERSITY *of*
NEW ORLEANS

Assessment of PM in the Ambient Air of the New Orleans Historic District

Submitted to the Graduate Faculty of the
University of New Orleans
In partial fulfillment of the
Requirements for the degree of
MS in Environmental Engineering

By
Federico Portillo
Fall 2008



THE UNIVERSITY *of*
NEW ORLEANS



A&WMA'S 101ST

ANNUAL CONFERENCE & EXHIBITION

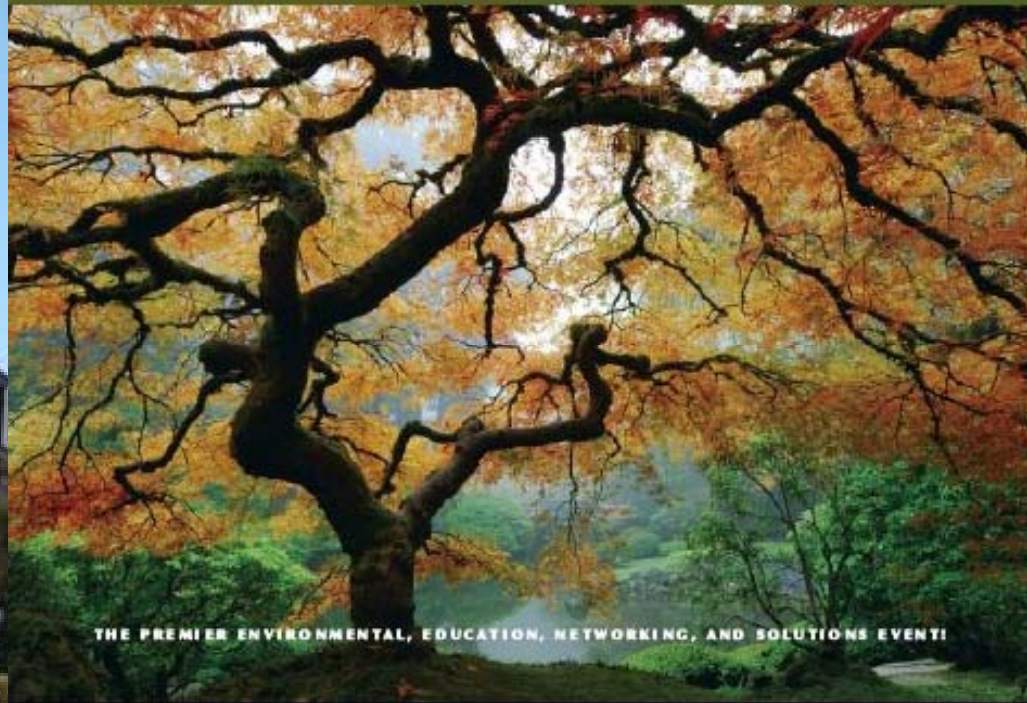
JUNE 24-27, 2008 • EXHIBITION: JUNE 24-26
OREGON CONVENTION CENTER • PORTLAND, OREGON

CONFERENCE SPONSOR:

TOYOTA



INTEGRATING SCIENCE AND SUSTAINABILITY



THE PREMIER ENVIRONMENTAL, EDUCATION, NETWORKING, AND SOLUTIONS EVENT!

THE UNIVERSITY *of*
NEW ORLEANS

- Failed Research Project:

- ESP to collect heavy metals from a fume chamber used in a welding process

- Alternative Research Project:

- Determination Particulate Matter concentration in Ambient Air



THE UNIVERSITY *of*
NEW ORLEANS

Andersen Dichotomous Sampler



THE UNIVERSITY of
NEW ORLEANS

X-Ray Fluorescent Analyzer



THE UNIVERSITY of
NEW ORLEANS

Research Scope

- Measure the Particulate Matter concentration in the Ambient Air of the New Orleans Historic District
- Measure Metal Concentration in the Airborne Particulate of sampling site
- Evaluate French Quarter's Ambient Air Quality Compliance with NAAQS based on $PM_{2.5}$ and PM_{10}



THE UNIVERSITY *of*
NEW ORLEANS

Introduction

- National Ambient Air Quality Standards
 - SO_2 , NO_2 , CO , O_3 , Pb , $\text{PM}_{2.5/10}$
- Particulate Matter
- Ambient Air Monitoring



THE UNIVERSITY *of*
NEW ORLEANS

Louisiana Ambient Air Monitoring Program



Image courtesy of LDEQ; www.deq.louisiana.gov



THE UNIVERSITY of
NEW ORLEANS

Louisiana South-east Region



Image courtesy of LDEQ: www.deq.louisiana.gov



THE UNIVERSITY of
NEW ORLEANS

LDEQ Monitoring Stations in Greater New Orleans

Sampling Site	Address	Distance from the St. Luis Cathedral	Monitoring PM _{2.5/10}
Algiers Entergy	2456 Ernest. New Orleans, LA	5.5 miles	
Chalmette High School	1100 E Jorge Perez Drive. Chalmette, LA	6.7 miles	
Chalmette Vista	24 E. Chalmette Circle. Chalmette, LA	5.4 miles	Yes
City Park	Florida & Orleans Avenue, New Orleans, LA	3.3 miles	Yes
Kenner	100 West Temple Place, Kenner, LA	13.8 miles	Yes
Marrero	Patriot Street and Allo Street, Marrero, LA	5.4 miles	Yes
Meraux	1101 Mistrot Drive. Meraux, LA	8.5 miles	



THE UNIVERSITY of
NEW ORLEANS

Sampling Site Location

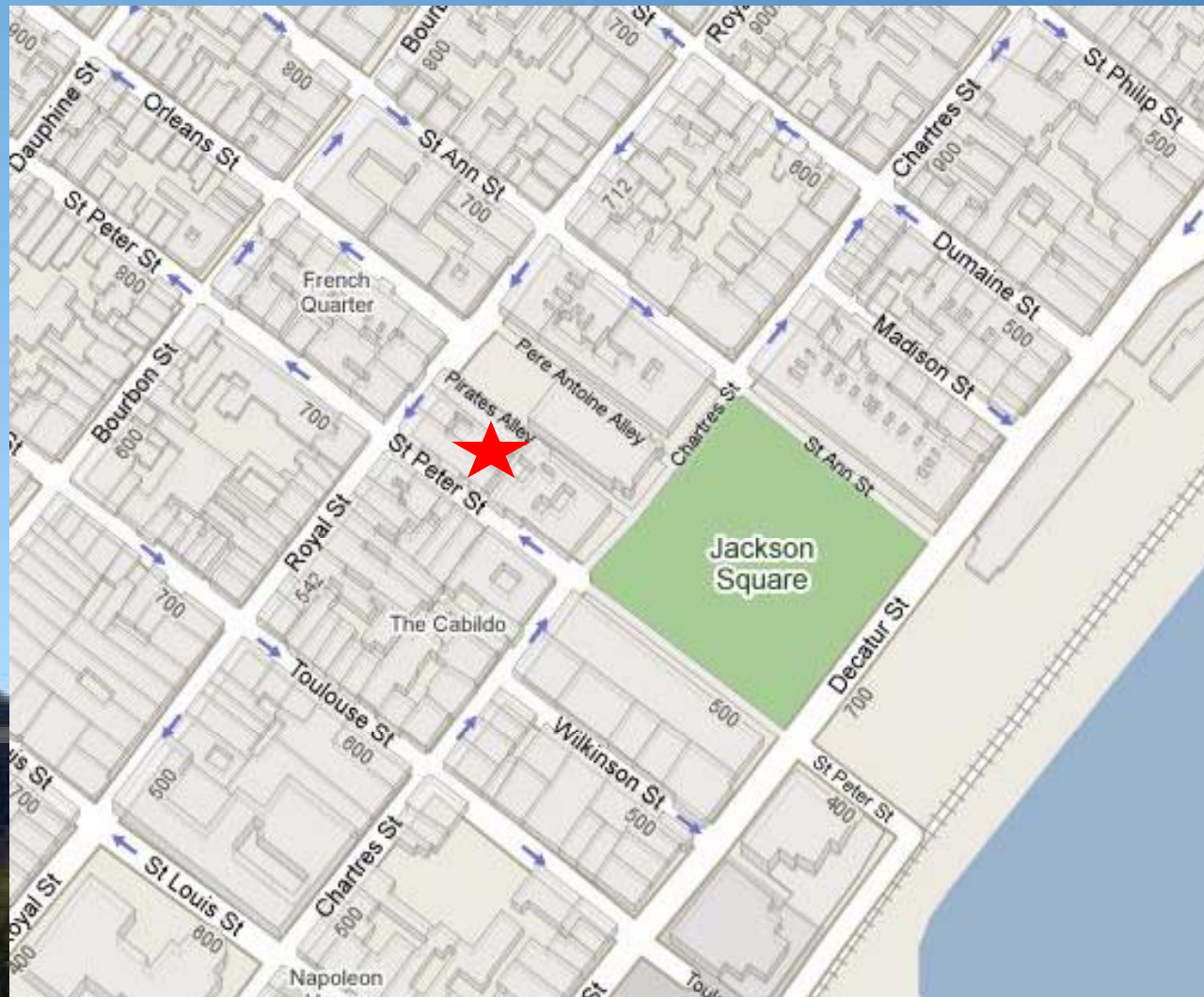
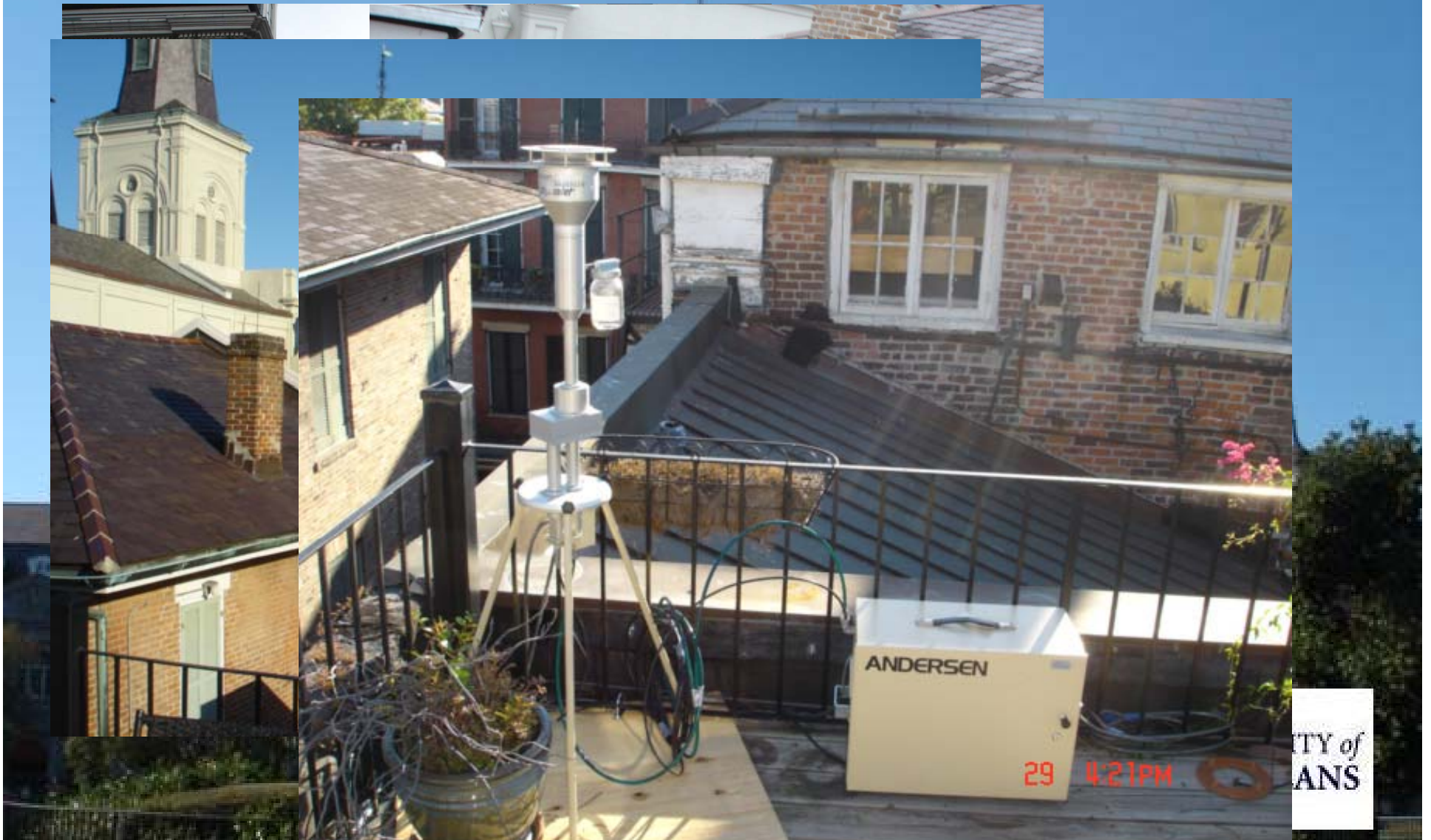


Image courtesy of Google maps: www.maps.google.com/maps



UNIVERSITY of
NEW ORLEANS

Sampling Site



Filters in the Dichotomous

- 37mm Teflon
 - Fine Particles: Diameter $2.5\ \mu\text{m}$ or smaller
 - Coarse Particles: Diameter 2.5 to $10\ \mu\text{m}$



THE UNIVERSITY of
NEW ORLEANS

Calibration of the Dichotomous Sampler

- **Dry Gas Meter:**

- Calibration Transfer Standard
- DC-2 Flow Calibrator
- Dry Cal/Bios International s/n B833
- Certified with EPA equipment Dry Cal s/n 107565

- **Flow Meter:**

- Streamline Pro™ Multical™ System
- Model M: 0.9 to 19.0 L/min
- NIST Traceable Standards
- Fabricator: Chinook Engineering



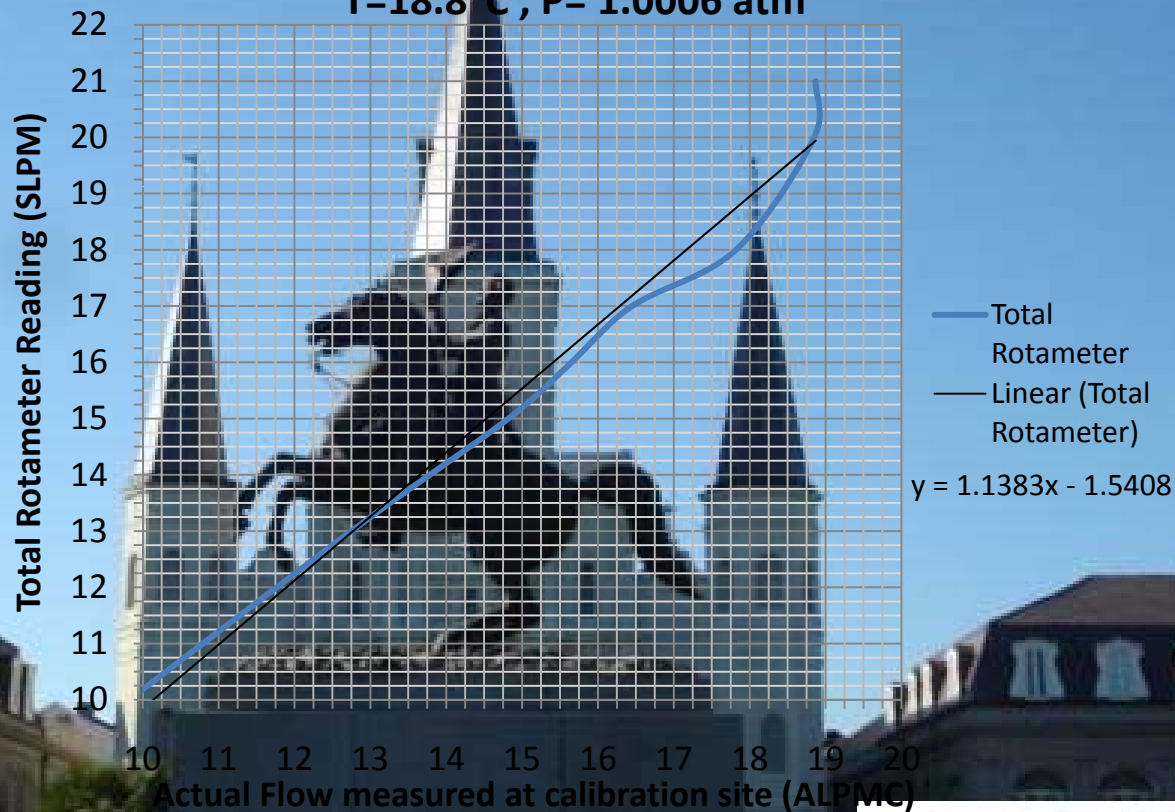
THE UNIVERSITY *of*
NEW ORLEANS

Calibration Curve

Total Flow Rotameter Calibration

Calibration Conditions:

T=18.8°C , P= 1.0006 atm



THE UNIVERSITY of
NEW ORLEANS

Experimental Data

- PM Concentration from the Gravimetric Analysis
- Metal concentration from the X-Ray Fluorescent Analysis



THE UNIVERSITY *of*
NEW ORLEANS

Gravimetric Analysis

Experiment 1 10/27-28/08 : 28hrs

Filter #	Weight Clean Filer (g)	Ring	Particles size	Weight PM + Filer (g)	Start Collection time 10/27/08	End Collection time 10/28/08	Sampling time (min)	Volume of Air Sampled (m ³)
1	0.1234	yellow	coarse	0.1239	12:00 n	4:00pm	1680	2.81
2	0.1230	white	fine	0.1232	12:00 n	4:00pm	1680	25.20

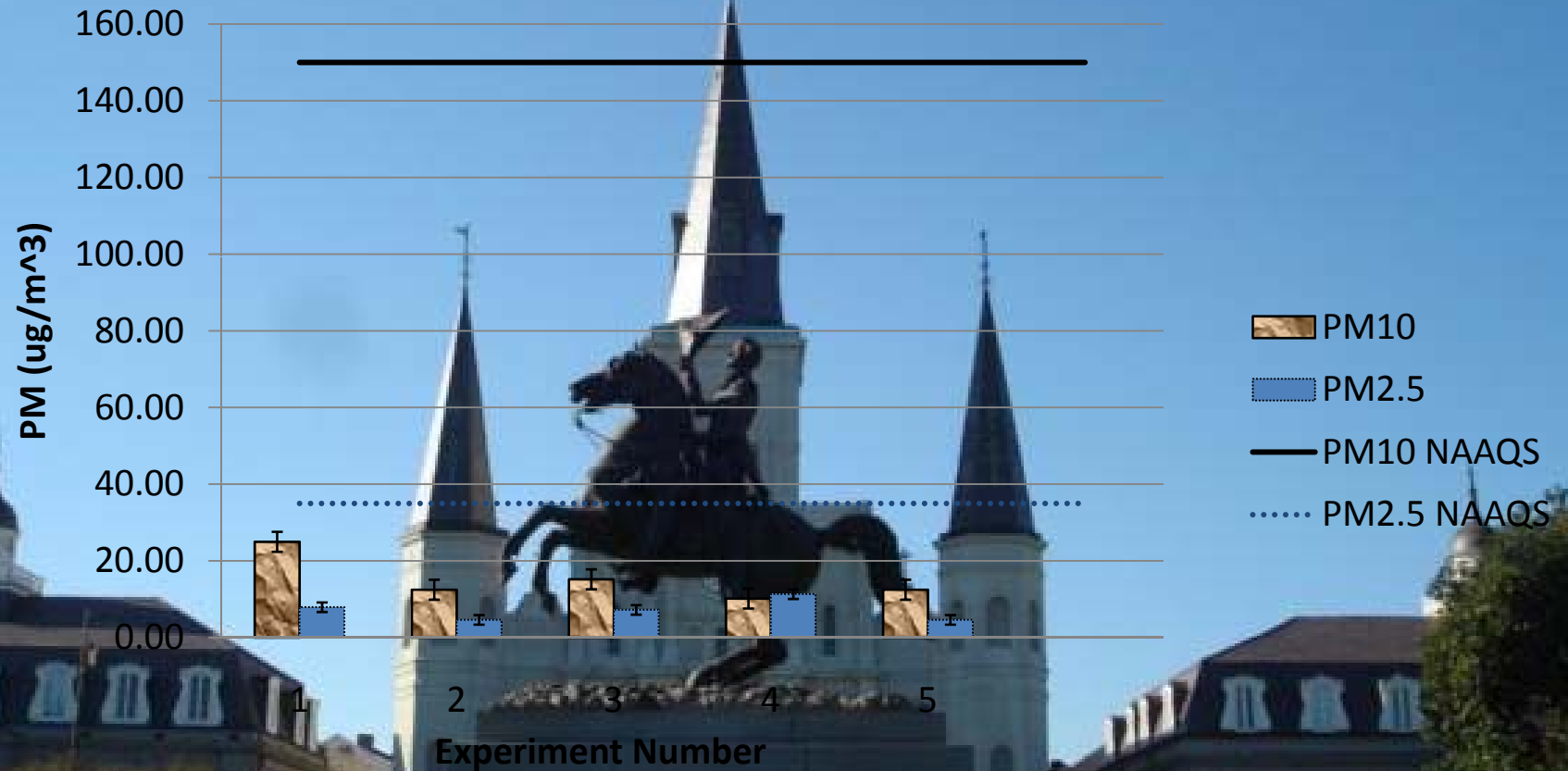
Experiment 3 10/29-31/08 : 46hrs

Filter #	Weight Clean Filer (g)	Ring	Particles size	Weight PM + Filer (g)	Start Collection time 10/27/08	End Collection time 10/28/08	Sampling time (min)	Volume of Air Sampled (m ³)
Y7	0.1223	yellow	coarse	0.1227	4:00pm	2:00pm	2760	4.61
W8	0.1221	white	fine	0.1224	4:00pm	2:00pm	2760	41.40



THE UNIVERSITY of
NEW ORLEANS

Particulate Matter in the Ambient Air of the New Orleans Historic District with their corresponding NAAQS



PM Concentration Ambient Air

PM size	Concentration
PM2.5	7.16 $\mu\text{g}/\text{m}^3$
PM10	15.08 $\mu\text{g}/\text{m}^3$



THE UNIVERSITY of
NEW ORLEANS

National Ambient Air Quality Standards

Pollutant	Average Time	Primary Standard	Secondary Standard
SO ₂	Annual arithmetic mean	0.03 ppm	
	24 hrs average	0.14 ppm	
	3 hrs average		0.50 ppm
NO ₂	Annual arithmetic mean	0.053 ppm	Same as primary
CO	1 hrs average	35 ppm	
	8 hrs average	9 ppm	
PM ₁₀	Annual arithmetic mean	150 µm/m ³ (*1)	
	24 hrs average	150 µm/m ³ (*2)	Same as primary
PM _{2.5}	Annual arithmetic mean	15 µm/m ³ (*3)	Same as primary
	24 hrs average	35 µm/m ³ (*4)	Same as primary
O ₃	1 hrs average	0.12 ppm	Same as primary
	8 hr Maximum	0.085 ppm	Same as primary
Lead	Quarterly Average	1.5 µm/m ³	Same as primary

Notes: (*1) The Annual NAAQS for PM₁₀ had not been set by EPA yet. Before December 2006, it was 50µm/m³

(*2) Not to be exceeded more than once per year on average over 3 years

(*3) To attain this standard, the 3-year average of the weighted annual mean PM_{2.5} concentrations from single or multiple community-oriented monitors must not exceed 15.0 µg/m³

(*4) To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m³ (effective December 17, 2006)



Metal Concentration

	($\mu\text{g Metal}/\text{cm}^2$)				Mass fraction		Concentration
	($\mu\text{g Metal}/\text{filter}$)		(Metal/PM)		($\mu\text{g Metal}$		
	PM2.5	PM2.5-10	PM2.5	PM2.5-10	PM2.5	PM10	/ m³ air)
Cr	0.73	0.73	0.08	0.08	2.53E-04	2.54E-04	3.26E-03
Fe	1.18	2.55	0.13	0.27	4.10E-04	8.86E-04	8.34E-03
Ni	0.04	0.03	4.30E-03	3.23E-03	1.39E-05	1.04E-05	1.56E-04



THE UNIVERSITY of
NEW ORLEANS

Conclusions

- PM_{2.5} at 25 feet above street level in the New Orleans French Quarter showed to be 7.16 $\mu\text{g}/\text{m}^3$
- PM₁₀ at 25 feet above street level in the New Orleans French Quarter showed to be 15.08 $\mu\text{g}/\text{m}^3$
- PM_{2.5} and PM₁₀ showed to be below NAAQS, which makes the sampling site in compliance with this EPA standard



THE UNIVERSITY of
NEW ORLEANS

Conclusions (cont.)

- Heavy metal concentration in the ambient air of sampling site is either negligible or too low to be detected by the XRF used when collection time is 48hrs
- Two Carcinogenic Metal were tested positive in the ambient air of the sampling site: Cr, and Ni
- Fe was the metal showing higher concentration at the sampling site: 8.34 ng/m^3



Possible Topics for Future Researches

- Complete AQI assessment for the New Orleans Historic District
- PM concentrations Heavy Metal Contents at street level in the City of New Orleans, LA
- Entire Profile of the Ambient Air PM Concentration of New Orleans French Quarter Area



THE UNIVERSITY *of*
NEW ORLEANS

Thanks for your time!

