

# **Assessment of the Distribution of TRI Facilities in Metropolitan Charleston: Environmental Injustice, Goods Movement & Policy**

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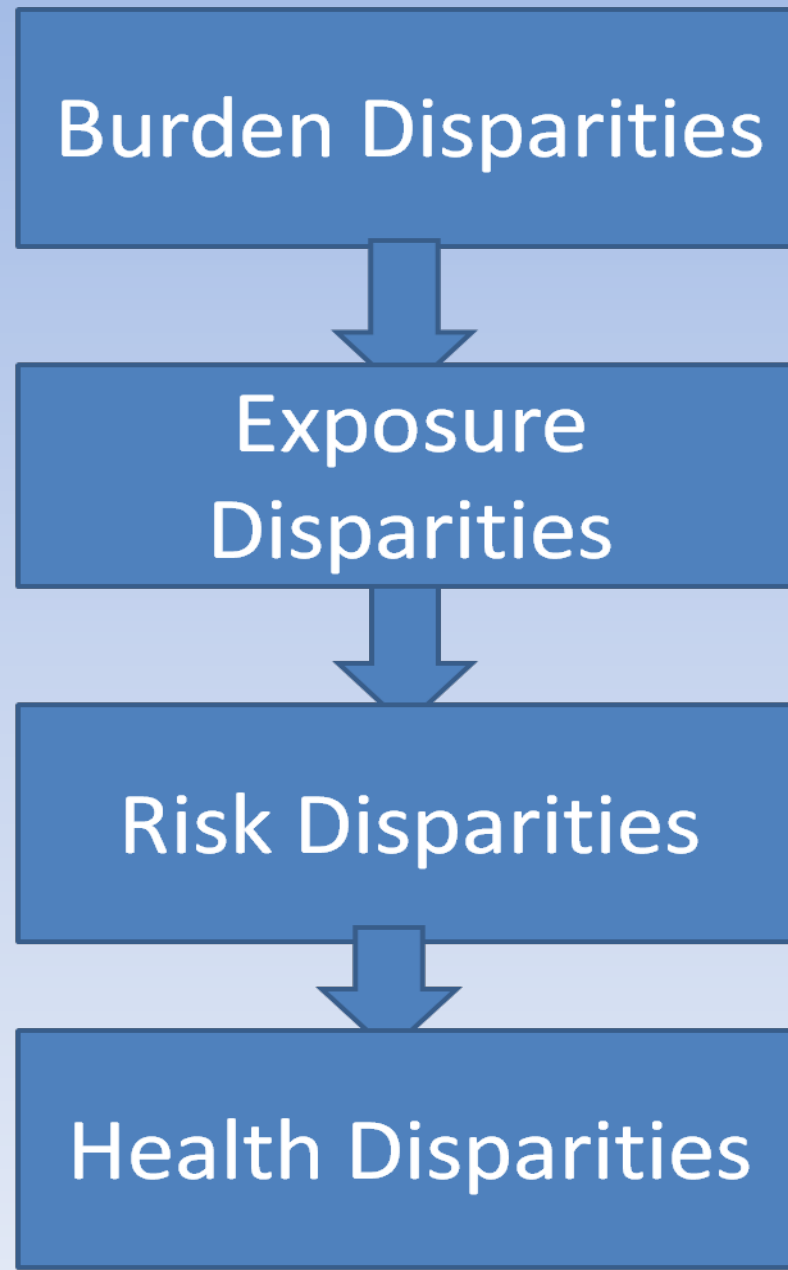
University of Maryland

College Park, MD

May 8, 2014

# **THE SCIENCE OF ENVIRONMENTAL (IN) JUSTICE ASSESSMENT**

# EJ Science = Assessment of Disparities



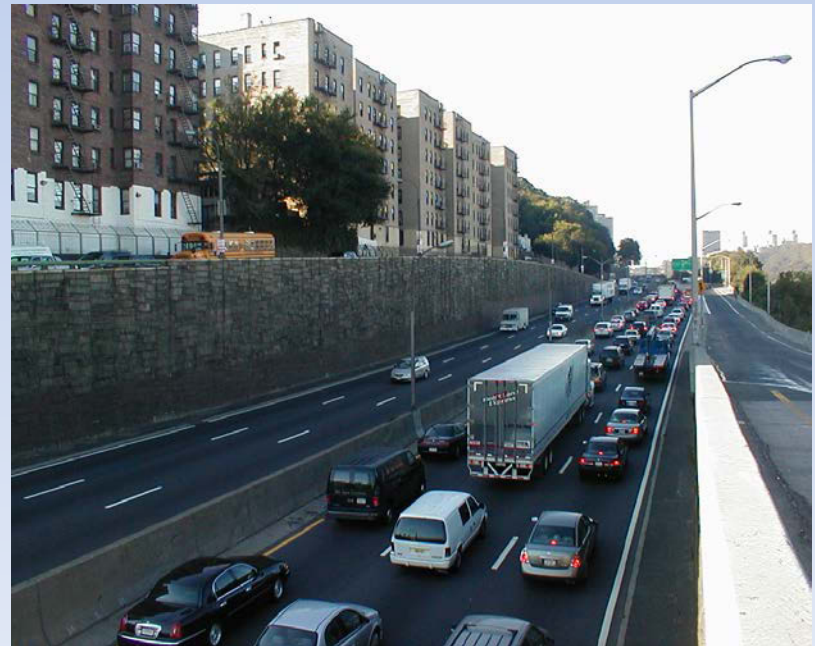
# Relevant Health-Related Disparities

- Exposure
  - PM<sub>2.5</sub> levels (inhalation- ambient/personal monitoring)
  - PCBs, PAHs, mercury (body burden)
  - Blood Lead Levels
- Health Outcomes
  - Asthma
  - Cancer
  - Cardiovascular Disease
  - Diabetes
  - Poor Birth Outcomes (low birth weight, infant mortality, birth defects)

- This EJ literature and ecological framework focuses on aspects of the built environment and spatial processes which create unhealthy community ecosystems known as “**riskscapes**” (Morello-Frosch and Lopez 2006)

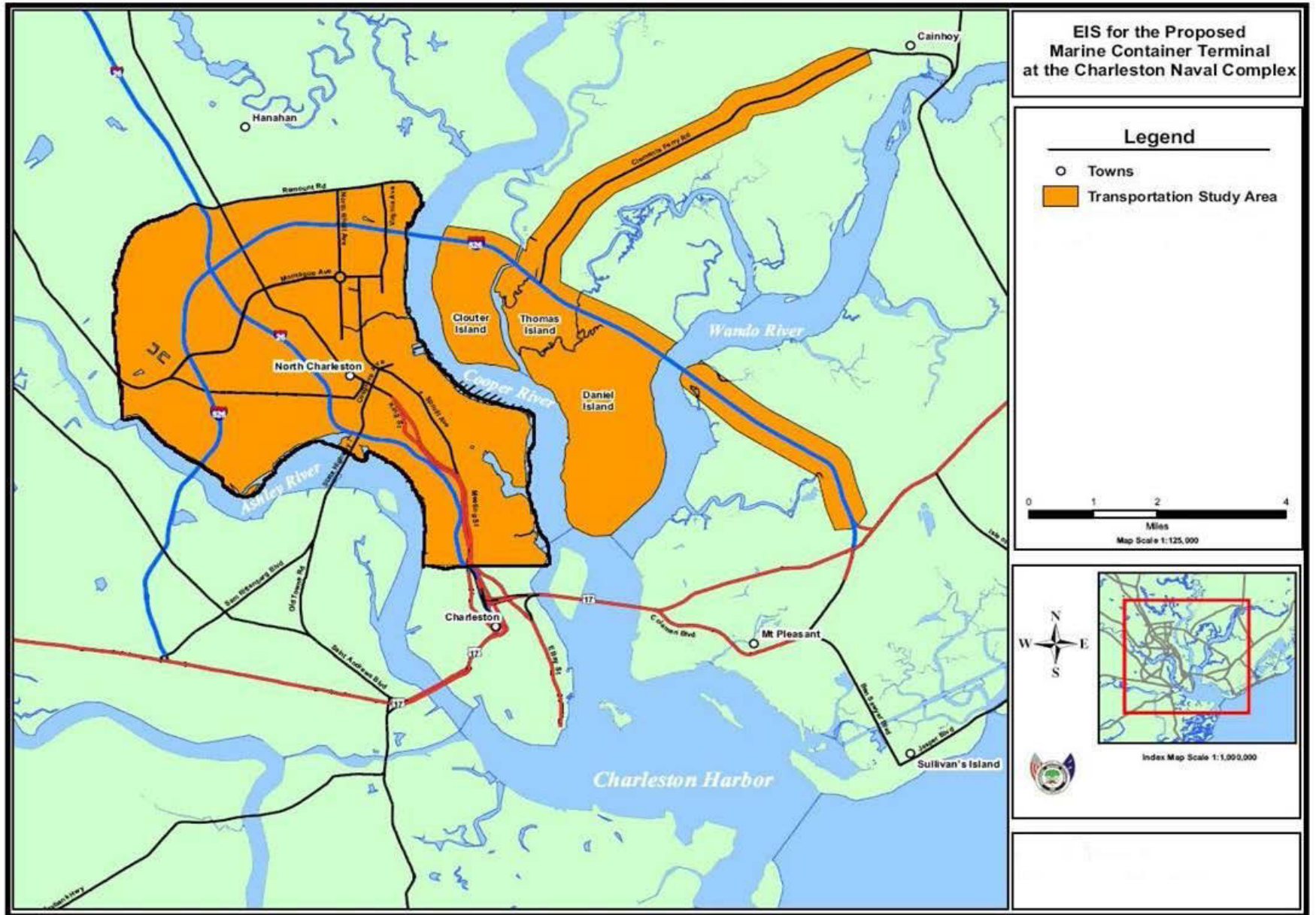


- Populations who live in or are exposed to “**riskscapes**” experience environmental health disparities (Gee and Payne-Sturges 2004)



# **Assessment of Environmental Injustice and Disparities in North Charleston, SC**

# Map of Transportation Study Area for the Port expansion in Charleston, SC



# Goods Movement, Environmental Justice, and Health

- Hricko et al., 2008
  - Residents living near ports have elevated rates of oropharyngeal cancer and certain lung cancers, according to an analysis of cancer by census tracts in Los Angeles County (Mack 2004).
  - Residents who live near rail yards, ports, and other goods movement facilities, may endure high noise levels, traffic congestion, visual blight, and other community impacts.
  - Residents who breathe ambient air pollution full of traffic-related pollutants may have higher rates of cardiovascular disease and death (Jerrett et al. 2005) and reduced lung function (Gauderman et al. 2004).
  - There is also evidence that low-income, non-white communities are disproportionately impacted by goods movement activities.



# Low Country Alliance for Model Communities

- Low Country Alliance for Model Communities (LAMC) represents seven of the most economically distressed neighborhoods in North Charleston, SC
- LAMC organized to address potential negative impacts of the expansion of the Port of Charleston
- LAMC organized to address the disproportionate burden of environmental hazards, unhealthy land uses, psychosocial stressors (violence, crime, poverty) and limited revitalization efforts in their community

# Community Mitigation Plan Agreement

- In November 2005, LAMC, SC States Ports Authority, and City of North Charleston met to develop a community mitigation plan that maximizes community benefits and minimizes undesirable impacts from the proposed expansion of the Port of Charleston.
- On February 8, 2006, LAMC formally presented their list of community concerns to the SCSPA and communicated a list of mitigation priorities to offset the most severe negative impacts.
- LAMC, SCSPA, and the City later signed a \$4.08 million community mitigation agreement, which was heralded as a new approach to community-based planning and involvement.

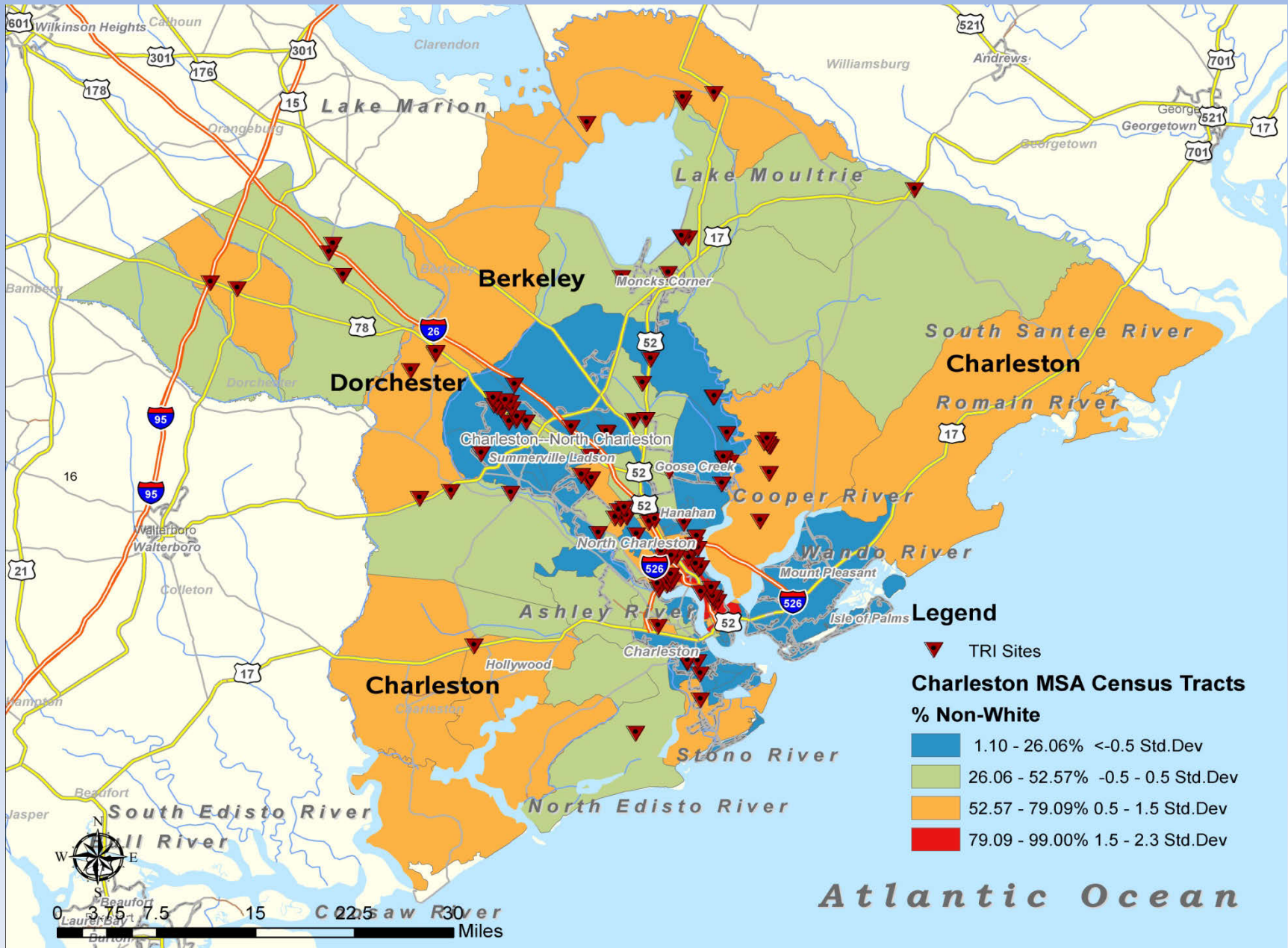
# Community Mitigation Plan Agreement

- Community priorities that will be funded through this partnership include:
  - 1) creation of an affordable housing trust
  - 2) enhanced community and health facilities
  - 3) environmental monitoring
  - 4) scholarships and other support for education
  - 5) small business development and assistance
  - 6) development of a community redevelopment plan

# Charleston Area Pollution Prevention Partnership (CAPs)

- Our **long-term goal** is to use a community-university partnership between the Low-Country Alliance for Model Communities (LAMC) and the University of South Carolina (USC), the community-based participatory research (CBPR) framework, and collaborative-problem solving model (CPSM ) principles to address environmental injustice, public health, and revitalization issues in North Charleston, SC.
  - LAMC neighborhoods are impacted by environmental hazards and pollution sources. A plan to expand the Port of Charleston and other development activities will increase air pollution in North Charleston and impact public health
  - We are performing a baseline exposure and health assessment before the new port terminal opens in 2017

# Charleston TRI Facilities vs % Non-White



# Comparing between host TRI and non-host TRI census tracts based on Chi-square tests

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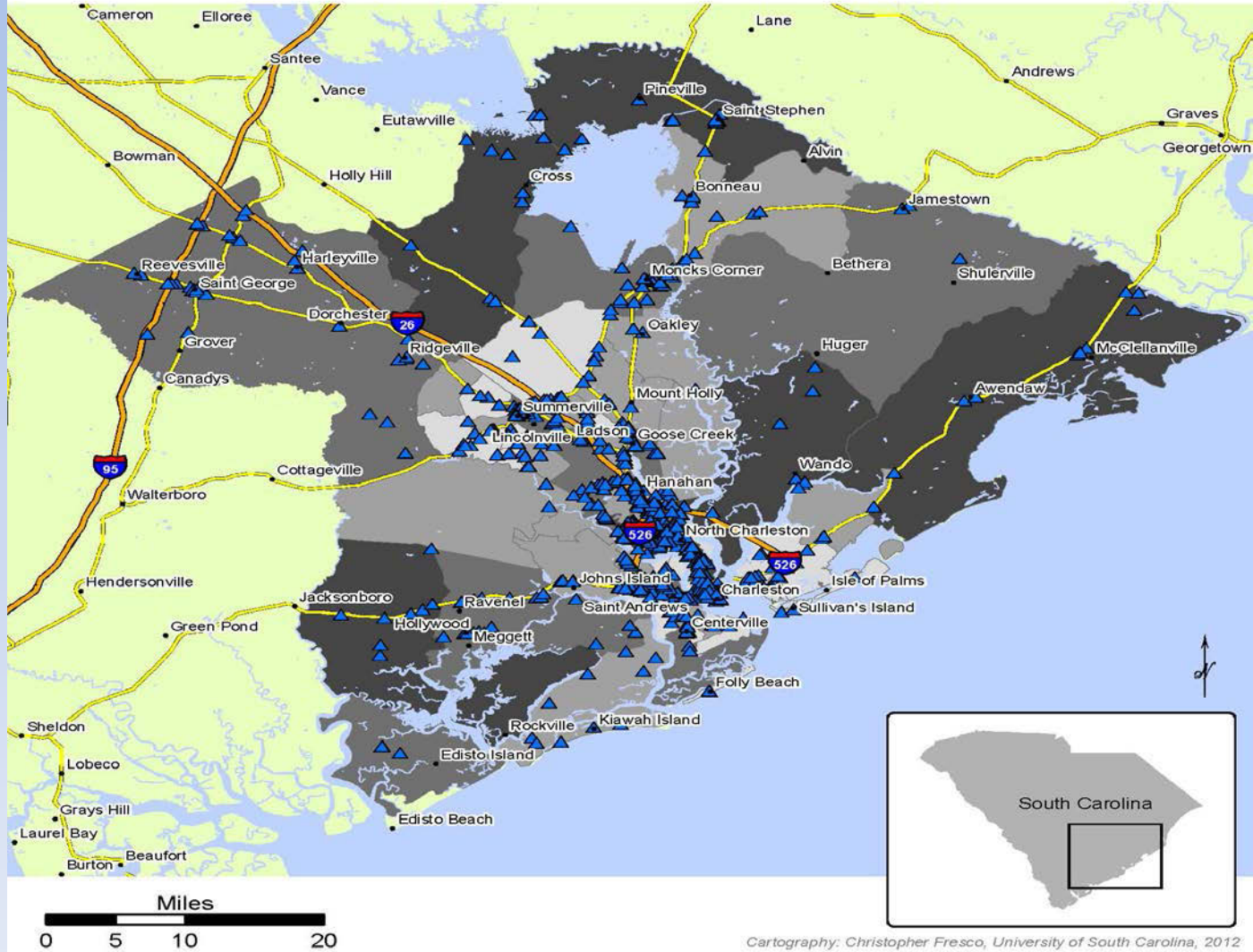
	Prevalence in host tracts	Prevalence in non-host tracts	Ratio (host/non-host)
<b>Non-white</b>	0.606	0.363	1.67*
<b>Owners</b>	0.407	0.497	0.82*
<b>Renters</b>	0.464	0.418	1.11*
<b>Poverty</b>	0.251	0.144	1.74*
<b>Unemployment</b>	0.114	0.061	1.86*
<b>No HS Diploma</b>	0.176	0.297	1.69*

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# Charleston MSA LUST Site Locations / Percent Non-White Population

Percent Non-White	Standard Deviation	# of LUST Sites	# of Census Tracts
0.57% - 18.36%	< -0.50 Std. Dev.	120	30
18.37% - 34.3%	-0.50 - 0.50 Std. Dev.	148	29
34.31% - 57.89%	0.50 - 1.5 Std. Dev.	211	29
57.9% - 99.41%	1.5 - 2.3 Std. Dev.	225	29



## Comparing between host LUST and non-host LUST census tracts based on Chi-square tests

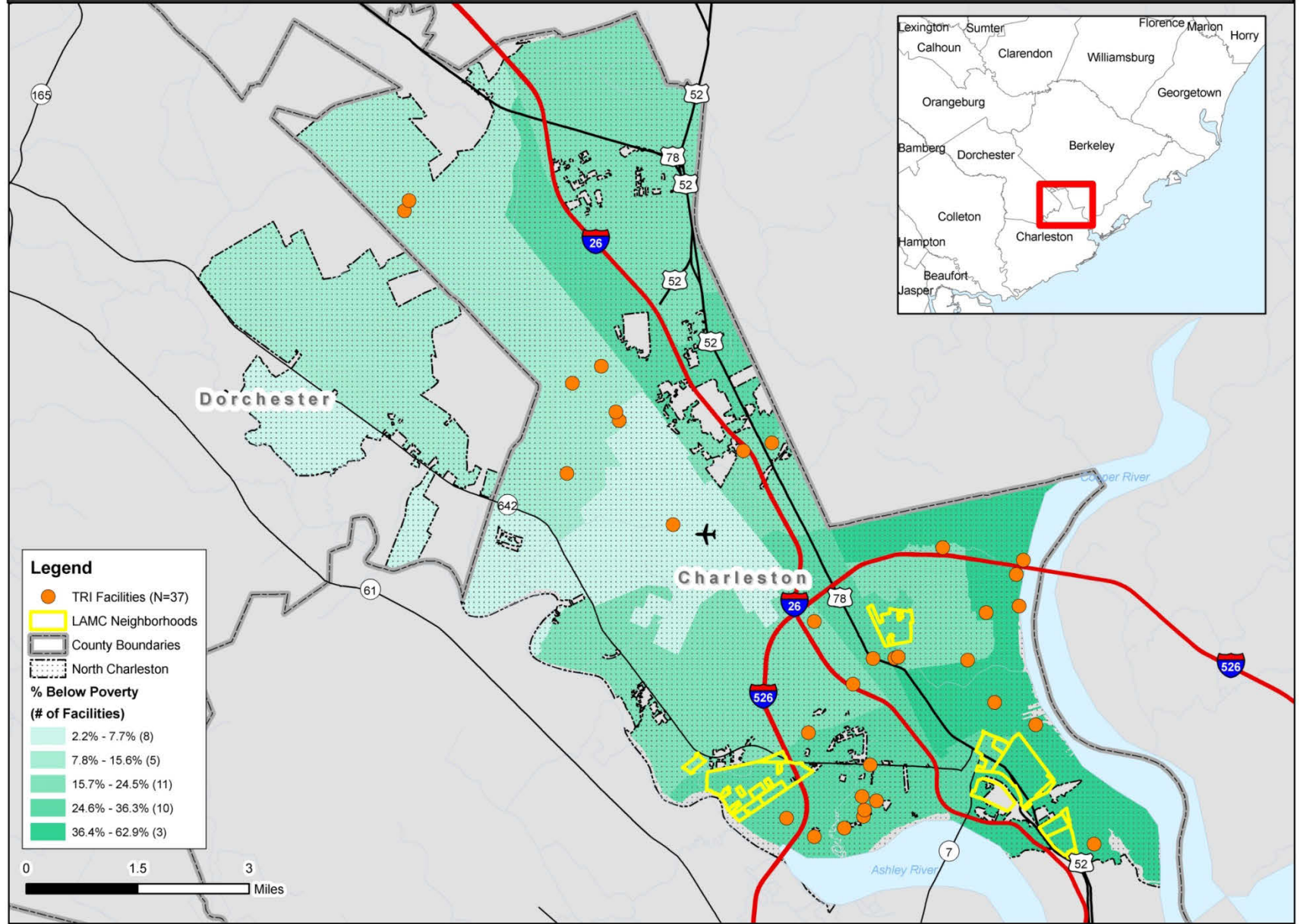
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	Prevalence in host tracts	Prevalence in non-host tracts	Ratio (host/non-host)
<b>Non-white</b>	0.610	0.234	2.60*
<b>Owners</b>	0.420	0.527	0.80*
<b>Renters</b>	0.467	0.390	1.20*
<b>Poverty</b>	0.254	0.086	2.96*
<b>Unemployment</b>	0.114	0.061	1.86*
<b>No HS Diploma</b>	0.297	0.115	2.58*

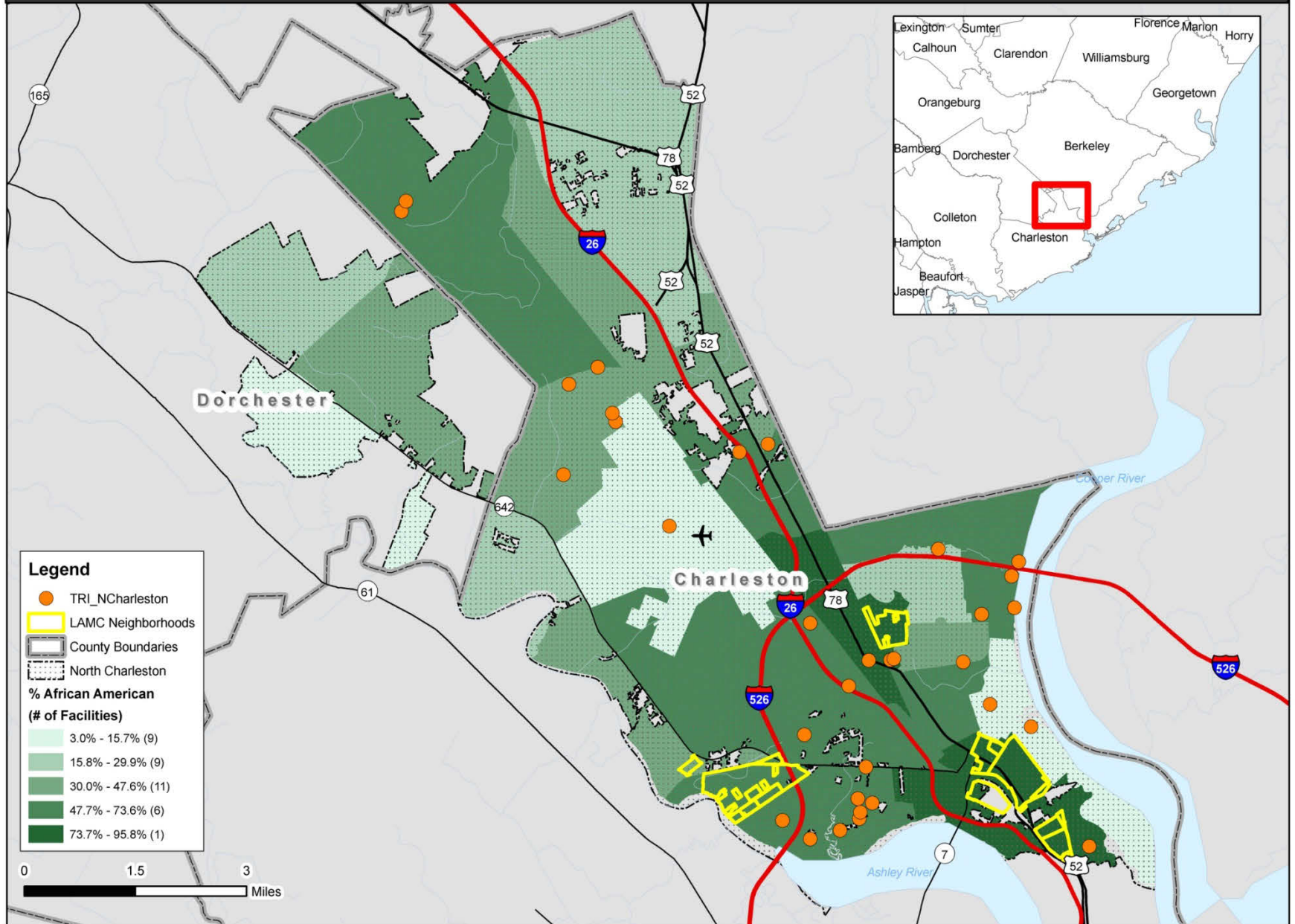
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# Location of TRI Facilities by Percent of Population Living Below Poverty North Charleston, SC

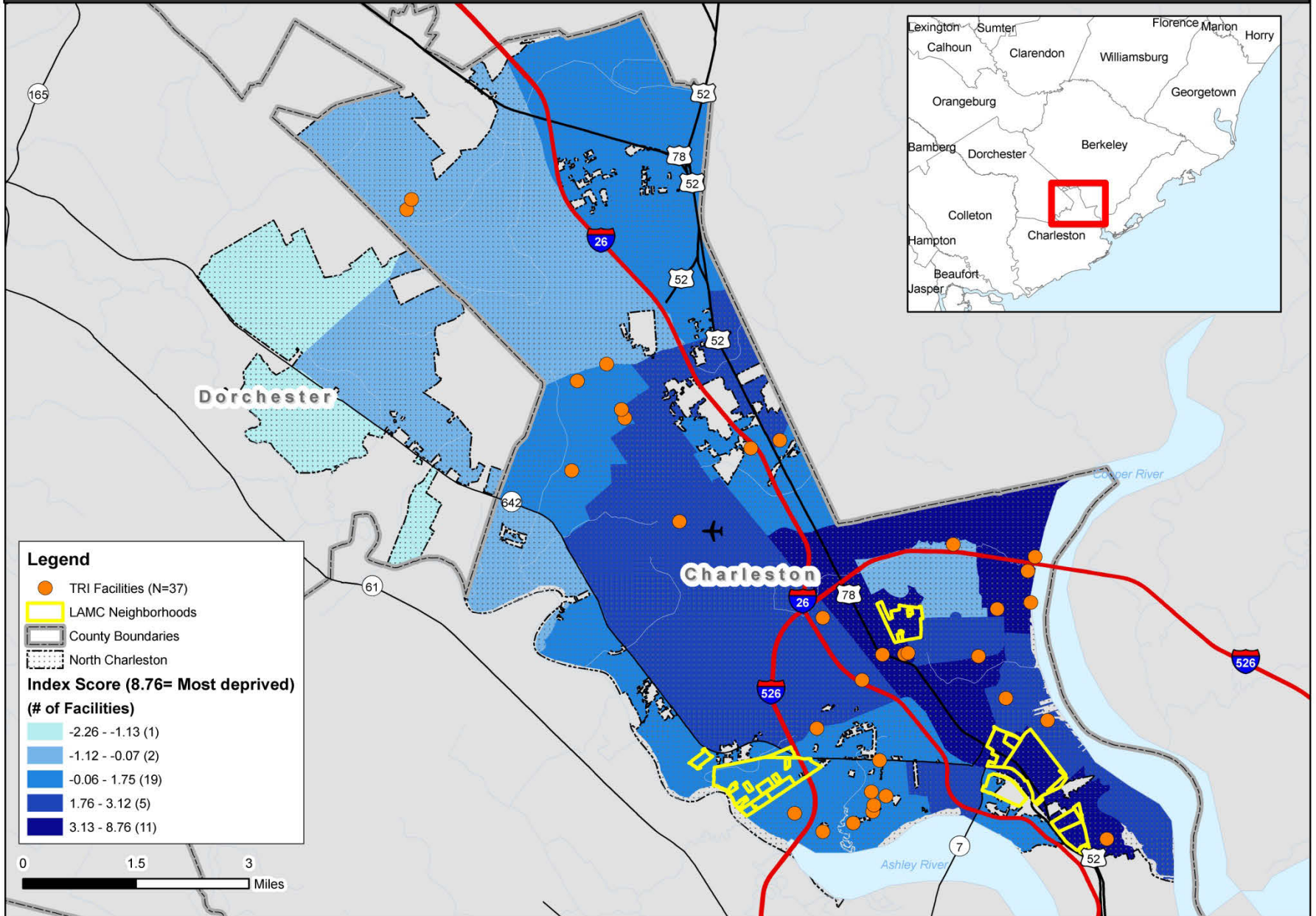


# Location of TRI Facilities by Percent African American Population North Charleston, SC



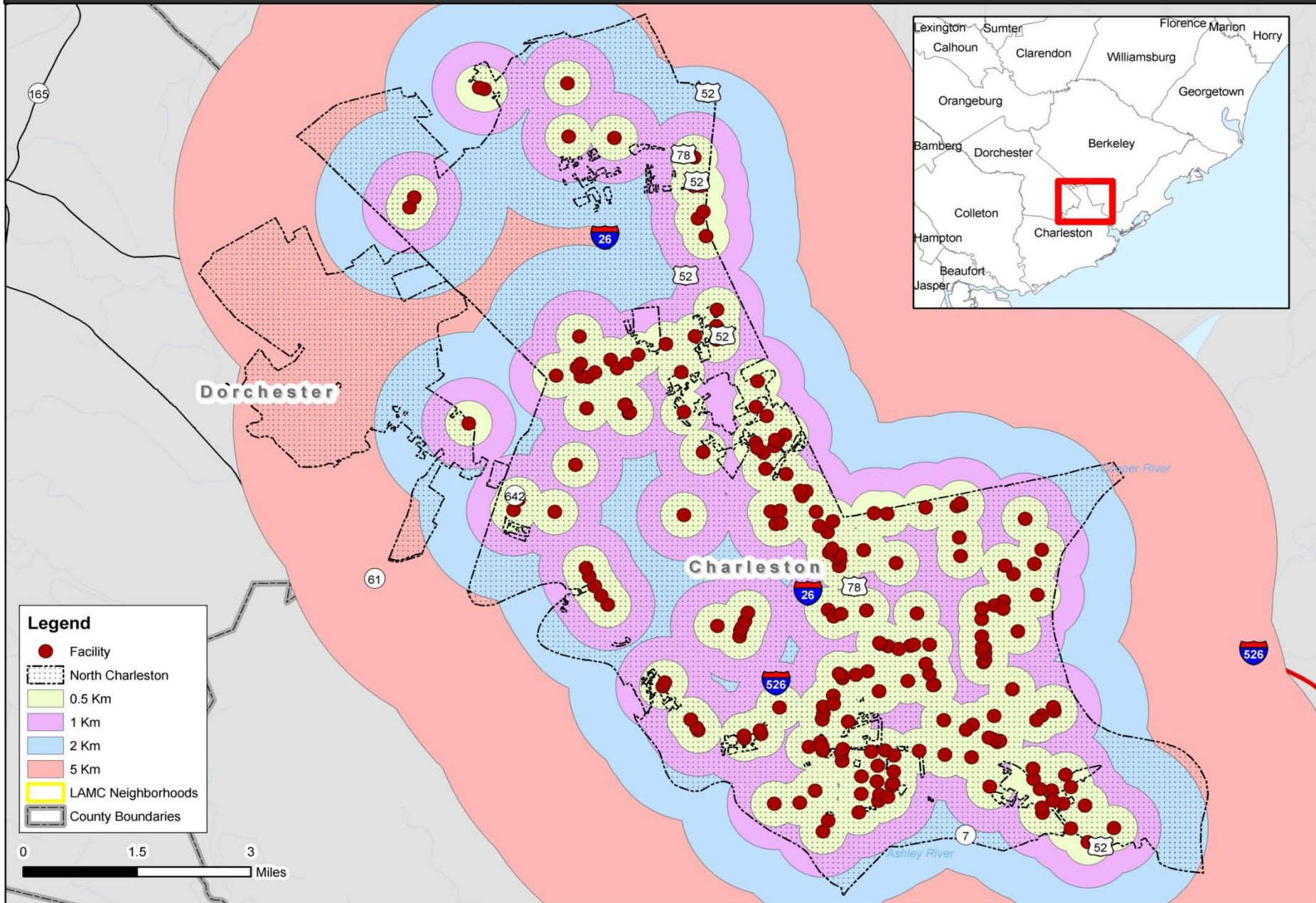


# Location of TRI Facilities by Townsend Deprivation Index Score North Charleston, SC





# Residents' Proximity to Chemical Facility-North Charleston, SC



# Project Excellence



- Mission: to promote environmental awareness, literacy, and empowerment in the African-American community.
- Goal: to increase community capacity to address local environmental health issues in North Charleston neighborhoods through community-based outreach, education, and training.
- Focus on capacity building, education and outreach, pipeline development, and training of community scientists



# Summer Enrichment Program (2010)



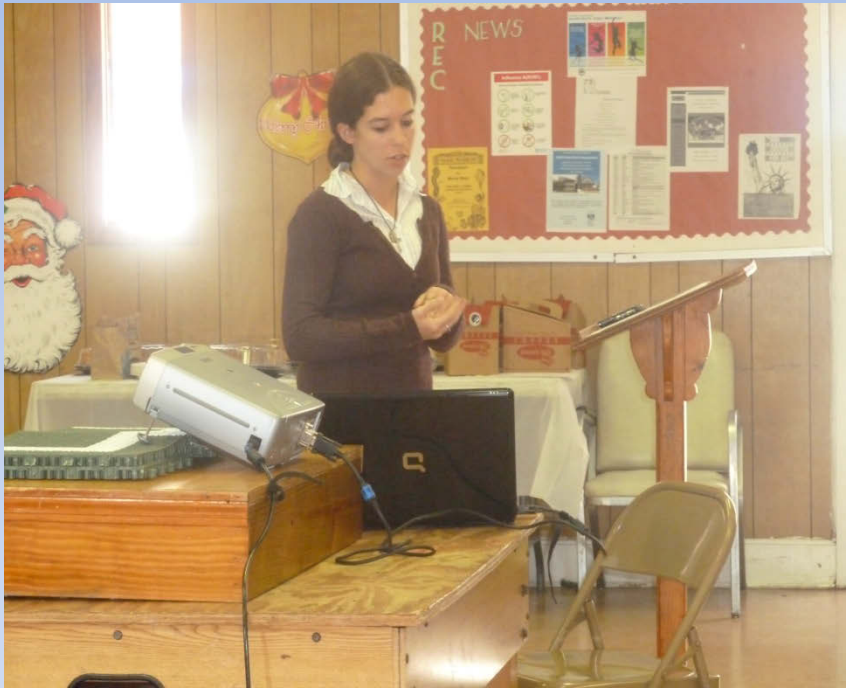
Students participating in a pilot block assessment



Students on a field trip to Hollings Marine Laboratory

- Developed a Summer Enrichment Program for students from underrepresented groups in the sciences (either from a LAMC neighborhood or attend a HBCU)
- Pipeline development
- Participated in workshops on public health
- Attended GIS/GPS training
- Field trip to Hollings Marine Laboratory
- Final paper and presentation on a EJ and health topic (landfills, incinerators, TRI facilities)

# Environmental Justice Service Learning Course (Fall 2010)



- Co-developed and taught an environmental justice and health course related to the partnership with Dr. Edith Williams, Co-I on the project
- Students learned about environmental justice and health issues in the community
- Students developed workshop materials and toolkits on soil sampling, brownfields, air pollution, health disparities, goods movement, online mapping tools, and other topics to be used as a part of community education workshops



# Community EH Education Workshops (Spring 2011)



- Dr. David Padgett, a geographer and GIS expert from Tenn State University led a one-day workshop on GIS mapping for residents
- Workshop included a laboratory tutorial on the use of online mapping tools
- Outside field exercise in the use of GPS units for mapping air monitoring locations



# Phase I Soil Sampling (July 2011)



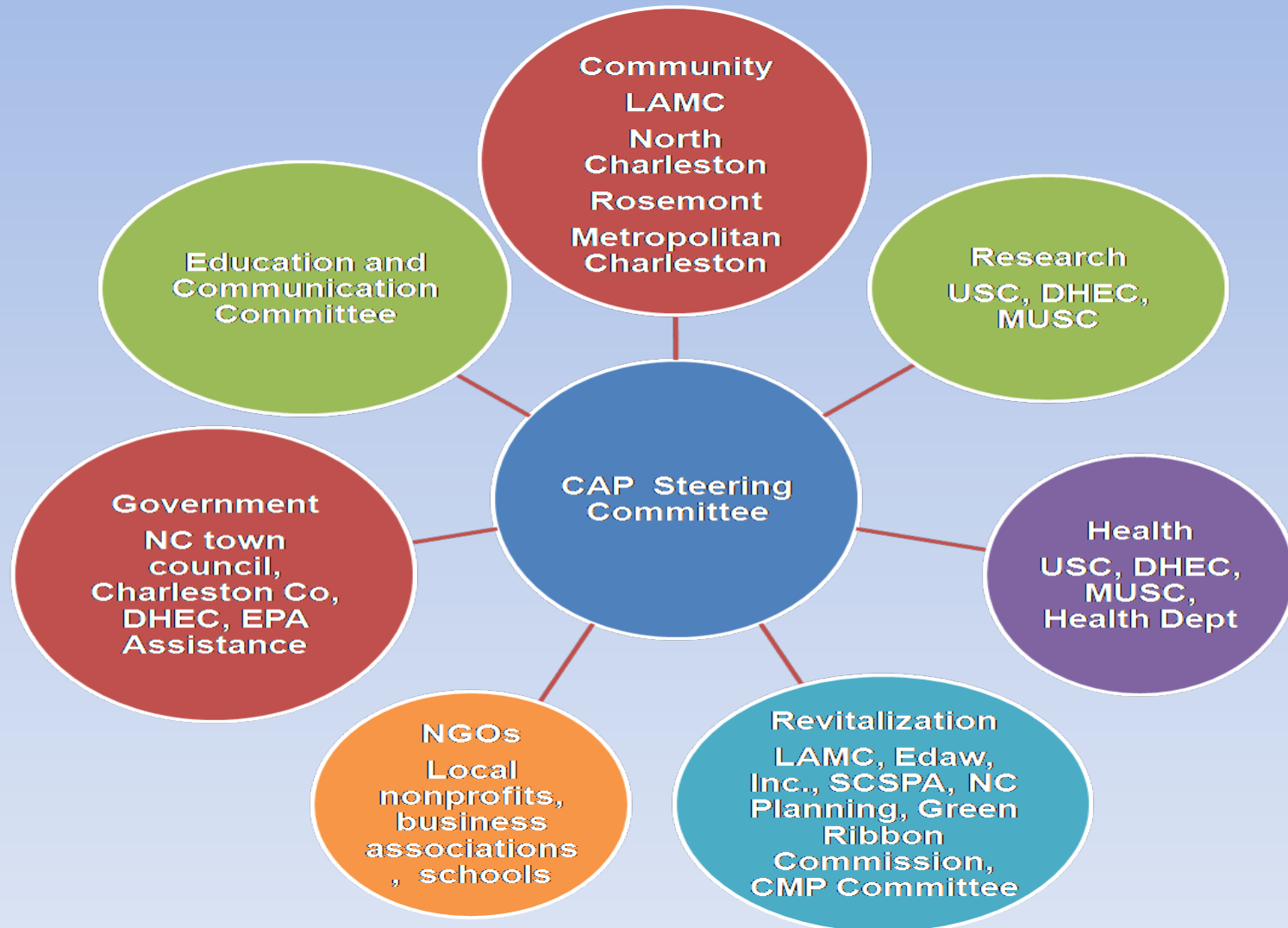
- Primarily sampled in the Union Heights Neighborhood
- Sampled near major industrial sites, Superfund sites, and brownfields
- Sampled near heavily trafficked roadways and background sites
- Sampled in areas that will be impacted by road expansion to support the new Port terminal
- Sampled near schools and community centers
- Noted latitude/longitude coordinates for each location
- Total of 50 sites

# Day of Neighborly Needs (July 2011)



- Annual Progress reporting event, health fair and community cookout
- Participants were able to learn about LAMC and CAPs
- Children received a bookbag with the Project Excellence logo and school supplies
- MUSC, DHEC, and other health partners had booths for participants to learn about:
  - Heart disease, high blood pressure, healthy living, lupus, asthma, and cancer
- DNR and other non-health partners had booths as well
- Zumba class for participants
- Healthy Cooking Demonstration
- Fun activities for kids

# Collaborative Problem-Solving Model Teams





# Charleston Community Research to Action Board (CCRAB)

- The CAB serves as a liaison between community members and university faculty to provide continuous and consistent input on the project via conference calls, e-mails, and quarterly meetings
- The Principal Investigator (PI) and research team are meeting with the CAB monthly at a designated location in North Charleston to obtain input from the CAB on study design issues, monitoring sites, use of funds to pay community monitors and participants, confidentiality and privacy issues, dissemination and translation of research results, and any other project-related concern
- We developed a research organizational structure, project workplan, and communications plan to be used by the CAB in its role as liaison between the community-university research team and LAMC residents
- The Community Advisory Board has evolved into the Charleston Community Research to Action Board



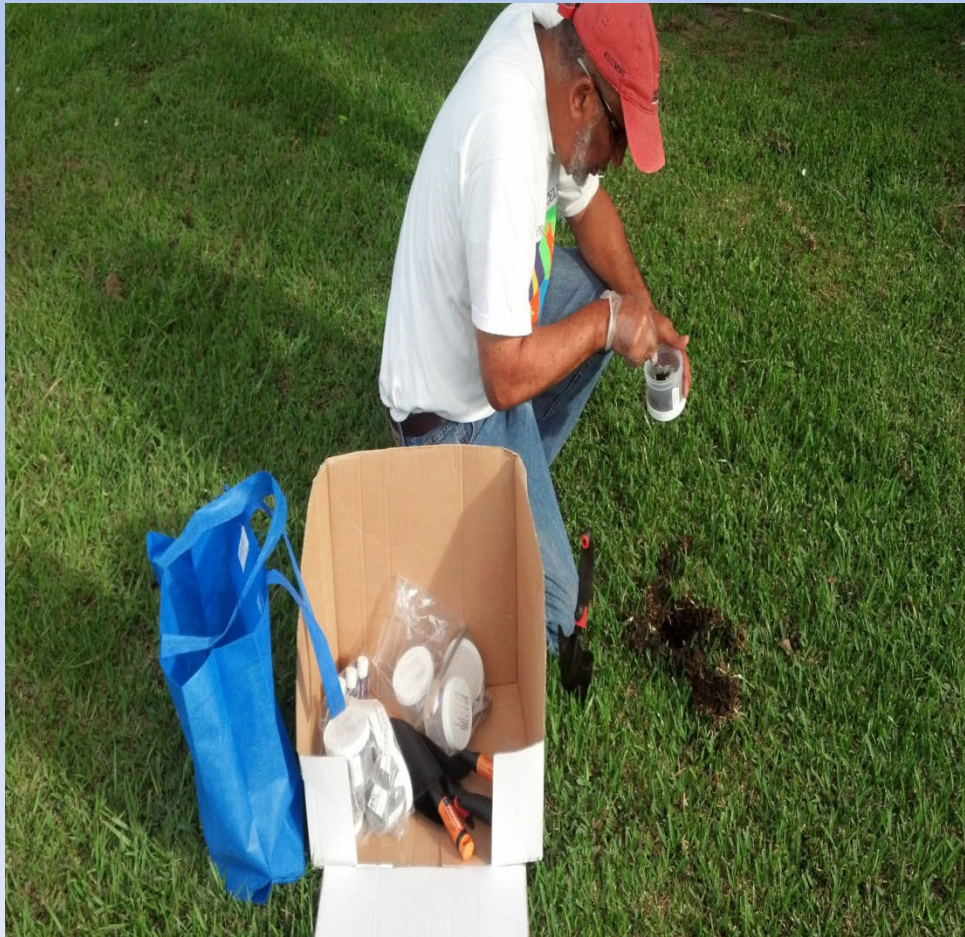
# CPS Meeting (March 24, 2012)





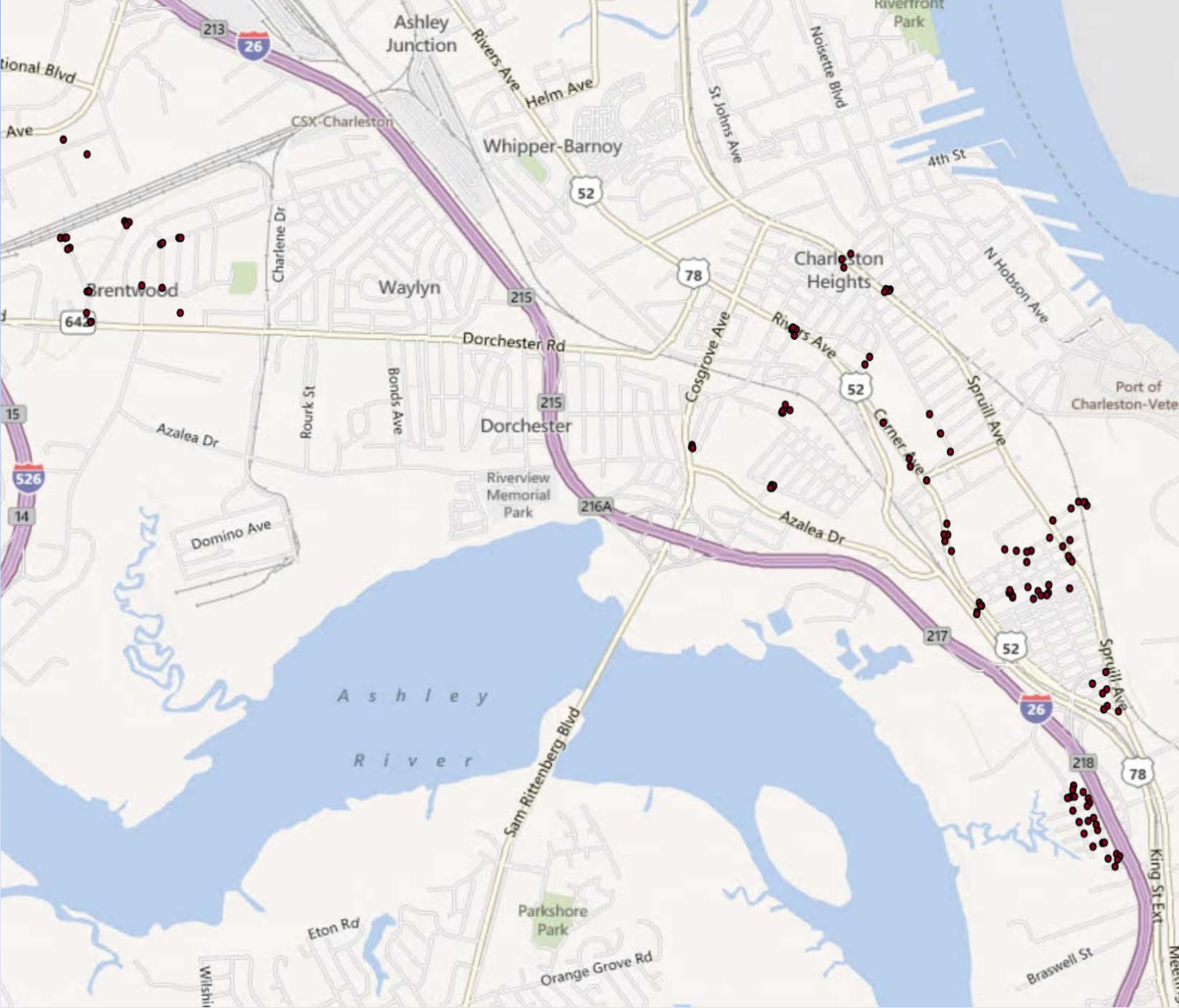
# Phase II Soil Sampling (June 21-22, 2012)

- 150 soil samples were collected in Union Heights, Accabee, Chicora-Cherokee, Liberty Hills, Rosemont, and Green Grove Communities





# Location of Soil Samples (Phase II)





# Impact

- Increased environmental literacy and awareness in the community
- Built community capacity to address environmental health concerns
  - Catalyzed CBO's current development of policies and procedures needed for its operation as a well-organized entity
- Helped residents on efforts with Port expansion
  - Knowledge of negative impacts
  - Permanent air monitor and baseline assessment
- Provided technical assistance and environmental health perspective for the Mitigation Agreement Committee
- Expanded partnership to include other communities including the Rosemont Community and universities including UMD-CP and MUSC
- Led to other funding opportunities for LAMC including LEAP grant, ACHIEVE grant, and Community-Engaged Scholars Program (MUSC)
- LAMC obtained an EPA Environmental Justice Achievement Award

# Charleston County Incinerator



The incinerator, built in the late 1980s, converts 230,000 tons of trash a year, or 80 percent of the county's garbage, into smoke, steam and a thick black ash.

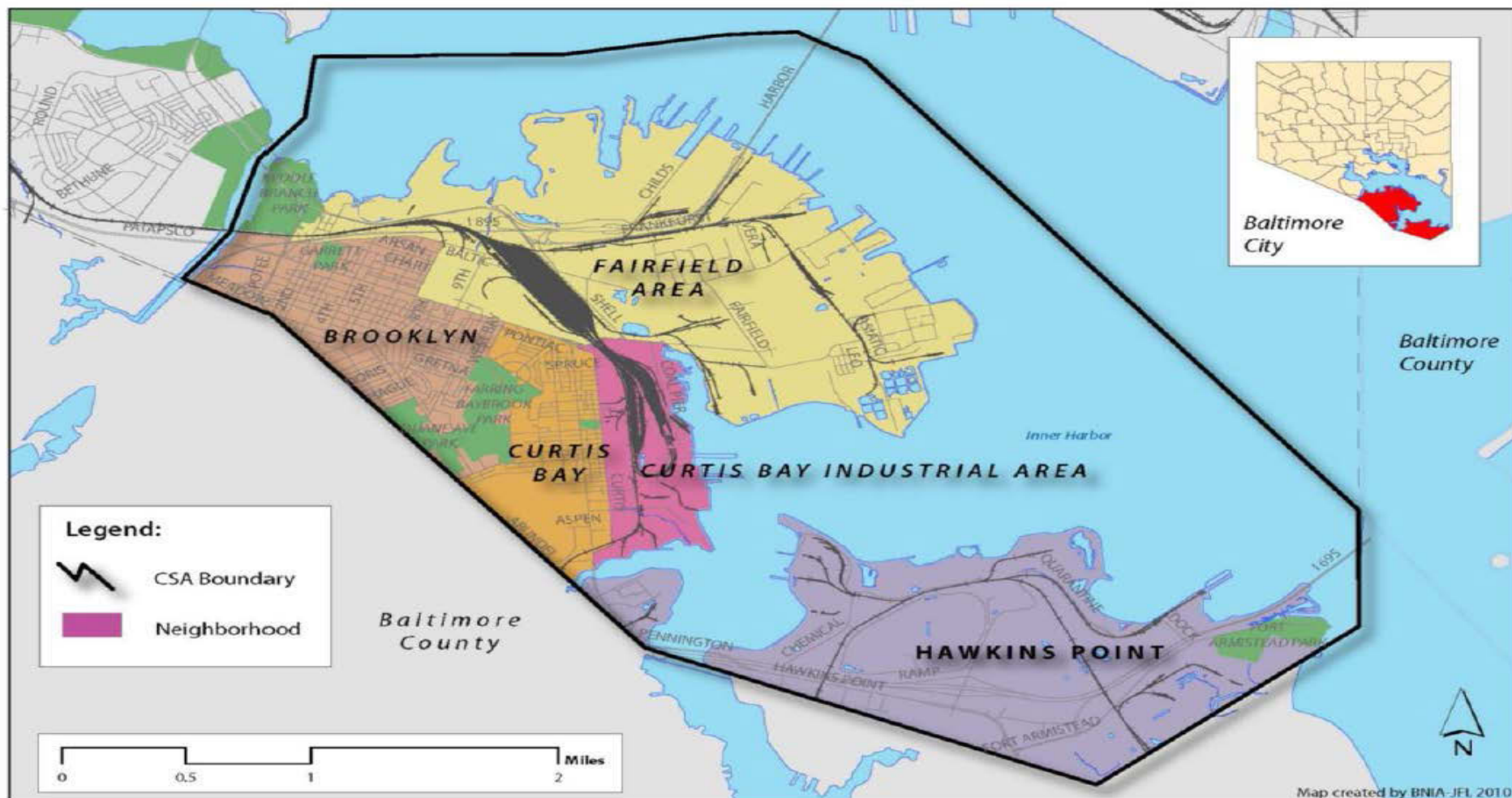
The plant, on Shipyard Creek Road in North Charleston, also is one of the state's biggest sources of mercury pollution, releasing about 129 pounds a year, more than some of the state's larger coal-fired power plants and twice as much as Nucor's smelter in Berkeley County.

**THANK YOU!**

# Acknowledgements

- Institute for Families in Society (USC)
- Low Country Alliance for Model Communities
- Herb Fraser-Rahim, LAMC Community PI
- Omega Wilson, WERA President
- Chris Heaney
- Steve Wing

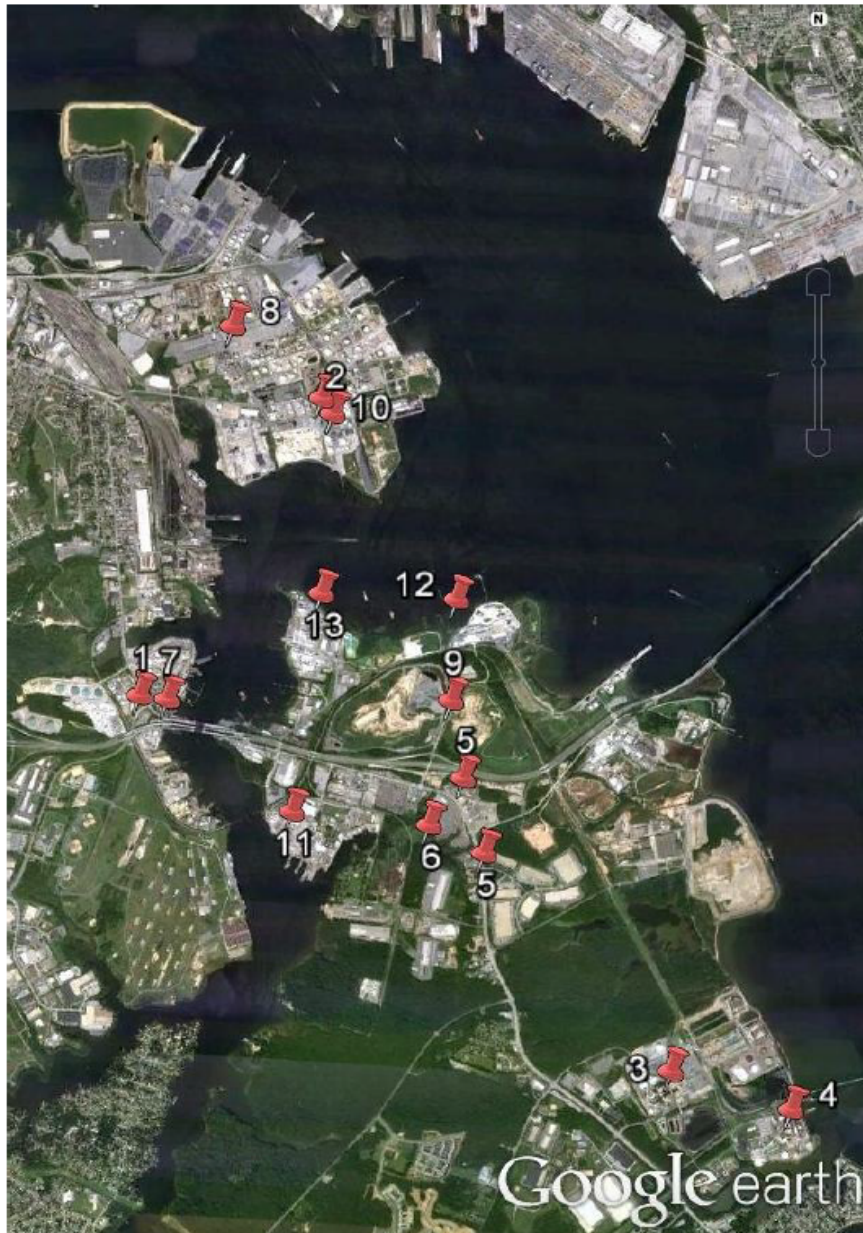
Figure 1: Baybrook Area



The neighborhoods that are the focus of this report are located in the southernmost part of Baltimore City. These neighborhoods, known as Curtis Bay, Brooklyn, Hawkins Point, Fairfield, and Wagner's Point are collectively referred to in this report as the Baybrook Area or Baybrook. This area can be identified by the four census tracts (250600, 250500, 250401, 250402) or two zip codes: 21225 and 21226. Fairfield, Wagner's Point, and Hawkins Point are primarily industrial areas while Curtis Bay and Brooklyn are primarily residential areas.

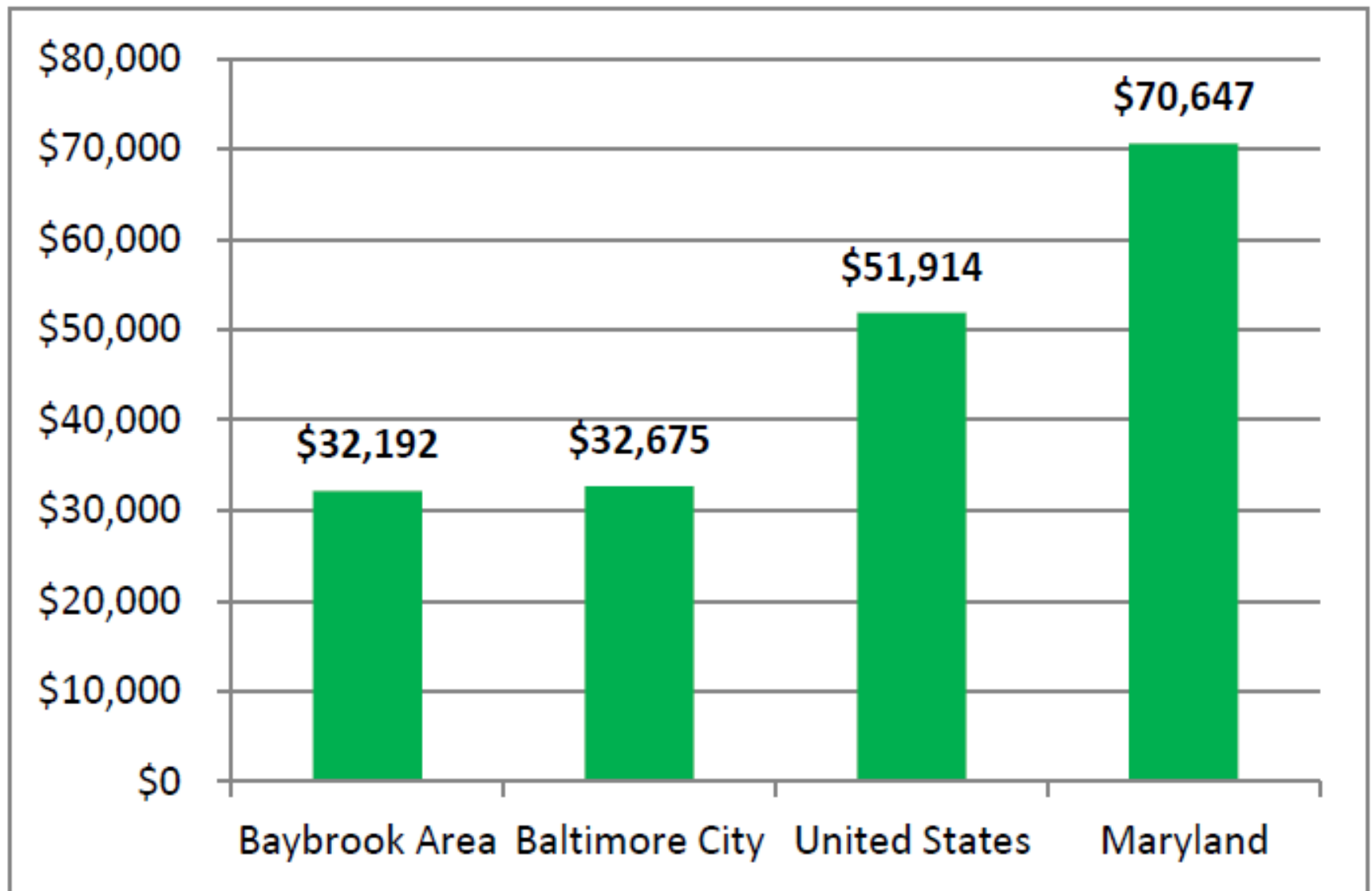


Figure 2: Active Facilities in Curtis Bay with Major Air Permits<sup>ff</sup>

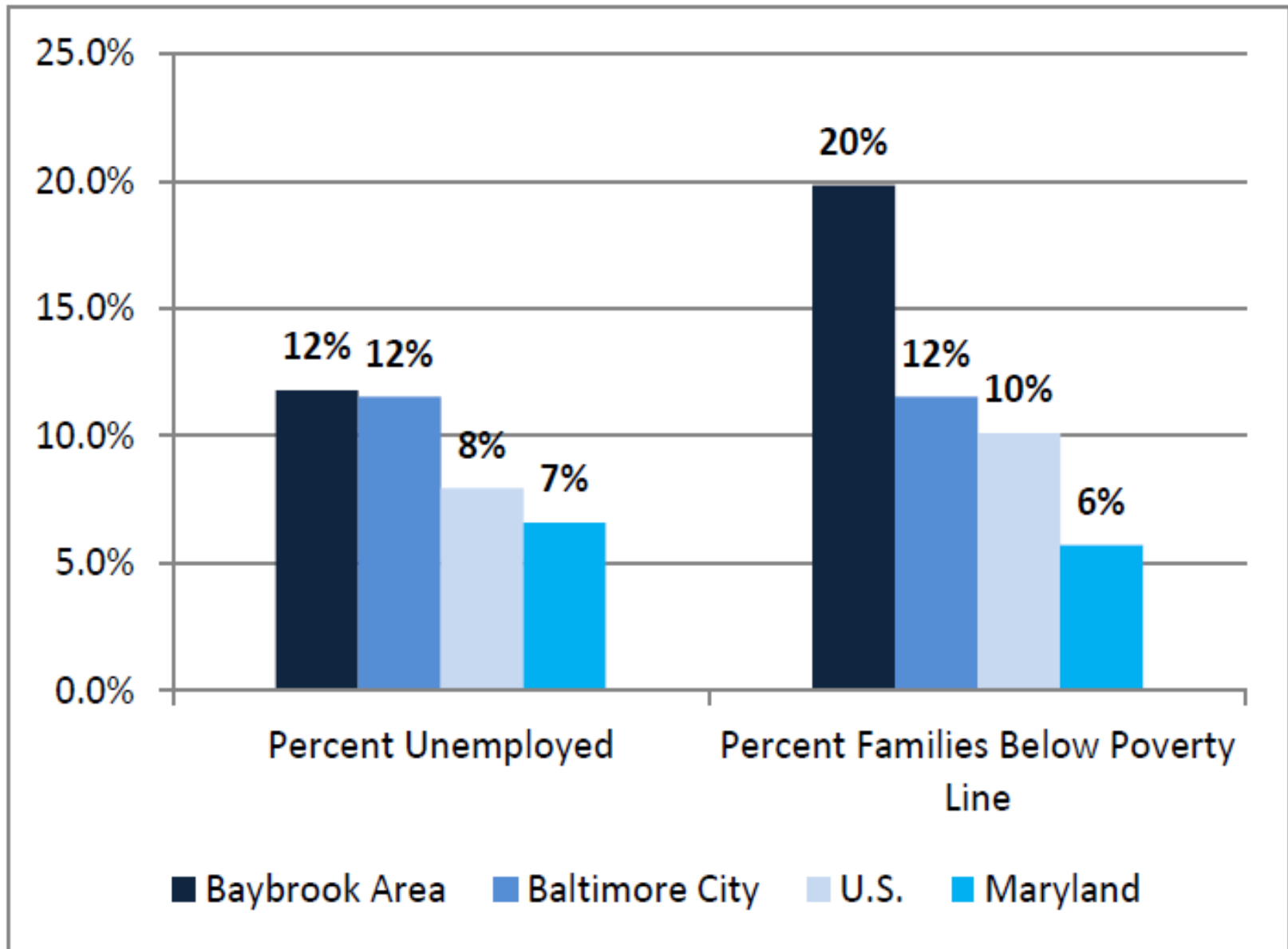


NO.	FACILITY NAME
1	BP PRODUCTS NORTH AMERICA INC CURTIS BAY TERMINAL
2	CITGO PETROLUEM CORP
3	CONSTELLATION - BRANDON SHORES STATION
4	CONSTELLATION - WAGNER STATION
5	CURTIS BAY ENERGY
6	ERACHEM COMILOG INCORPORATED
7	HESS CORP BALTIMORE TERMINAL
8	MOTIVA ENTERPRISES
9	QUARANTINE ROAD LANDFILL
10	SUNOCO PARTNERS MARKETING & TERMINALS LP BALTIMORE TERMINAL
11	US COAST GUARD YARD
12	US GYPSUM CO
13	W.R. GRACE - DAVISON CHEMICAL

**Figure 3: Comparison of Median Household Income**

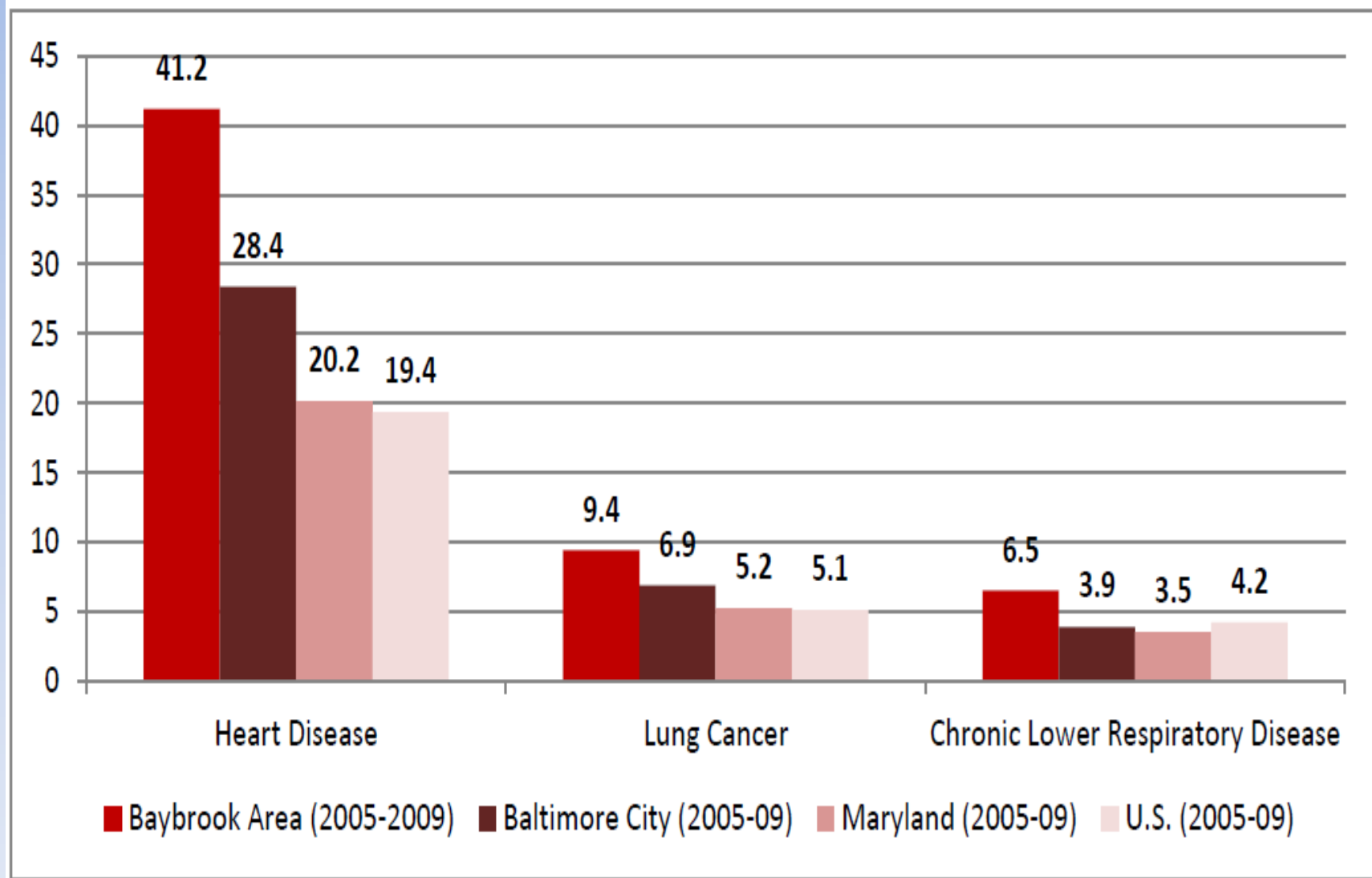


**Figure 4: Comparison of Unemployment and Poverty Rates**





**Figure 5: Comparison of Baybrook Area Specific Mortality Rates per 10,000 to Baltimore City, Maryland, and United States**



## Toxic Air Emissions Reported to the Toxics Release Inventory in 21226 Relative to Other Zip Codes in the U.S.

Year	Toxic Air Emissions		
	Rank	Percentile	Pounds
2005	7	99.93%	13,736,694
2006	9	99.91%	11,939,943
2007	1	99.99%	20,670,026
2008	1	99.99%	21,650,020
2009	2	99.98%	13,798,694
2010	75	98.96%	2,205,260
2011	73	99.00%	2,084,433

Rank is out of 8,949 zip codes in the U.S. (not counting territories)

Figure 7: 2004-2008 Average Annual PM<sub>2.5</sub> Concentrations in Baltimore City

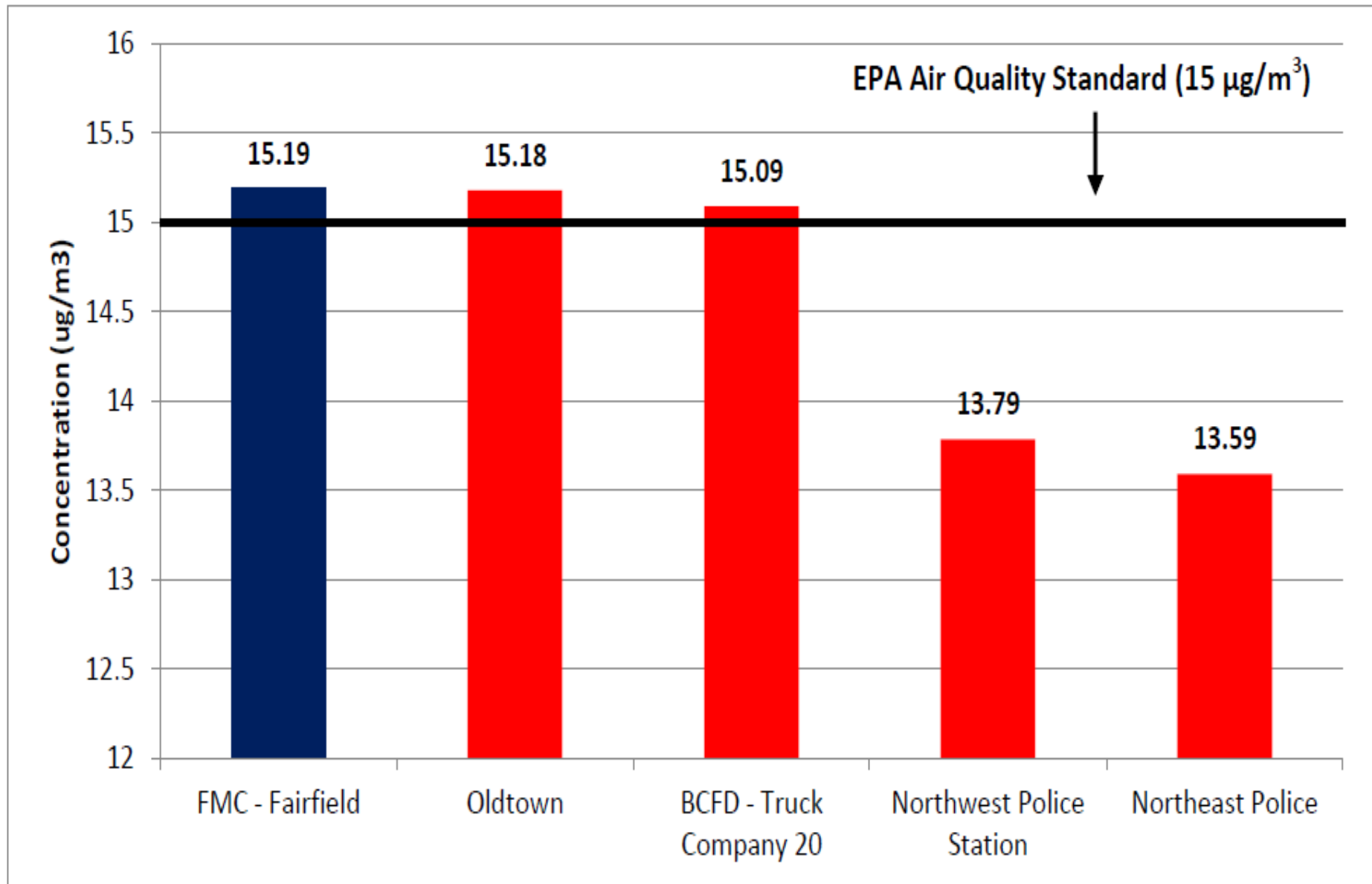
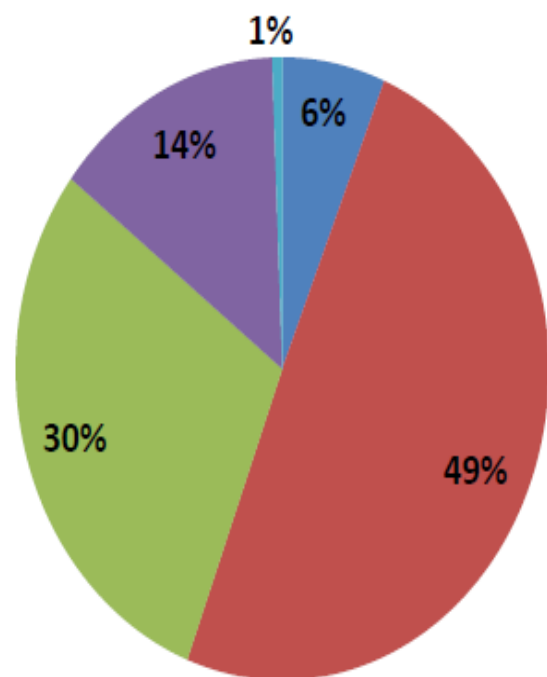


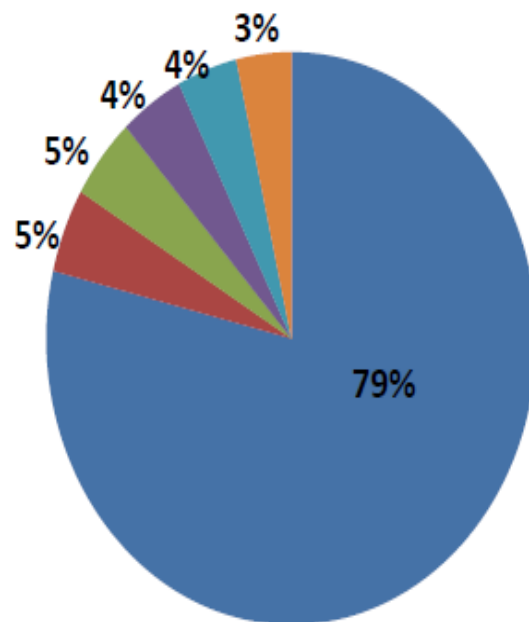
Figure 12: NATA Breakdown of Respiratory Risk by Source Category and Pollutant

### Respiratory Risk by Source Category



- Point Respiratory Risk
- Nonpoint Respiratory Risk
- Onroad Respiratory Risk
- Nonroad Respiratory Risk
- Background Respiratory Risk

### Pollutants Contributing to Respiratory Risk

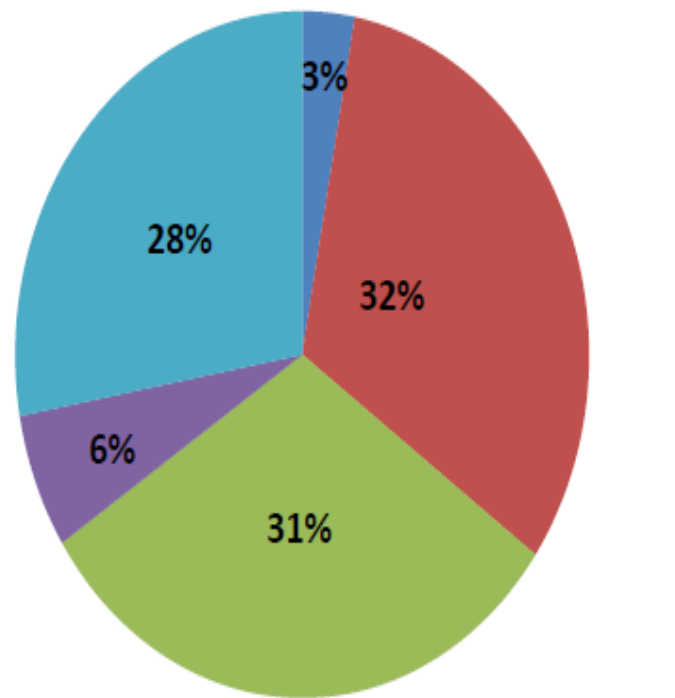


- Acrolein
- Diesel Engine Emissions
- Formaldehyde
- Chlorine
- Acetaldehyde
- Others



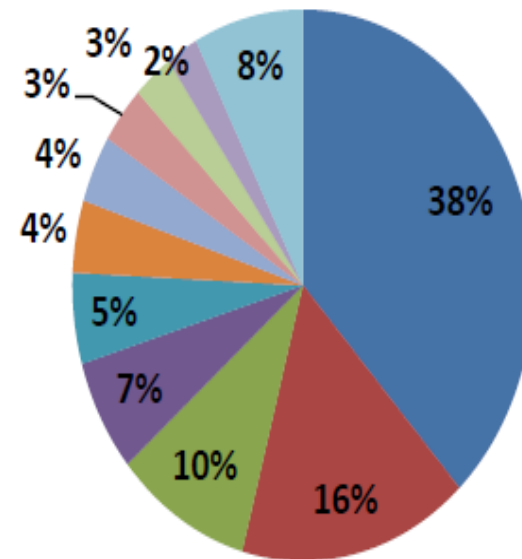
Figure 15: NATA Breakdown of Cancer Risk by Source Category and Pollutant

### Cancer Risk by Source Category



- Point Cancer Risk
- Nonpoint Cancer Risk
- Onroad Cancer Risk
- Nonroad Cancer Risk
- Background Cancer Risk

### Pollutants Contributing to Cancer Risk



- Formaldehyde
- Benzene
- PAHPOMs
- Naphthalene
- Acetaldehyde
- 1,3-Butadiene
- Carbon Tetrachloride
- Chromium Compounds
- Arsenic Compounds
- Ethylene Oxide
- Other