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The Business of Innovation

Technical System Audits (TSAs) and
Instrument Performance Audits (IPAs)
of the National Air Toxics Trends Sites
(NATTS) and Supporting Laboratories

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- Participating State and Local Agencies
- EPA Regional Representatives
- Battelle Audit Team

NATTS Network

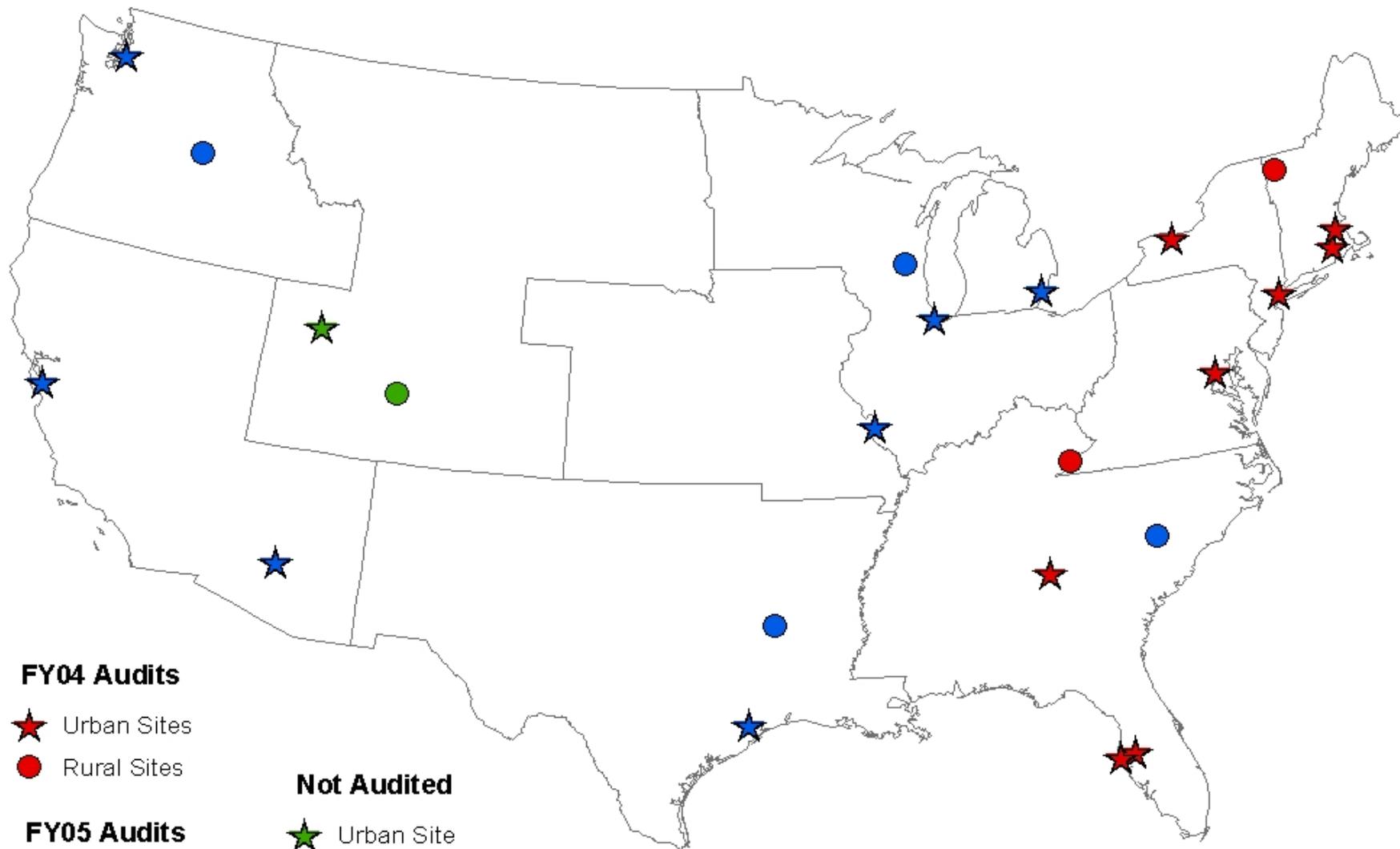
- 22 sites (15 urban, 7 rural)
- EPA Regions 1 - 10
- Two aspects of Quality System:
 - Technical Systems Audits
 - Instrument Performance Audits
- Audit each network site and the laboratories that provide the analyses

Audit Schedule

- Regions 1 through 4 were audited in FY04
- Regions 5 through 10 are scheduled to be audited in FY05
 - Exception of Region 8

Audit Year	Urban	Rural
FY04	<ul style="list-style-type: none"> • E. Providence, RI • Boston (Roxbury), MA • New York (Bronx), NY • Rochester, NY • Washington, DC • Atlanta (Decatur), GA • Tampa, FL (2 sites) 	<ul style="list-style-type: none"> • Chittenden County (Underhill), VT • Hazard, KY
FY05	<ul style="list-style-type: none"> • Detroit, MI • Chicago, IL • Houston (Deer Park), TX • St. Louis, MO • San Jose, CA • Phoenix, AZ • Seattle, WA 	<ul style="list-style-type: none"> • Chesterfield, SC • Mayville, WI • Harrison County (Karnack), TX • La Grande, OR
Not Audited	<ul style="list-style-type: none"> • Bountiful, UT 	<ul style="list-style-type: none"> • Grand Junction, CO

National Air Toxics Trends Sites



FY04 Audits

- ★ Urban Sites
- Rural Sites

FY05 Audits

- ★ Urban Sites
- Rural Sites

Not Audited

- ★ Urban Site
- Rural Site

TSA and IPA Form Development

- Initial guidance -- previously generated OAQPS audit forms
- NATTS Technical Assistance Document
 - <http://www.epa.gov/ttn/amtic/files/ambient/airtox/drafttad.pdf>
- TSAs
 - Thorough, systematic, on-site, qualitative audit of facilities, equipment, personnel, training, procedures, record keeping, data validation, chain of custody, data management, and reporting aspects of a system
- IPAs
 - Assess sample flow rates through the three sampling systems
 - Site assessment

Field Site TSA/IPA form – Outline

- **23 page document with approx. 160 questions**

Part I. General Information

Part II. Basic QA/QC

- A. QAPP and SOPs
- B. Organization and Responsibilities
- C. Training, Safety, and Chain-of-Custody
- D. Sample Handling and Sampling Frequency
- E. Monitoring Site Housekeeping
- F. Documentation

Part III. Specific Sampling Criteria

- A. VOC/Canister Sampling
- B. Carbonyl Sampling
- C. PM₁₀ Metals Sampling

Part IV. Sampler Siting

Part V. Instrument Performance Audit

- A. General
- B. VOC Sampler
- C. Carbonyl Sampler
- D. PM₁₀ Metals Sampler

Analytical Lab TSA Form – Outline

- **38 page document with approx. 360 questions**

Part I. <u>General Information</u>	Part IV. <u>Carbonyl Analysis</u>
Part II. <u>Basic QA/QC</u>	A. Carbonyl Sampler Cleanliness
A. QAPP and SOPs	B. Analysis Procedures
B. Organization and Responsibilities	C. Chain-of-Custody and Sample Handling
C. Quality Assurance/Quality Control	D. Performance Evaluation
D. Training	Part V. <u>PM₁₀ Metals Analysis</u>
E. Safety	A. Filter Preparation
F. Document Control and Records	B. Sample Receipt & Storage
G. Facilities, Equipment, Software	C. Sample Digestion
Part III. <u>VOC/Canister Analysis</u>	D. Metals Analysis
A. Canister Cleaning Equipment	E. Chain-of-Custody and Sample Handling
B. Canister Cleanliness	F. Performance Evaluation
C. Canister Analysis Procedures	
D. Chain-of-Custody and Sample Handling	
E. Performance Evaluation	

Audit Results

- Commonalities and Weaknesses

- QAPPs present and up to date: sites=100%, labs=85%
- SOP(s) present and up to date: sites=90%, labs=85%
- Perform internal audits: sites=40%, labs=54%
- Formal document control program: sites=NA, labs=46%

	The number of sites/laboratories where...			
	...the QAPP is present and up to date.	...the SOP(s) is/are present and up to date.	...internal audits are performed.	...a formal controlled document program is in place.
Monitoring Sites (10 total)	10	9	4	NA
Analytical Labs (13 total)	11	11	7	6

Highlights of Site and Laboratory Audits

- Environmental differences between the urban and rural site locations
- Types of samplers used for each measurement method
 - Cartridge manufacturers, types of canisters
- Collocated and duplicate samples
- Results from the instrument flow checks
- Summary of the analytical laboratories associated with the various sites

Urban versus Rural Field Sites

- Urban Field Site: Roxbury, MA
- Environmental justice site
- Bordered to the ...
 - North: an automobile salvage yard
 - West: a series of stores
 - South: an electrical utility station
 - East: a street

Roxbury, MA – looking to the East



Roxbury, MA – looking to the South



Urban versus Rural Field sites (cont')

- Rural Field Site: Hazard, KY
- Sits on top of a large hill
- School located below to the north/northwest of the site
- Area around trailer and fence is clear for approximately 100 feet in all directions and the land outside of that area is covered in trees

Hazard, KY – looking to West



Hazard, KY – looking to North



Sampler Manufacturers by Method

- Three monitoring methods : canisters, carbonyls, and PM₁₀ metals
- More than one type of sampler manufacturer was operated for each method

Sampler Method	Sampler Manufacturer (n = number of sites out of 10)
Canisters	<ul style="list-style-type: none">•Xontech (n=4)•ATEC (n=2)•In-house design (n=2)•Andersen AVOCs (n=1)•Meriter (n=1)
Carbonyls	<ul style="list-style-type: none">•ATEC (n=8)•ERG (n=2)
PM ₁₀ Metals	<ul style="list-style-type: none">•Andersen type (n=7)•Wedding (n=2)

Air Sample Collection

- Cartridge Manufacturers
 - Two suppliers for the carbonyl sampling cartridges
 - Waters → 4 sites
 - Supelco → 6 sites
- Canister Types
 - Two types of stainless steel (SS) sampling canisters
 - Fused silica lined (SS) → 5 sites
 - Passivated (SS) → 3 sites
 - Both → 2 sites
- Hi-Volume PM10 Metals → 8 x 10" quartz filter

Collocated and Duplicate Samples

- Collocated: two independent samplers
- Duplicate: one sampler, more than one channel

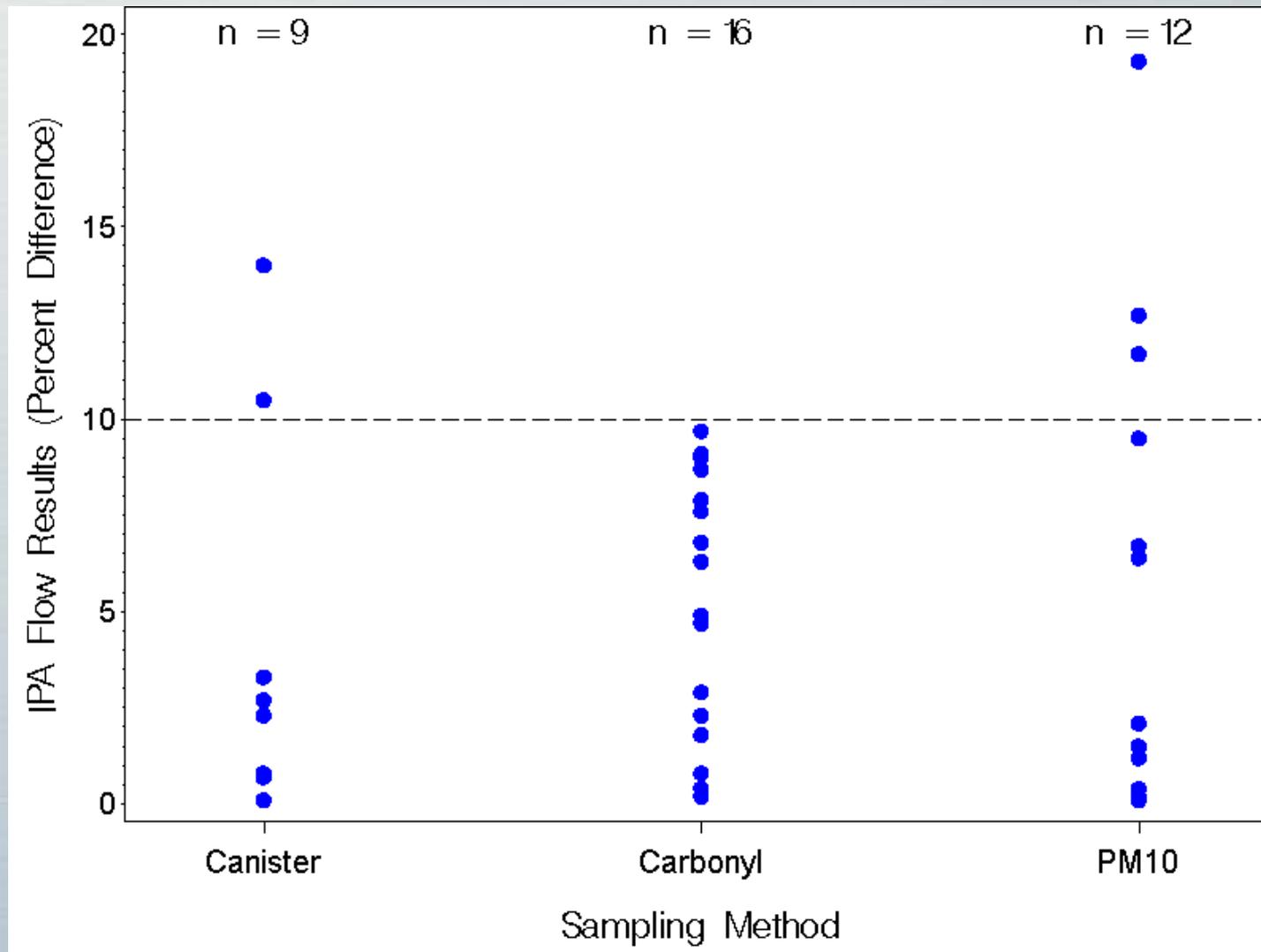
Sampler Method	Number of Sites (out of 10 total)		
	Collocated	Duplicate	Single
Canister	1	1	8
Carbonyl	1	5	4
PM ₁₀ Metals	3	NA	6

Summary of IPA Flow Results

- Flow rate comparisons look reasonably good, especially for the carbonyl sampling method.
 - Carbonyls: all differences < 10%
 - Canisters: most < 5%, but two outliers > 10%
 - PM₁₀: most < 10%, but three values > 10%
 - and one of those values is a large outlier at ~19%

Percent Difference	Canister Sampler (n=9) ^a	Carbonyl Sampler (n=16)	PM ₁₀ Sampler (n=12)
Min	0.1	0.2	0.1
Median	2.7	5.6	4.25
Max	14.0	9.7	19.3

Summary of IPA Flow Results (cont')



Only 5 of the 37 flow rate checks were above 10 percent.

Laboratories

- 13 different laboratories included in the FY04 audits
 - Thus, not always one laboratory assigned to each site
- For example:
 - Atlanta, Georgia → one laboratory
 - Providence, Rhode Island → two laboratories
 - Tampa, Florida → three laboratories

Analytical Methods

- Canister analysis: TO-15 method
- Carbonyl analysis: TO-11 method
- Metals analysis (five labs audited):
 - 4 labs used ICP-MS (inductively coupled plasma-mass spectrometry)
 - ICP-MS is the recommended procedure in the NATTS TAD
 - 1 lab used ICP-OES (inductively coupled plasma-optical emission spectroscopy)

Summary

- FY04 NATTS audits focused on EPA Regions 1-4
- Total of 23 final audit reports generated
- Found very few issues of concern
- Overall, the NATTS project managers and supporting technical/analytical staff members were very conscientious, well qualified, and exhibited considerable expertise

Next Steps

- We are currently working closely with the NATTS monitoring contacts in Regions 5-10 and the associated laboratories
- Plan to work with EPA on a Quality Assurance Annual Report
 - Summary of the QA data generated for NATTS in FY04, may include:
 - Precision
 - Bias → laboratory (PT results) and field (flow audits)
 - MDLs
 - Completeness