

Office of Research and Development

HOMELAND SECURITY RESEARCH PROGRAM



EPA SAMPLING AND ANALYSIS SCIENCE TOOLS

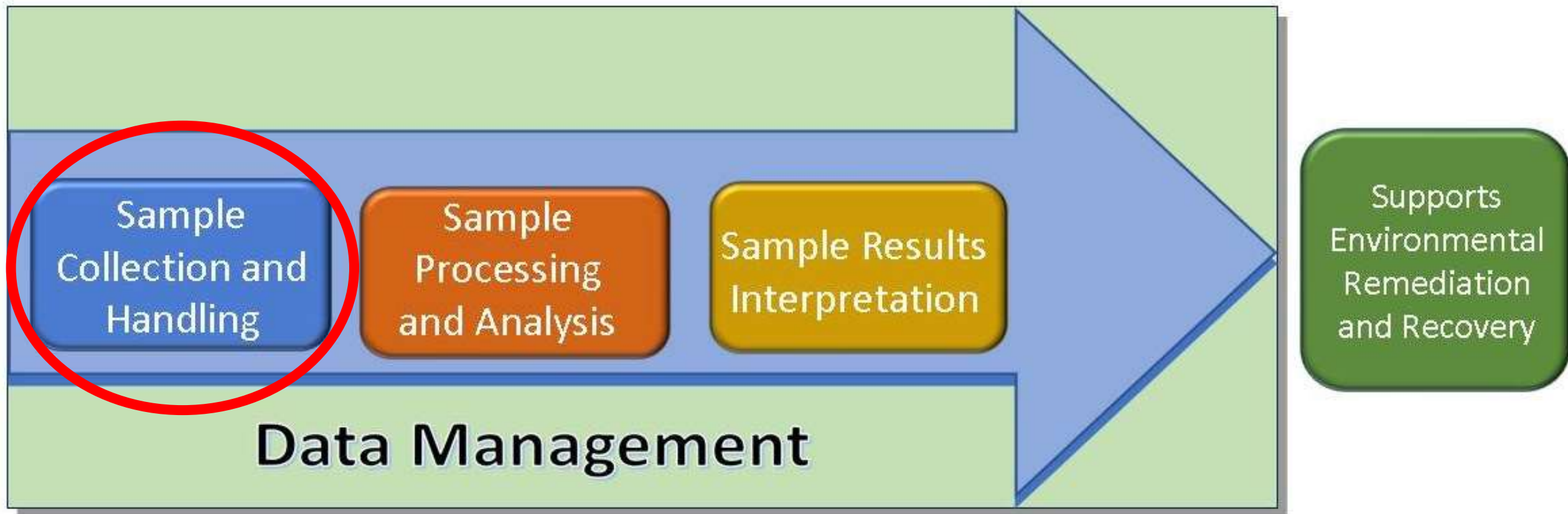
SARAH TAFT PH.D.

**U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
INTERNATIONAL DECONTAMINATION RESEARCH AND
DEVELOPMENT CONFERENCE**

MAY 9, 2019



Environmental Sampling and Analytical Methods Program (ESAM)



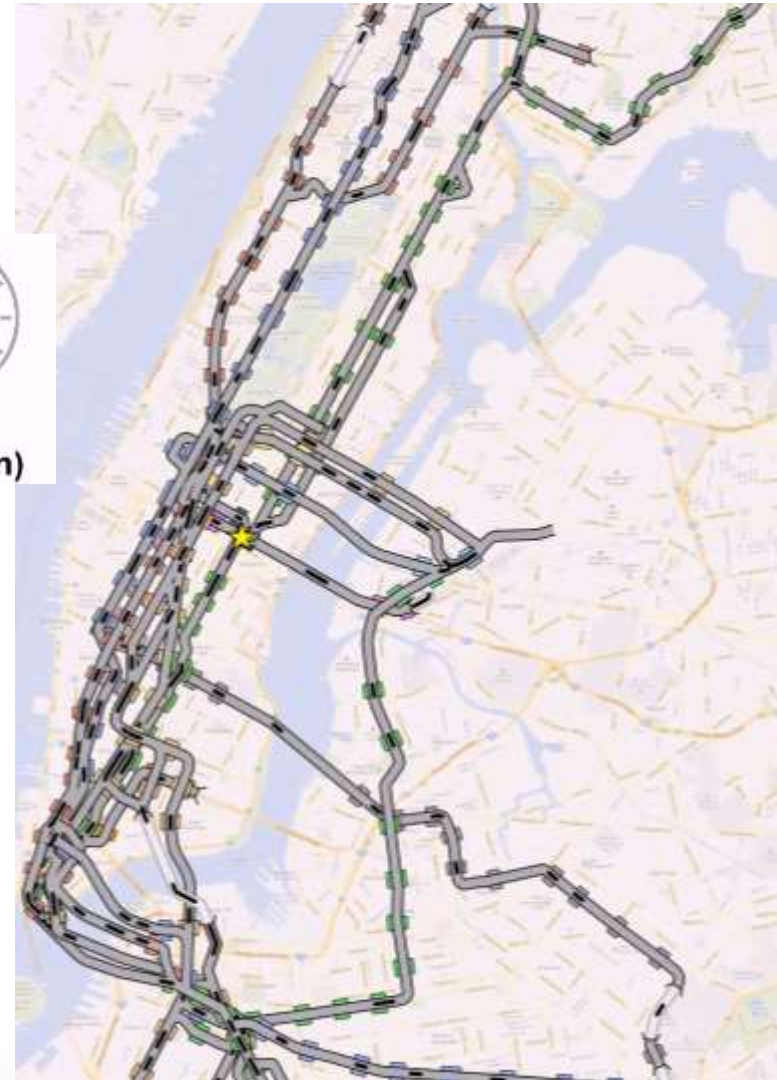
<https://www.epa.gov/homeland-security-research/environmental-sampling-analytical-methods-esam-program-home>



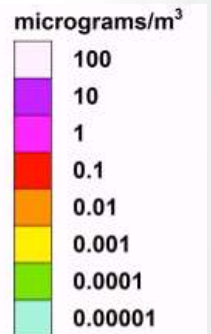
The Game Changer – A Wide-Area Bio Incident



11:00
(T + 0 min)



New York
Subway
System
(MTA)

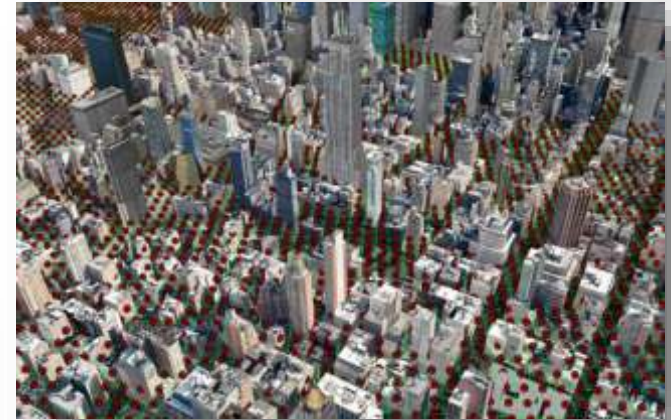




The Game Changer – A Wide-Area Bio Incident

2 mi² outdoor urban ‘area of interest’:

- 15 mi² indoors, 0.5 mi² underground
- 30 million samples
- \$15B
- 3.6M Person-hours
- 10 years





HSRP Innovation Sample Collection and Strategies Research for Wide-Area Incident

• Traditional Sampling • Composite Sampling

- 1-4 ft² sample size
- 2-3 personnel
- \$\$\$\$
- Challenges:
 - time consuming
 - labor intensive
 - require a large number of samples

- Whole room, floor, or building sample size
- 2 personnel
- \$



Wet vacuum.



Robotic cleaner.



Native air filters (e.g. HVAC)

Emerging Composite Sampling Methods

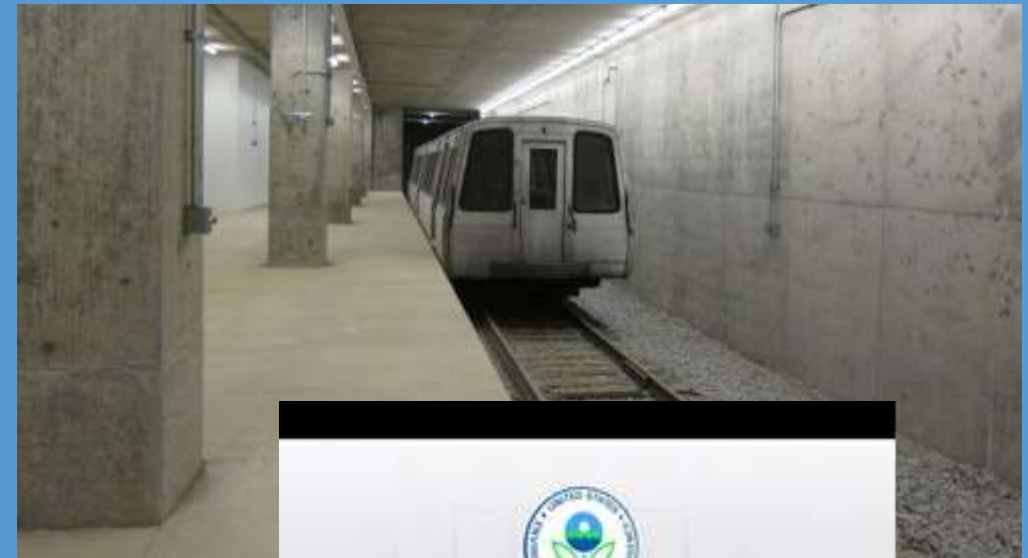
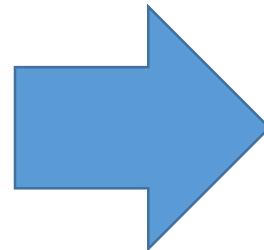
presented by the

**National Homeland Security
Research Center**

U.S. Environmental Protection Agency



Transitioning from Laboratory Research to Operation Technology Demonstration (OTD)



Link to OTD Video: <https://youtu.be/5QlZBW8N02Y>



HSRP Innovation Sample Collection and Strategies Research for Wide-Area Incident

Tests confirmed the following benefits using composite sampling methods:

- large sampling area
- economic and rapid
- small number of sampling personnel per area
- reduced burden on processing labs

Comparison of surface sampling methods:

Method	Total sampled area (ft ²)	Sampling duration (min)	Sampling cost per ft ² (\$)
37 mm micro-vaccum	49	970	395
Robotic Floor Cleaner	~1350	36	0.6
Wet Vaccum	421	84	1.6



Sample Collection Future Directions

- New sample collection methods for bio:



Air sampling.



Soil and vegetation sampling.



Municipal equipment.

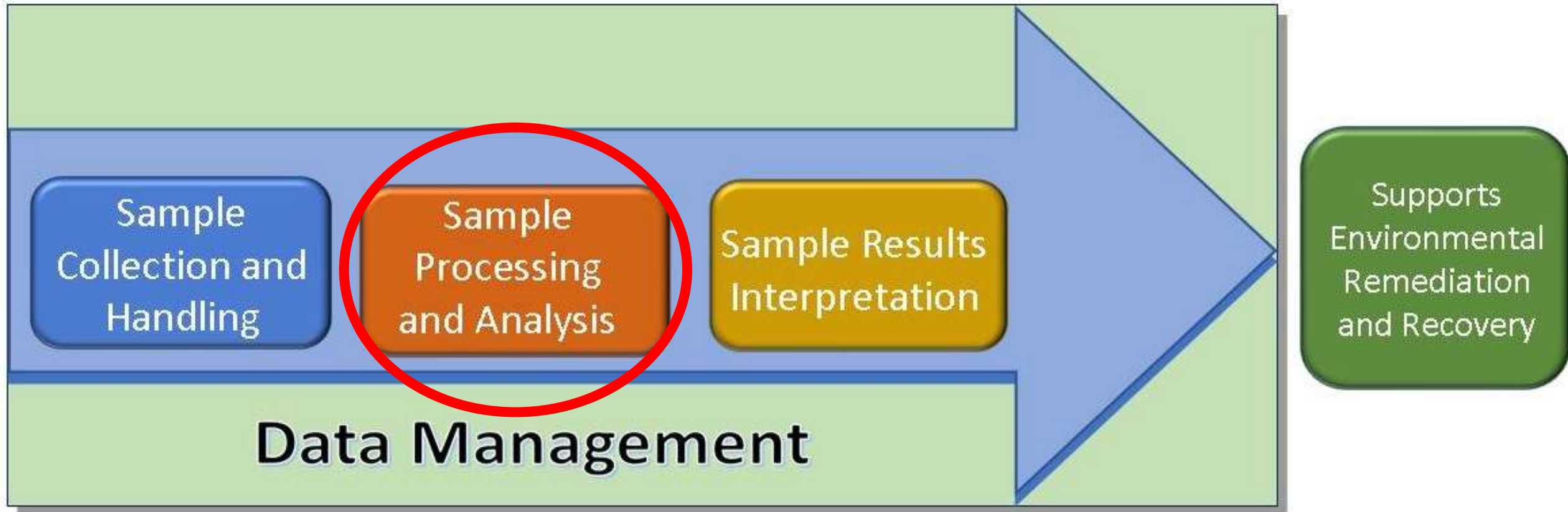
- Sampling strategies – Where, when, and how many samples?

- Developed to facilitate transfer of field samples to the analytical laboratory by indicating specific requirements for:
 - Collection volume or weight
 - Sample containers
 - Holding times
 - Preservation or preparation
 - Packaging
 - Shipping labels





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What types of contaminants and sample types?

Chemicals	Radiochemicals	Pathogens	Biotoxins
<ul style="list-style-type: none"> • <u>145 analytes</u> <ul style="list-style-type: none"> • Chlorine • Fentanyl • VX • <u>5 sample types</u> <ul style="list-style-type: none"> • Solids • Non-drinking water • Drinking water • Air • Wipes 	<ul style="list-style-type: none"> • <u>36 analytes</u> <ul style="list-style-type: none"> • Cesium-137 • Plutonium-238/239 • Strontium-90 • <u>10 sample types</u> <ul style="list-style-type: none"> • Drinking water • Aqueous & liquid phase • Soil & sediment • Surface wipes • Air filters • Vegetation • Brick • Concrete • Asphalt matrices • Asphalt shingles 	<ul style="list-style-type: none"> • <u>33 analytes</u> <ul style="list-style-type: none"> • <i>Bacillus anthracis</i> • <i>Legionella</i> • <i>Cryptosporidium</i> • <i>Noroviruses</i> • <u>5 sample types</u> <ul style="list-style-type: none"> • Aerosol • Particulate • Soil • Drinking water • Post decontamination waste water 	<ul style="list-style-type: none"> • <u>17 analytes</u> <ul style="list-style-type: none"> • Ricin • Microcystins • Botulinum neurotoxins • <u>5 sample types</u> <ul style="list-style-type: none"> • Aerosol • Solid • Particulate • Non-drinking water • Drinking water

Selected Analytical Methods (SAM)

- Identifies a single, selected method for each analyte/sample type in a specific matrix (e.g. soil, water, air)
 - Permits sharing of sample load between laboratories
 - Increases the speed of analysis
 - Improves data comparability
 - Simplifies potential outsourcing analytical support





Selected Analytical Methods (SAM) Applicability Tiers

SAM Applicability Tier I	Analyte/sample type is a target of the method. Multi-laboratory evaluated will allow implementation for the analyte/sample type with no modifications. Data available for all aspects of method performance and quality control measures supporting its use.
SAM Applicability Tier II	Method has been used by laboratories to address the analyte/sample type, but not multi-lab validated. <ul style="list-style-type: none">(1) The analyte/sample type is a target of the method, but method performance/quality control measures need further evaluation (e.g., single-lab tested).(2) The analyte/sample type is not a target of the method, but limited data for method performance/ quality control may be available.
SAM Applicability Tier III	Analyte/sample type is not a target of the method, and/or no reliable data supporting the method's fitness for its intended use are available.





New Processing and Analysis Methods in ESAM

Biological and Biotoxin:

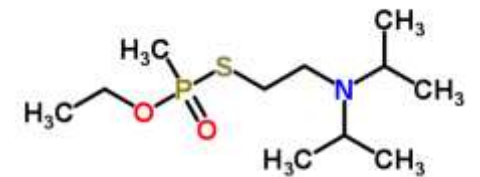
- *Yersinia pestis*
- *Francisella tularensis*
- Ricin

Chemical:

- VX
- EA-2192, VX Degradation Product
- Semivolatile Organic Compounds (21 sVOCs)
- Organophosphorus-based Pesticides

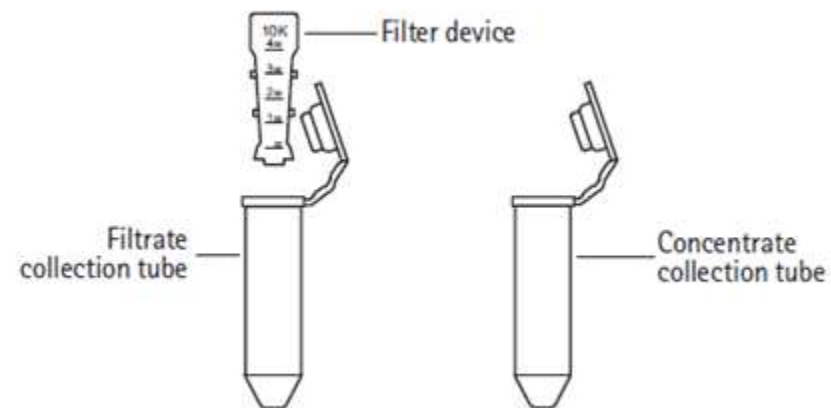
Radiochemical:

- Cf -252, Cm -244, and Sr - 89
- Rapid radiochemical methods for concrete, brick, asphalt, shingles, limestone, and granite





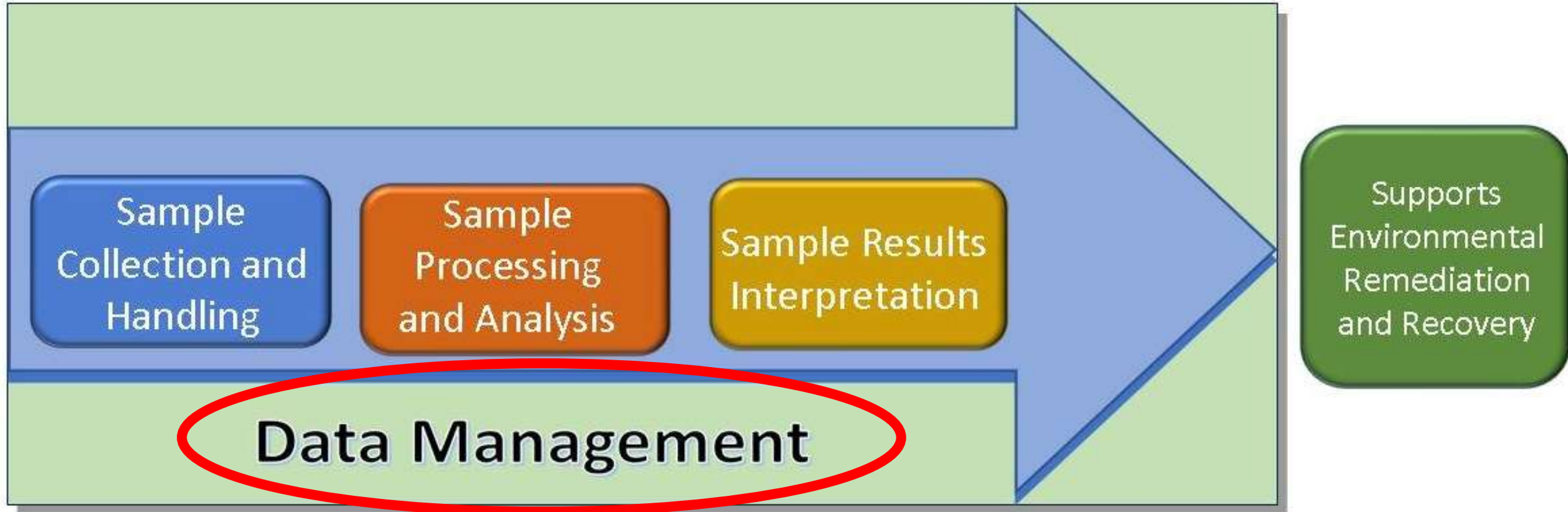
Ricin Cleanup in Boulder, CO, October 2017



Sample Processing Procedure for Post-Decontamination Ricin Samples using 0.5 mL Ultrafiltration Devices



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Sampling Design Planning - MicroSAP

EPA | MicroSAP | HELP | RESOURCES | [bell icon] | [gear icon]

Sample Plan

Created On: Thu, 01/11/2018 - 08:24 | By: silvestri,erin | Status: Draft

[To Dos\(0\)](#) | [Log](#) | [Export](#) | [Duplicate](#) | [Privacy: Public](#)

SILVESTRI,ERIN, you are the owner of this SAP.

Cover Page

Characterization Sampling and Analysis Plan

SAP:

EVENT TYPE:

FIRST NAME: LAST NAME: AFFILIATION:

STREET ADDRESS: CITY: ZIP CODE: STATE:

DATE:

EPA | MicroSAP | HELP | RESOURCES | [bell icon] | [gear icon]

Search for an existing SAP

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SEARCH:

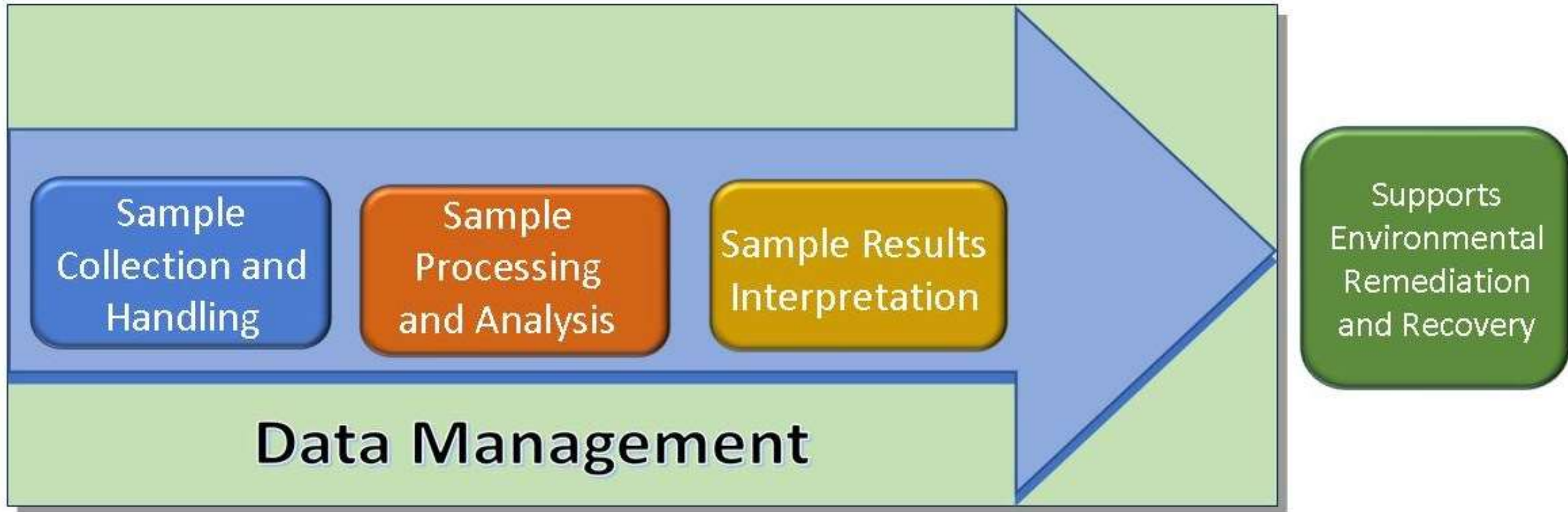
Showing 1 to 2 of 2 entries

	ID	EVENT NAME	EVENT TYPE	PATHOGEN	MATRIX	CREATED BY	STATUS
<input type="checkbox"/>	2	Sample Plan	Incident	Bacillus anthracis	U/S	silvestri,erin	Draft
<input type="checkbox"/>	1	Sample Exercise	Exercise	Francisella tularensis	U/S	sapadmin	Draft

Previous Next



DEMO of ESAM



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Acknowledgements

- *John Archer*
- *Tim Boe*
- *Helen Buse*
- *Worth Calfee*
- *Romy Campisano*
- *Sandip Chattopadhyay*
- *Hiba Ernst*
- *Vince Gallardo*
- *Jim Goodrich*
- *John Hall*
- *Kathy Hall*
- *Terra Haxton*
- *Robert Janke*
- *Sang Don Lee*
- *Jingrang Lu*
- *Matthew Magnuson*
- *Anne Mikelonis*
- *Reagan Murray*
- *Tonya Nichols*
- *Lukas Oudejans*
- *Emily Parry*
- *Sanjiv Shah*
- *Erin Silvestri*
- *Emily Snyder*
- *Jeff Szabo*
- *Stuart Willison*
- *Joe Wood*





Thank you!

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