Field Sampling Procedures Manual Ch. 3 & Attainment Guidance Version 3.0 Training

September 17, 2024

Contaminated Site Remediation & Redevelopment

Moderators

Gillian Schwert

Co-Moderator
DEP/CSRR Training Committee

Jessica Palilonis

Co-Moderator
DEP/CSRR Training Committee

Continuing Education Credits

Site Remediation Professional Licensing (SRPL) Board

has not yet approved

3 Technical CECs

for this Training Session

Attendance Requirements:

- **Webinar participants**: must be logged-in for the entire session and answer all poll questions (randomly inserted in the presentation)

CECs: What's the Process?

Since the SRPL Board has <u>not yet approved</u> CECs for the course:

- NJDEP compiles a list of "webinar" participants eligible for CECs and provides the list to the Licensed Site Remediation Professional Association (LSRPA)
- LSRPA will email eligible participants a link to an LSRPA webpage with certificate access instructions
- Certificates are issued by the LSRPA after paying a *$25 processing fee*

Test Your Knowledge

EXAMPLE WEBINAR QUIZ SLIDE

Test Poll

EXAMPLE WEBINAR QUIZ SLIDE

Why are you here today?

A. Earn CECs
B. My friend said it would be fun
C. Learn more about CSRR

Communication

Questions Function

- Ask any questions you have for the presenters at any time during the presentation (these will be addressed during the questions segments)
- If a question isn't addressed during a question segment of the presentation, it will be answered after the presentation
- Questions should be brief and general (no case-specific questions)

Remember!

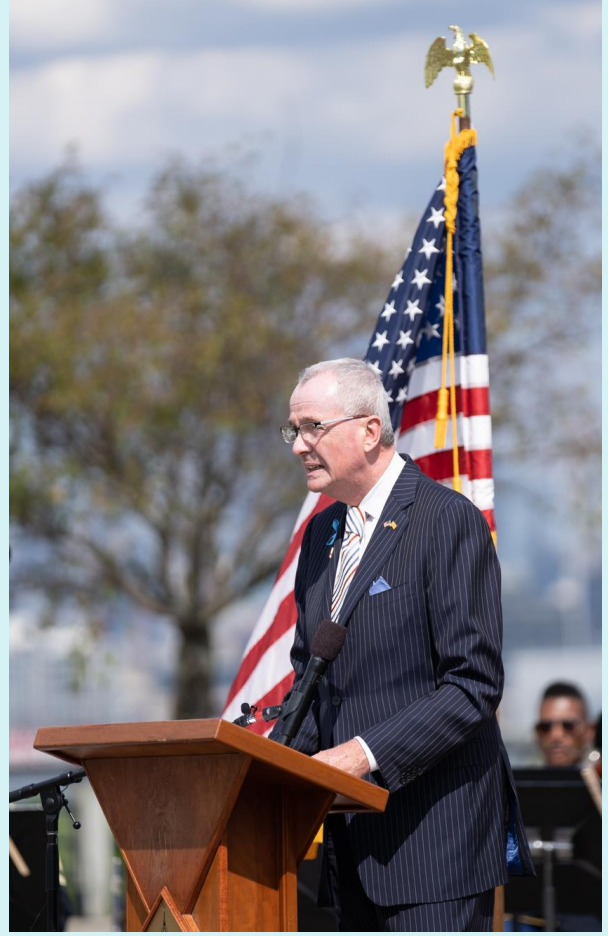
Please fill out the Course Evaluation here:

https://forms.office.com/g/hXQRuABrcp

The slides are available now!

Your Job in this Training

- Participate!
- Complete polls
- Provide feedback



Thank you!

September 17, 2024

NJDEP - Contaminated Site Remediation & Redevelopment

Technical Guidance Training

- Chapter 3 of the Field Sampling Procedures Manual (2024)
- Attainment of Remediation Standards and Site-Specific Criteria

NJ Licensed Site Remediation Professionals Association

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UPCOMING LSRPA COURSES & EVENTS

- **September 18, 2024 – Introduction to New Jersey Resilient Environments and Landscapes (NJ REAL)**
  Instructors: Jeffery Entin, LSRP, Ramboll Environmental
  Mark Heinzelmann, Esq., Lowenstein Sandler
  Zachary Berliner, Esq., Lowenstein Sandler
  Jennifer Wollenberg, Ph.D., Integral Corporation
  Moderator: Lyssa Naron, Senior Scientist, SLR International Corporation

- **October 1, 2024 – Aspiring Professionals Series: In-Person Drilling Techniques and Equipment**
  Instructors: Tim Gallagher, Doug Lindes, Howard Hammel, Jason Kuni, Brandon Carpenter
  Moderator: Stephanie Virgin, LSRP, Langan

- **October 8, 2024 – Integrating 3-Dimensional Visualization (3DVA) into Conceptual Site Model Development**
  Instructor: Jason C. Ruf, PG, S2C2.

Visit LSRPA.org for details and registration

UPCOMING LSRPA COURSES & EVENTS

- **October 10, 2024 – Ethics for Site Remediation Professionals**

  Instructors: Lawra Dodge, PG, LSRP, Excel Environmental
  Marlene B. Lindhardt, LSRP, Lindhardt Environmental Consulting
  Joanne Vos, Esq., Maraziti & Falcon, LLP
  Sonya Ward, LSRP, Tetra Tech, Inc.
  Moderator: Anita Locke, LSRP, Geosyntec Consultants

- **October 15, 2024 – LSRPA Virtual Regulatory Roundtable: PFAS Analysis Trends: What Remediation Professionals Need to Know**

  Instructors: Joseph Ravino,York Analytical Labs
  Marshall E. King, PE, LSRP, Earth Systems, LLC

Visit LSRPA.org for details and registration


NJSWEP & LSRPA Present the
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THURSDAY OCTOBER 3, 2024
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New Jersey Licensed Site Remediation Professionals Association

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THANK YOU!


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Field Sampling Procedures Manual (FSPM) Update: Chapter 3

September 17, 2024

Crystal Pirozek, FSPM Committee Chair
Bureau of Remedial Action Permitting
Contaminated Site Remediation & Redevelopment

Committee Members

NJDEP

Crystal Pirozek, Chair

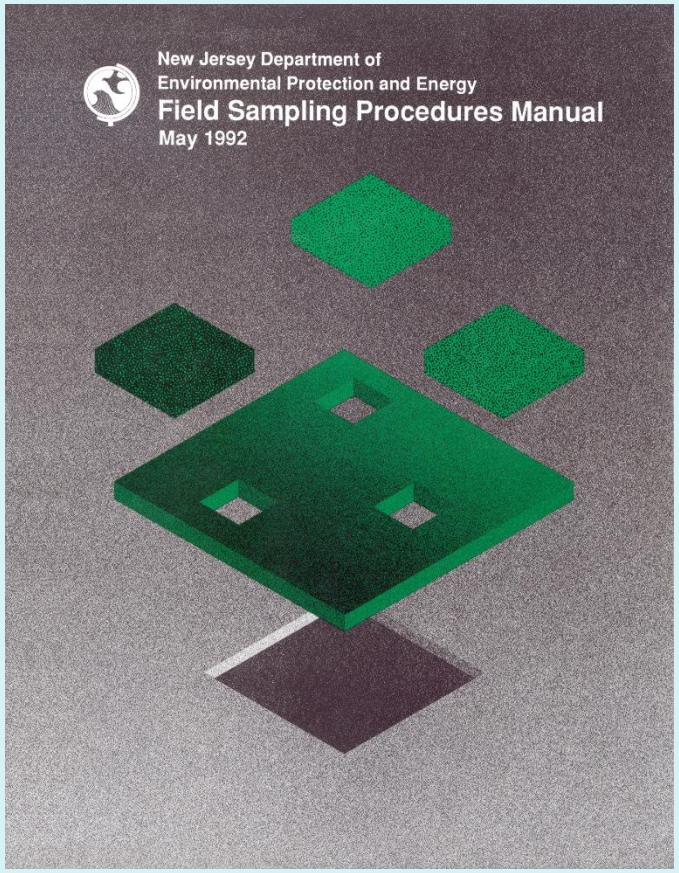
Amy Bowman
Bill Heddendorf
Bridget Sweeney
Catherine Jedrzejczyk
Greg Giles
Lee Lippincott
Harry Wertz
James McCullough
Paul Bauer
John Dotterweich
Kelly Meccia
Matthew Scott
Melissa Hornsby
Victor Poretti
Ryan Larum
Greg Rapp

Committee Members

Stakeholders

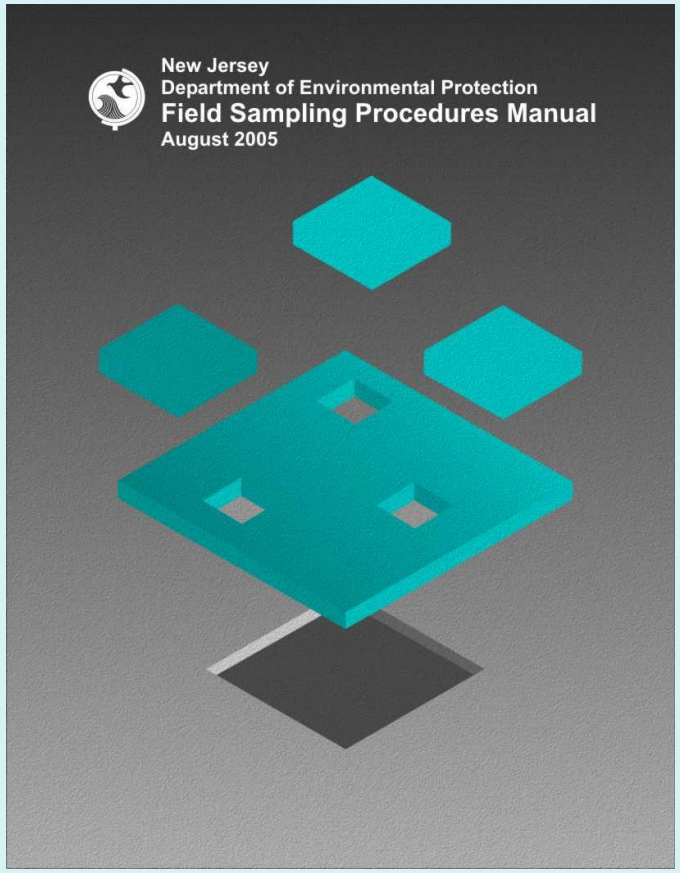
Ali Chowdhury, Shell
Amanda Forsburg, LSRP, Langan
Amelia Jackson, USEPA, R2
Bradley Musser, PennJersey Env
Carrie McGowan, AECOM
Dan Cooke, CDM Smith
Eileen Snyder, Pace Analytical Services
Heather Steffe, Arcadis
John Bracken, LSRP, Verdantas
Kari Brookhouse, LSRP, BSI
Omar Minnicks, LSRP, EWMA
Scott McCray, TRC Environmental Corp
Sean Clifford, LSRP, Brockerhoff Env Services LLC

History: FSPM 1992 Version



- Original document
- Created to promote accuracy and consistency
- Discusses how environmental samples are collected and analyzed

FSPM 2005 Update



- Complete rewrite of the manual
- First electronic copy

Other FSPM Updates

- Multiple updates since 2005
  - Most minor text and clarification updates
  - Last update was in 2011
  - Full list of updates

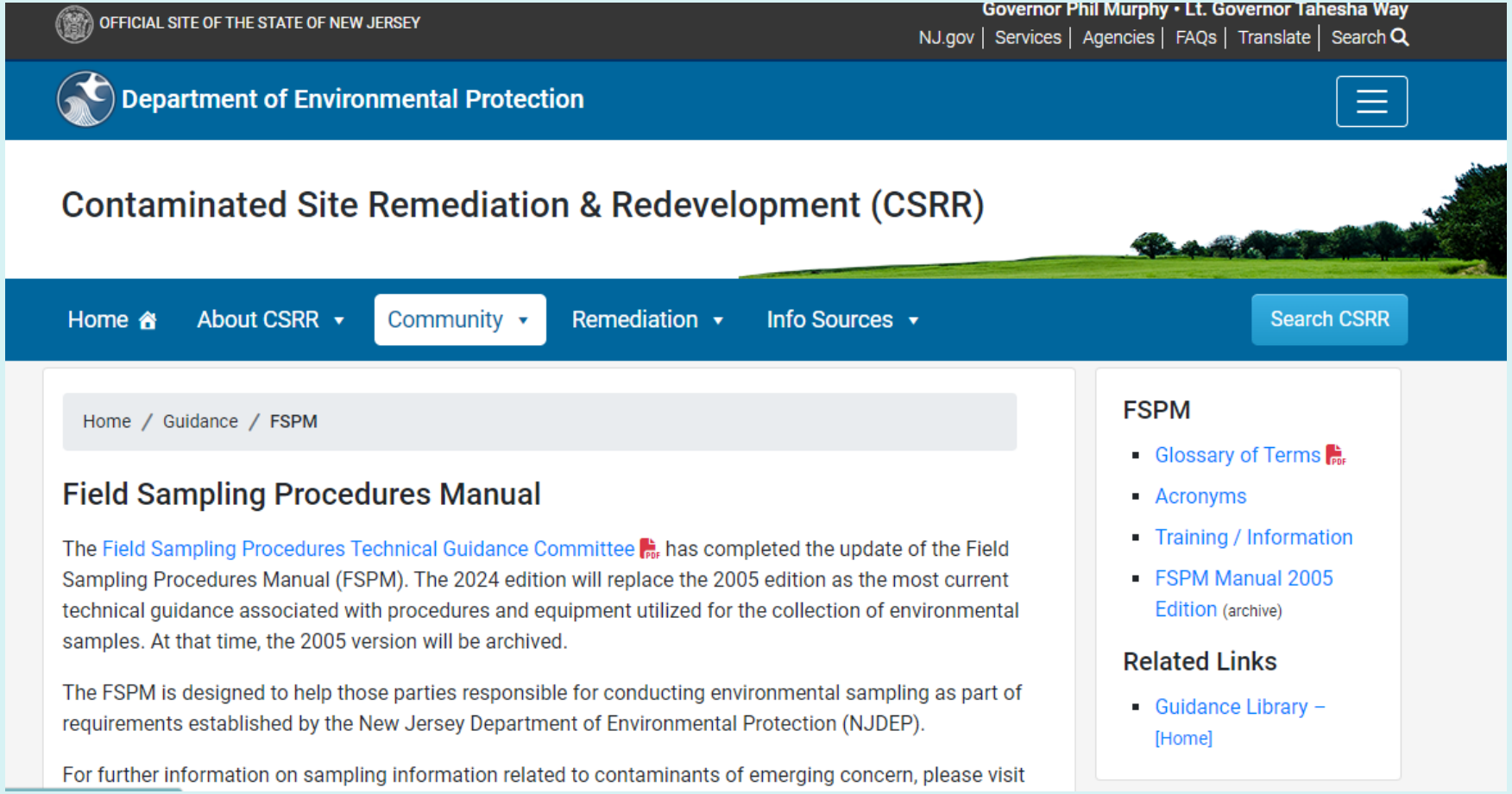
    https://www.nj.gov/dep/srp/guidance/fspm/updates.htm

FSPM Current Version

- Committee convened in the Fall of 2017
- Every chapter has been updated!

FSPM Webpage

https://dep.nj.gov/srp/guidance/fspm/



FSPM Webpage

- Additions to the webpage
  - Glossary
  - Acronyms
  - 2005 Edition
  - Training

Update Process

- The workgroup assigned to each chapter went through the entire chapter and made changes and updates
- The document was then given to the entire committee to review
- The document then went to the stakeholders and NJDEP for review
- All comments received were reviewed and discussed and the finalized chapter posted to the DEP website

Technical Justification

CSRR allows for deviations from all technical guidance documents including the FSPM. If you choose to deviate from this guidance you should document:

- That your method is equally protective
- Any special site-specific circumstances

Disclaimer

The use of equipment names is just for informational purposes and does not constitute an endorsement. The sampling technologies are provided as examples and are not all inclusive.

FSPM Chapters

Introduction

Chapter 1 The Sampling Plan

Chapter 2 Quality Assurance

Chapter 3 Emerging Contaminants

Chapter 4 Site Entry Activities

Chapter 5 Sampling Equipment

Chapter 6 Sample Collection

Chapter 7 Field Analysis

Chapter 8 Geophysical Techniques

Chapter 9 Soil Gas Surveys

Chapter 10 Documentation

Chapter 11 Sample Shipment

Chapter 12 Radiological Assessment

Chapter 13 Personnel Protection

FSPM Chapters 1, 2, and 4

- Chapters 1, 2, and 4 posted for use and trained in March 2022
- Copy of that training can be found under the training tab in the FSPM website and the NJDEP training website

https://dep.nj.gov/srp/training/#fspm_training

Chapters 5-13

- Chapters 5-13 posted for use and trained in February 2024
- Copy of that training can be found under the training tab in the FSPM website and the NJDEP training website

Why Chapter 3?

Gaining Entry to Inspect Sites with Actual or Suspected Contamination

Contaminants of Emerging Concern

Chapters 3 Workgroup

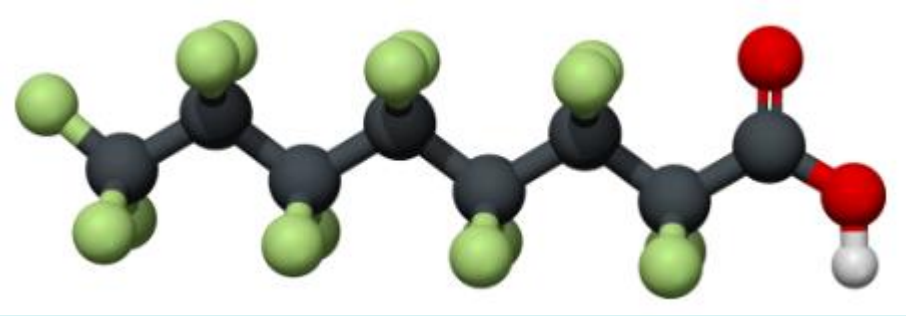
Crystal Pirozek, NJDEP
Paul Bauer, NJDEP
Greg Giles, NJDEP
Scott Mathew, NJDEP
Catherine Jedrzejczyk, NJDEP
Lee Lippincott, NJDEP
Bridget Sweeney, NJDEP

John Bracken, Verdantas
Kari Brookhouse, BSI
Eileen Snyder, Pace Analytical Services

Posted for Use February 2024

Chapters 3 Contaminants of Emerging Concern

3.1 Introduction
3.2 What is a Contaminant of Environmental Concern
3.3 History and Use of Site
3.4 Analytic Method and Remedial Standard Challenges
3.5 General Sampling Considerations



Section 3.2.1

What is a Contaminant of Emerging Concern (CEC)?

- Present a concern for both hazard and exposure to public or ecological health occur in the environment (e.g. media, substances, products)
- Are not currently regulated or need regulatory reassessment
- Include substances and microorganisms including physical, chemical, biological, or radiological materials
- May be new or known contaminants
- Considered a CEC due to a change in information

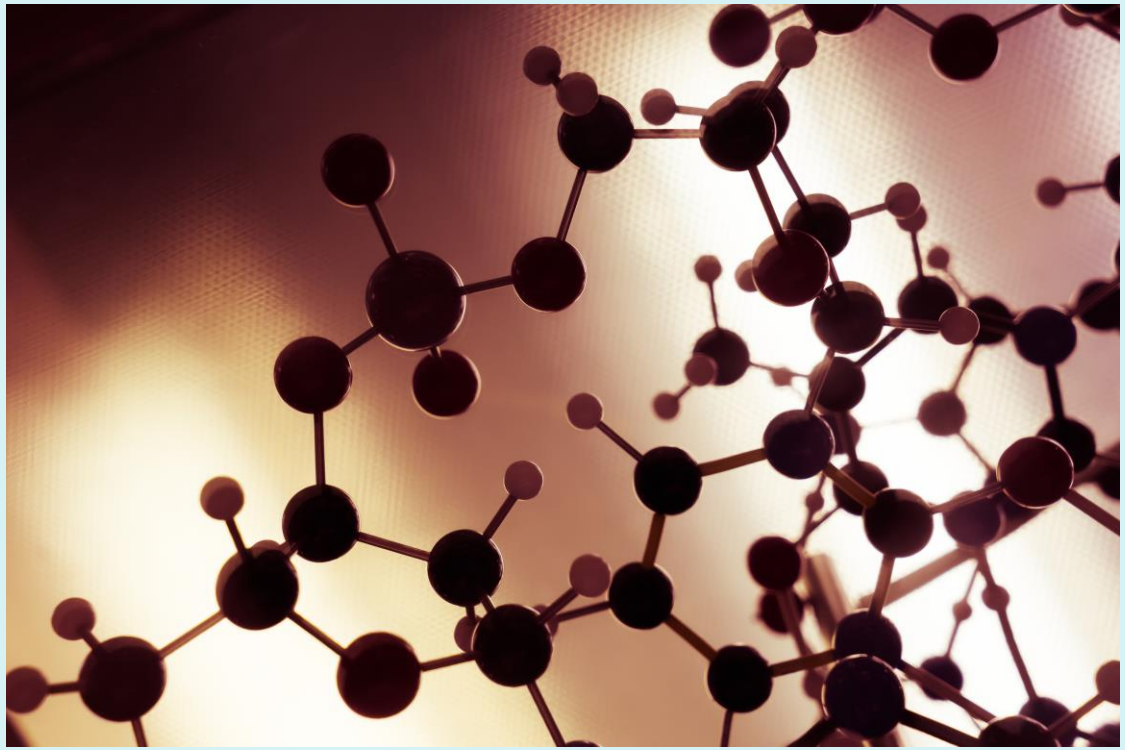
3.2.1.1 Existing Lists of Contaminants of Emerging Concerns

CECs can include various types of chemicals and pollutants

- synthetic chemicals (e.g., per- and -polyfluorinated alkyl substances (PFAS))
- pharmaceuticals
- personal care products (PCPs)
- disinfectant
- microplastics
- microorganisms
- pesticides

3.2.2 Understanding Evolving Contaminants of Emerging Concern

- Evolving development of candidate CECs
- Dynamic and multifaceted challenge
- Effects on human health and the environment



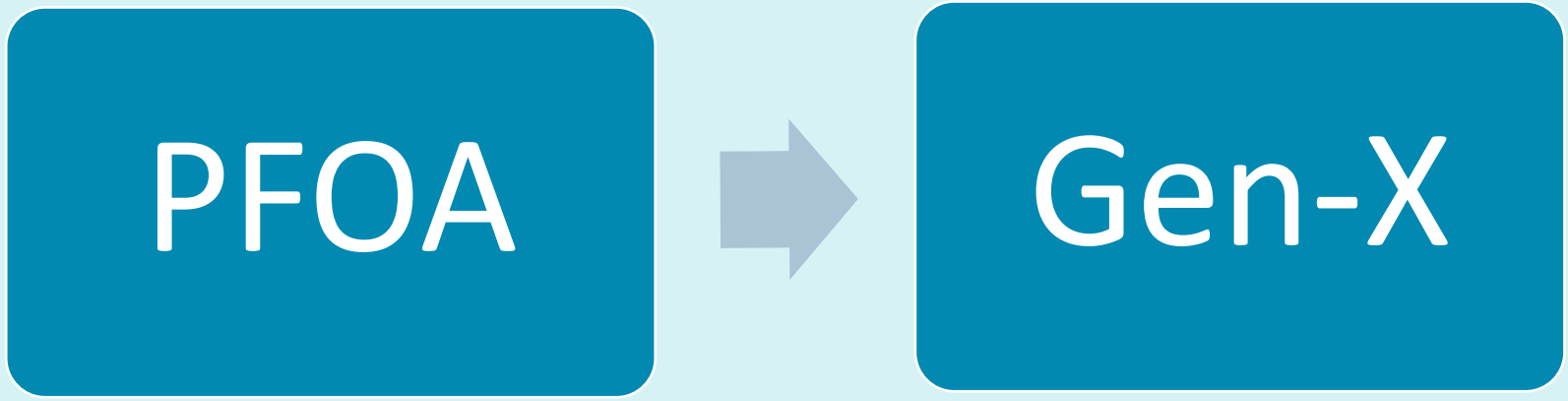
3.2.2.1 How Does a Chemical Become a Contaminant of Emerging Concern?

USEPA periodically evaluates chemicals as 'emerging contaminants' that are characterized by a perceived, potential, or real threat to human health or the environment based on preliminary health screening values, or lack of published health standards.

- ❑ chemicals
- ❑ personal care products
- ❑ biota
- ❑ pesticides
- ❑ pharmaceuticals

3.2.2.2 Substitute Compounds

Substitute compounds refer to chemical compounds or substances that emerge as alternatives to known contaminants, often as a response to regulatory actions or environmental concerns



3.2.2.3 Fate and Transport of CECs

Understanding the fate and transport of CECs through naturally occurring and/or remediation processes is critical to evaluating effects on water quality, soil, ecological receptors, and human health.

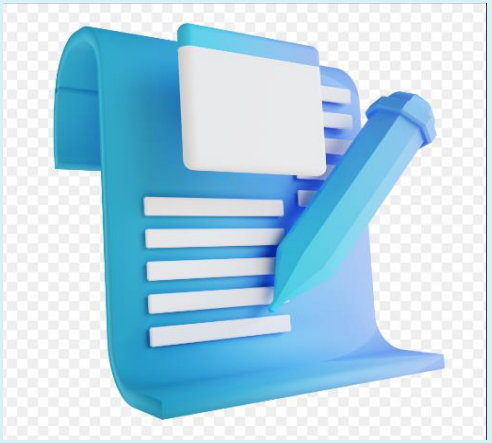
- ❑Ongoing studies are needed to better understand fate and transport and/or degradation of CECs
- ❑Continued research is necessary

3.2.3 Environmental and Health Impacts

The evolving nature of CECs supports the need for ongoing research to further understand how these contaminants persist in the environment and affect various organisms

3.2.3.1 New Toxicology Evaluations

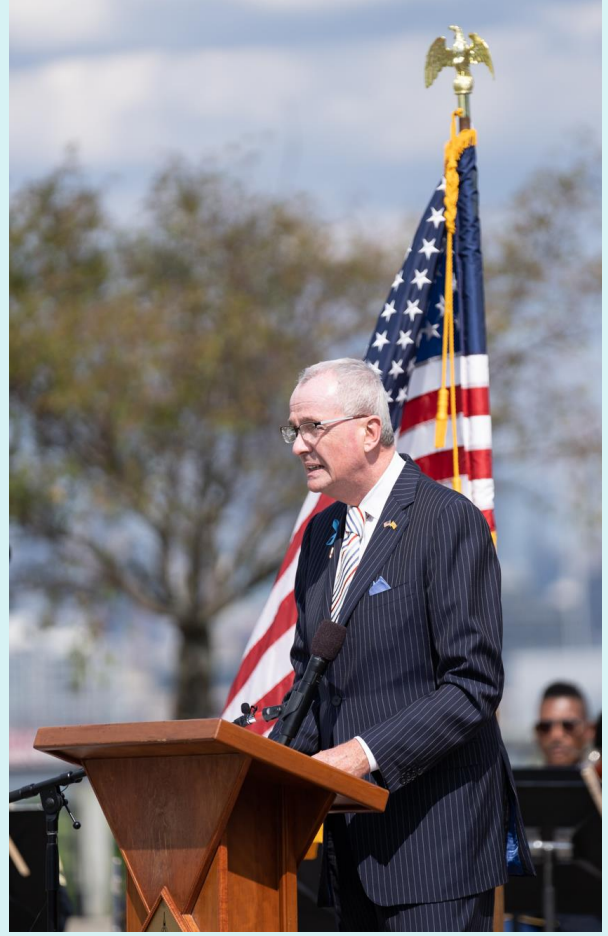
The EPA and CDC maintains different systems, guidelines, assessments, and documents that detail the various chemicals and substances found in the environment and the health effects. This section details where that information can be found and how it can be useful.



- ❑Integrated Risk Information System (IRIS)
- ❑Agency for Toxic Substances and Disease Registry (ATSDR)
- ❑Provisional Peer-Reviewed Toxicity Values (PPRTV)
- ❑Unregulated Contaminant Monitoring Rule (UCMR)
- ❑Monitoring Unregulated Contaminants in Drinking Water

Practical Considerations

During the presentation, our presenters will be discussing examples of practical considerations as they relate to CECs



Thank you!

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Field Sampling Procedures Manual (FSPM) Update: Chapter 3.3

September 17, 2024

Kari Brookhouse, Sr. Consultant, LSRP, BSI America Professional Services Inc.
Contaminated Site Remediation & Redevelopment

3.3 History and Use of Site

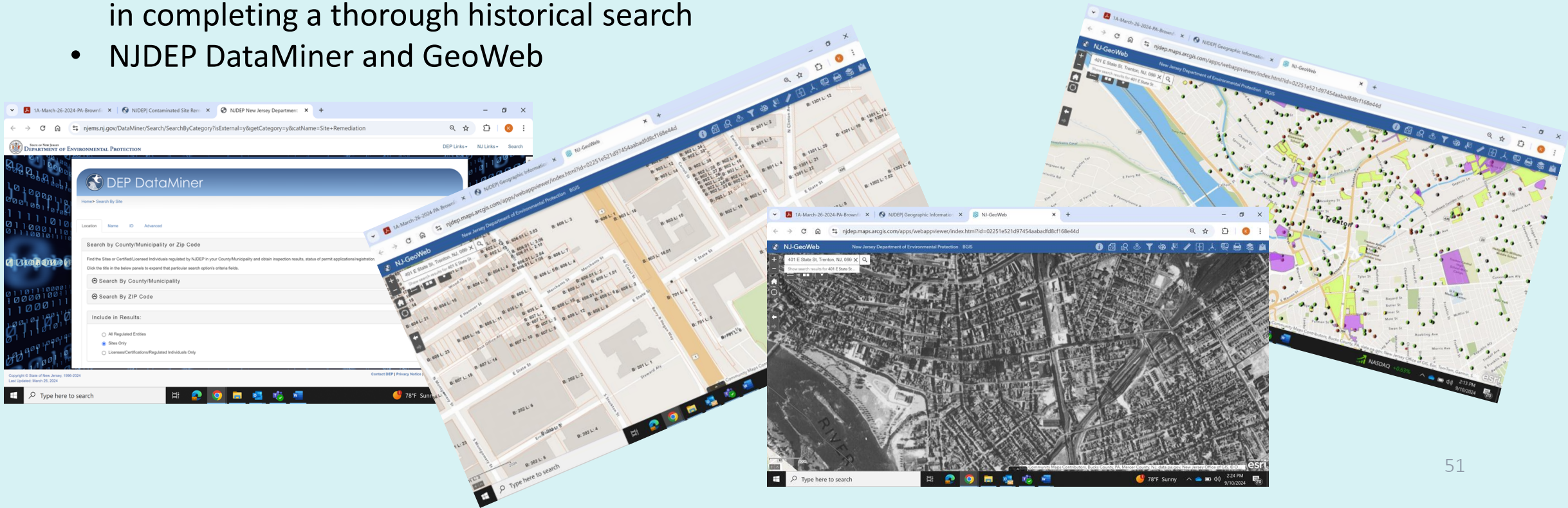
Section 3.3 reminds the investigator/PRCR that a review of products used over the history of the Site and potential discharge pathways could help identify potential sources of compounds of emerging concern that would then help in development and/or refinement of the conceptual site model.

Practically speaking, as shown in the images below, what you see now at a Site may not be what was always there, so it is important to understand the historical as well as current Site uses to better define the areas of concern, compounds of potential concern and possible sample locations.

3.3 History and Use of Site

Where do you start?

- Refer to Chapter 1, Section 1.3 of the FSPM for a list of sources that may be able to provide historical information
- Refer to the NJDEP March 2018 Preliminary Assessment (PA) Technical Guidance for guidance in completing a thorough historical search
- NJDEP DataMiner and GeoWeb



3.3 History and Use of Site

- Conduct a Site Walk/Site Inspection - PA Guidance Checklist
- To help identify past ownership and/or Operation, a title search and a business directory search can be useful
  - The title search and business directory search will help to identify historical use as **commercial, residential or both**
  - Keep in mind, operations/use of the Site may have changed several times
  - **make note of the years**, the property was used for **commercial** purposes
  - If it was a commercial property, was it used as industrial, warehousing, manufacturing, or retail, etc.
- Sanborn Fire Insurance Maps, historical topographic maps and aerial photos
- Once property use has been identified, then determine what materials were used there
  - Identify raw/waste material/chemical storage, locations of labs, location of manufacturing plant, process wastewater piping and discharge locations. Specific to PFAS investigations, try to also identify any locations of historical fires
  - Complete file reviews, NJDEP Site Remediation, Community Right to Know, Municipal and County Planning and Health Departments

If historical or current uses indicate CECs may have been or are being used at the Site, they will need to be addressed in a site investigation. As previously noted, this information will be used to select Areas of Concern, Potential Compounds of Concern and possible sample locations/media

What Was It

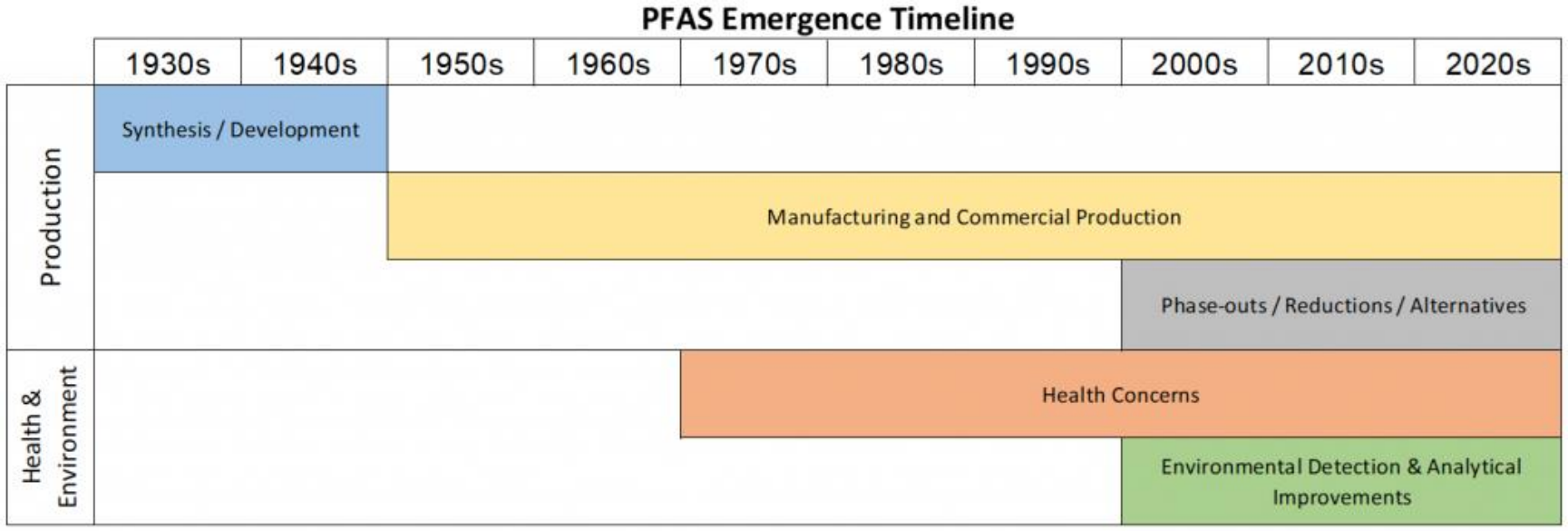
Dates of Operation

What Was Stored/Used There

Where Was It Stored/Used There

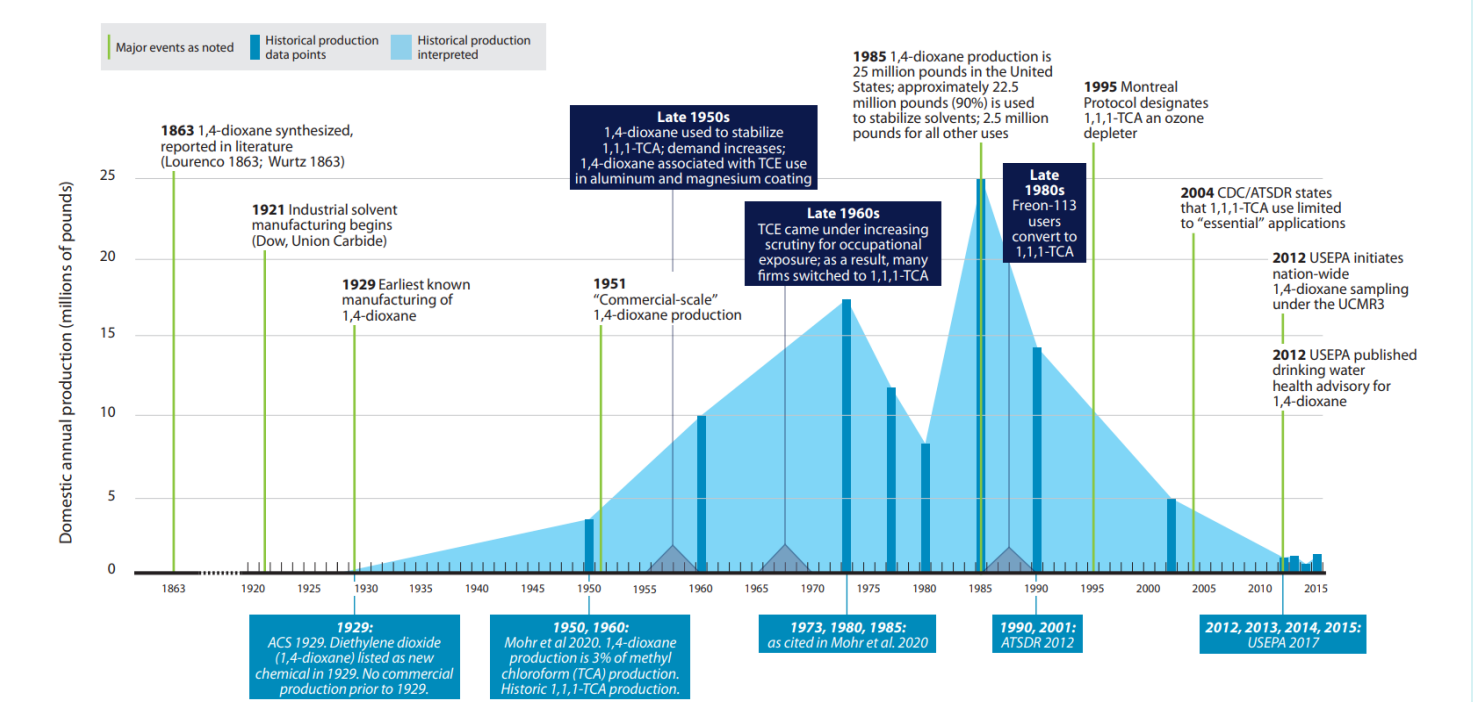
3.3 History and Use of Site

- It is important to understand the date of operations because that can be compared to dates of the manufacturing and commercial production of the CECs. Per the NJDEP PA Guidance, a diligent inquiry should go back to 1932 or before the site was developed and was naturally vegetated, whichever is earlier
    - According to the ITRC History of PFAS Fact sheet (link below), PFAS chemistry was discovered in the late 1930s and by the 1950s was being used in many products used by both consumers and by industry
- Below are links to ITRC identifying the history of PFAS compounds and potential uses
    - https://pfas-1.itrcweb.org/wp-content/uploads/2020/10/history_and_use_508_2020Aug_Final.pdf
    - https://pfas-1.itrcweb.org/2-5-pfas-uses/



3.3 History and Use of Site

- A simple internet search can help identify dates when other CECs were developed and widely used. For example, microbeads were patented in the 1960s with widespread use in the 1990s. Commercial-scale production of 1,4-dioxane began in 1951. Historically, 1,4-dioxane has primarily been used to stabilize 1,1,1-TCA - ITRC History and Use of 1.4 D

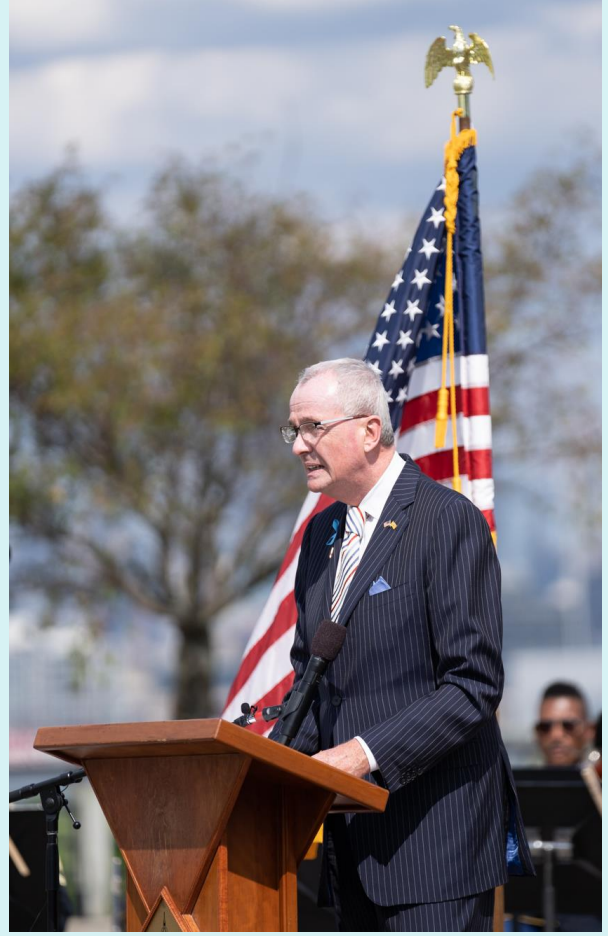


3.3 History and Use of Site

After completion of your current and historical information search, if you find evidence that CECs may have been used at the Site a site investigation will be necessary. How to set up your investigation and sampling and analytical considerations will be discussed the next.

However, if CECs are detected in Site groundwater but no evidence of use is found, it may be necessary to expand the search to nearby properties. Please refer to the NJDEP September 2018 Off-Site Source Ground Water Investigation Technical Guidance for how to evaluate and document the lines of evidence of a potential offsite source migrating onto the Site.

*It is important to note, **CECs may not appear on safety chemical data sheets or active ingredients lists, and manufacturers may not be aware of the presence** of CECs in the products they use in their manufacturing process.



Thank you!

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Field Sampling Procedures Manual (FSPM) Update: Chapter 3.4

September 17, 2024

Eileen Snyder, Regional Technical Coordinator
Pace Analytical Services

Chapter 3 – Section 3.4

3.4 Analytical Method and Remedial Standard Challenges

- 3.4.1 Analytical Method Selection Considerations
- 3.4.2 Analytical Methods Certification
- 3.4.3 Analytical Interferences

Chapter 3 – Section 3.4

3.4.1 Analytical Method Selection Considerations

- Project Plans should be discussed with the laboratory in advance of sample collection
- Discuss the purpose of the Sampling Program and the applicable Regulatory Criteria – such as:
  - Site screening – Example: groundwater samples analyzed by EPA Method 1633 for select target analytes (i.e., PFOA, PFOS, PFNA)
  - Site characterization – Example: groundwater samples analyzed by EPA Method 1633 for full list of 40 PFAS target analytes
  - Site remediation – Example: groundwater samples analyzed by EPA Method 1633 for PFAS target analytes (i.e., PFOA, PFOS, PFNA)
  - Regulatory compliance monitoring – Example: PFAS potable water samples analytes by EPA Method 537.1 for PFAS target analytes (i.e., PFOA, PFOS, PFNA)

Chapter 3 – Section 3.4

3.4.1 Analytical Method Selection Considerations

- Selection of analytical methods is based on multiple factors including:
  - ✓ Sample type – Examples: SCM (soil, sediment, waste); NPW (surface water, groundwater); DW (potable water); BT (biological tissue); Air
  - ✓ Target analyte report list – Examples: select regulated PFAS analytes vs. full list of method defined target analytes
  - ✓ Analytical method sensitivity – Examples: DW MCL and GWQS as µg/L (ppb) vs. Lab Reporting Limit as ng/L (ppt)
  - ✓ Laboratory accreditation or certification – Examples: state certification for select PFAS target analytes in select matrices vs. national NELAP accreditation for full list of 40 target analytes by 1633 in all matrices
  - ✓ Project-specific data quality objectives (DQOs) – Examples: How will data be used? Refer to CSRR Analytical Methods Technical Guidance (4-part set) and the QAPP template and the Project Communication Form (PCF)
  - ✓ Data report type – Examples: NJ-Full (Level 4) vs NJ-Reduced data package (PDF); and NJ-HazSite EDD vs E2 EDD
  - ✓ Project Plans – Examples: QAPP plans, Data quality assessment (DQA) Plans, Data Usability Evaluation (DUE) plans

Test Poll #1

Test Poll #1

Analytical method selection considerations include:

A. Sample type
B. Analytical method sensitivity
C. Project-specific data quality objectives
D. All of the above

Test Poll #1

Analytical method selection considerations include:

A. Sample type
B. Analytical method sensitivity
C. Project-specific data quality objectives
D. All of the above

Chapter 3 – Section 3.4

3.4.2 Analytical Method Certification

- Certification for analytical methods is determined by the NJDEP Office of Quality Assurance (OQA) – Refer to the Annual Certified Parameters List (ACPL) contained in Part III of the Certification Application.
- Certification should be evaluated prior to sample collection and data reporting.
- Certified analytical methods may not be available for all sample media types, parameters, contaminants of concern, target analytes, and instrumentation. Refer to the NJDEP Data Miner search tool; ask NJDEP OQA or the Laboratory.
- Certification is offered by
    - ✓ Sample media type – Examples: SCM (soil, sediment waste); NPW (GW, SW, WW); DW (potable water)
    - ✓ Parameter – Examples: PFAS; and 1,4-Dioxane
    - ✓ Target analyte or contaminant of concern – Examples: PFAS as PFOA, PFOS, PFNA, GenX, etc.
    - ✓ Technique used for analytical determination and quantitation – Example: LC/MS/MS vs. GC/MS; and
    - ✓ Department sanctioned analytical methods (DSAMs) vs. User defined analytical approach (Lab SOP)

Chapter 3 – Section 3.4

3.4.3 Analytical Interferences

- Sample matrix interferences may cause sample processing issues

- This may be the result of one or more factors, such as:
  - ✓ Elevated levels of target and non-target analytes – Example: the concentration of PFOA exceeded the limits of the calibration range, but the remaining analytes were quantitated within range
  - ✓ Elevated levels of suspended solids present in aqueous samples – Example: GW samples containing high levels of TSS
  - ✓ Elevated moisture levels present in solid sample matrices – Example: wet soil samples collected in the saturated zone cause the Laboratory to report data with an elevated Reporting Limit
- Interferences may result in (1) sample dilutions/ elevated reporting limits, (2) re-extraction and/or re-analysis, and (3) reporting of results qualified with Quality Control excursions

- The impacts on data usability may include decreased levels of analytical sensitivity/elevated reporting limits. Example: analytical results reported with a 100x Dilution Factor and elevated Reporting Limit

Chapter 3 – Section 3.4

Key Takeaways:

3.4.1 Selection of analytical methods is based on multiple factors.

3.4.2 Certification of analytical methods, as determined by the NJDEP Office of Quality Assurance (OQA), is based on several factors.

3.4.3 Sample matrix interferences may cause sample analytical processing issues and may result in elevated reporting limits and/or QC excursions.

Discuss project plans with the Laboratory during plan development and well before containers are ordered and fieldwork begins.

1,4-Dioxane – Practical Considerations

Sample analysis for 1,4-Dioxane should consider several factors:

- ✓ Regulatory Program jurisdiction applicable to the project
- ✓ Remediation standards applicable to the project
- ✓ Analytical method sensitivity (RL) needed to meet NJDEP GWQS
- ✓ Analytical method selectivity needed for analyte identification and quantitation in the sample matrix
- ✓ Recovery of this analyte from the sample matrix using the selected sample preparation and analytical approach
- ✓ Data quality needed to achieve project Data Quality Objectives (DQOs)

1,4-Dioxane – Practical Considerations

The LSRP selects a Laboratory for the project. The project sampling plans include collection of GW and Soil samples for 1,4-Dioxane. The project team calls the Laboratory to place a bottle order. The Laboratory works with the LSRP to clarify the project scope:

- ✓ What is the applicable regulatory program? NJDEP CSRR
- ✓ What remediation standards apply? NJ SRS (N.J.A.C. 7:26D) & NJ GWQS (N.J.A.C. 7:9C)
- ✓ What additional analytical parameters are requested and what target analytes need to be reported for Soil and for GW samples?
- ✓ The Laboratory verifies their NJ-certification to report the requested target analytes in the project sample matrices
- ✓ The Laboratory processes the bottle order request and delivers the containers
- ✓ Samples are received, logged in, processed, and data are reported to the LSRP

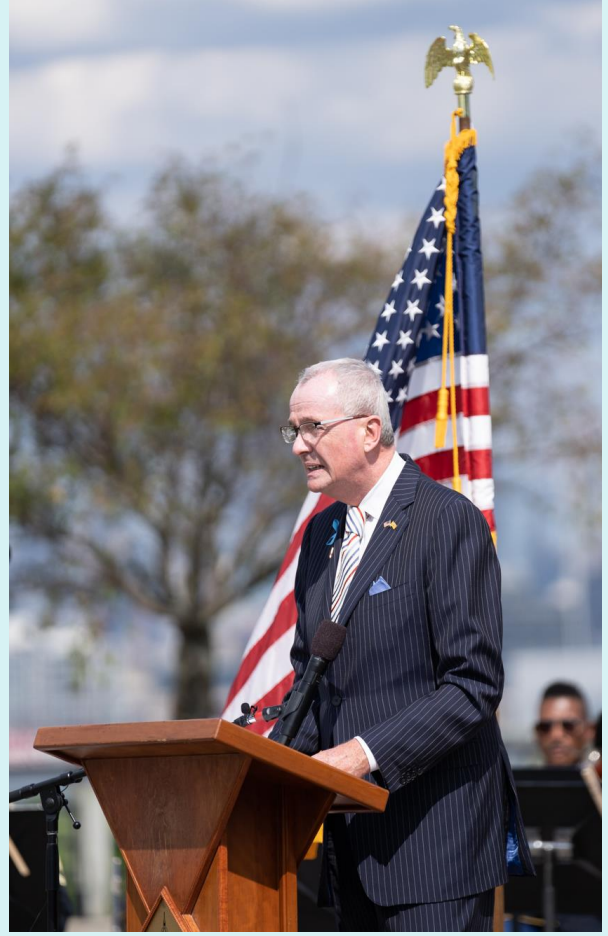
1,4-Dioxane – Practical Considerations

The LSRP reviews the sample analytical data and determines that:

- ✓ The requested analytical parameters did include the target analytes of concern, and
- ✓ 1,4-Dioxane was reported at a level of sensitivity (RL) needed to compare the data to the applicable NJDEP remediation standards (NJ-GWQS 0.4 µg/L, and NJ-SRS MGW 0.067 mg/kg)
- ✓ Data are determined to meet project DQOs and are 'usable' for the intended purpose

The LSRP then reviews the project Laboratory Invoice and notes a separate charge for analysis of 1,4-Dioxane in GW. The LSRP asks for an explanation.

- ✓ The Laboratory confirms that a modified method (which included use of Isotope Dilution and Selected Ion Monitoring or SIM) was to be used to analyze and report 1,4-Dioxane as a single analyte to achieve the sensitivity, selectivity and analyte recovery needed to meet the project DQOs – thus a separate charge is listed for that single analyte in GW samples on the Invoice



Thank you!

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Field Sampling Procedures Manual (FSPM) Update: Chapter 3.5

September 17, 2024

John Bracken, LSRP
Verdantas

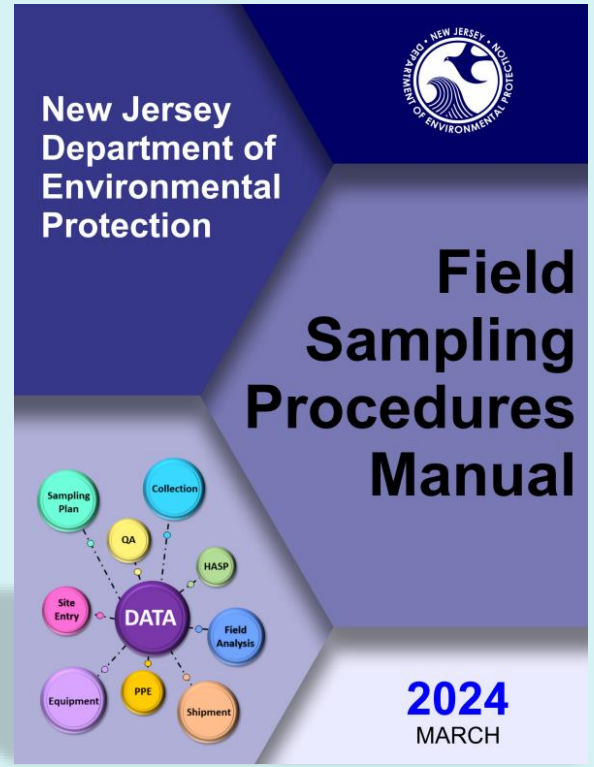
Chapter 3.5
General Sampling Considerations

Chapter **3.5** focuses on:

- General sampling considerations for CECs
- Sampling objectives and special considerations when investigating CECs
- Investigation derived waste (IDW) considerations

Chapter 3.5
General Sampling Considerations

- Sampling Objectives
- Potential Cross Contamination
- Sampling Sequence
- Decontamination Considerations
- Investigation Derived Waste Disposal



https://dep.nj.gov/srp/guidance/fspm/

Chapter 3.5
Sampling Objectives

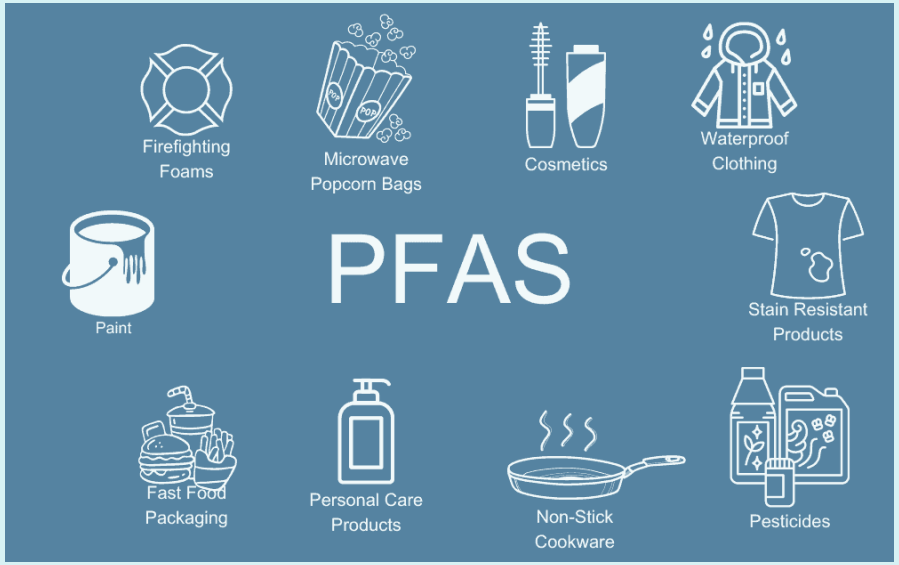
Sampling Objectives

- Develop a project-specific Quality Assurance Project Plan (QAPP)
  - Include:
    - Analyte List
    - Method(s) of analysis
    - Sample media/matrix
    - Reporting limits
  - See Chapter 2 of the FSPM
- Development of these items will require coordination with the contracted laboratory

Chapter 3.5
Cross-Contamination

Potential Cross-Contamination

- Cross contamination may compromise analytical results and overall outcome of the investigations
- Potential sources of cross-contamination is typical with most sampling activities However, CECs may pose an added risk due to the nature and use of CECs in the environment such as:
  - Personal protective equipment (PPE)
  - Sampling equipment (rental/owned vs disposable)
  - Personal hygiene and personal care products (PCPs)
  - Food packaging
- Understanding the type of CEC and potential exposure should be evaluated to prevent compromising field samples and data quality



Chapter 3.5
Sampling Sequence

Sampling Sequence

- Order of sample collection matters
  - Collect from known or suspected areas of contamination from low to high impact areas
  - Media specific sampling sequence and segregation
    - Sample Potable Water first
    - Separate Potable Water samples from other media
  - Analyte sampling sequence
    - See Chapter 6 of FSPM

Chapter 3.5
Decontamination Considerations

Decontamination Considerations

- Decontamination Guidance
  - See Chapter 5 of FSPM
- Decontamination is key for preventing cross-contamination
  - Understanding equipment previous use/handling should be considered
    - Rental equipment
    - Gross contamination
- Field/equipment and trip blanks are important
  - See Chapter 2 of FSPM

Chapter 3.5
Investigation Derived Waste

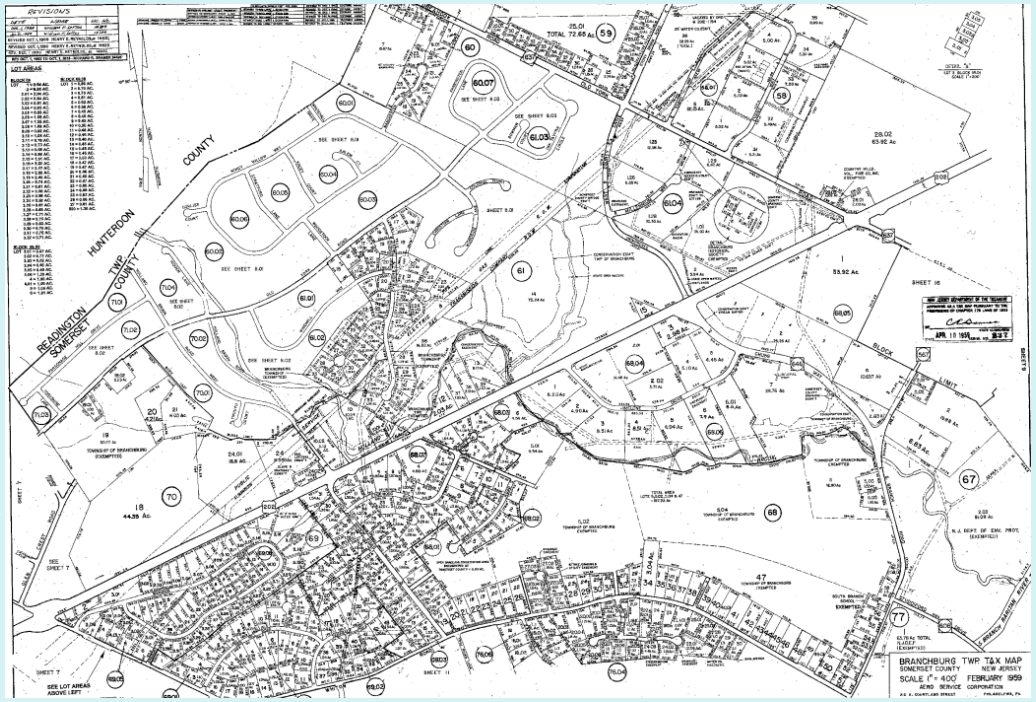
Investigation Derived Waste (IDW) Disposal

- Proper waste characterization
- Understanding disposal facility limitations
- Client disposal restrictions/limitations
- Local, State, and Federal disposal requirements/guidance
  - USEPA – Disposal Guidance of Certain PFAS Materials
  - ASTM – Site Characterization

Chapter 3 - CEC
Practical Considerations: Case Study Example

Typical Industrial/Commercial Site with Soil & Groundwater Investigations

- Have you done due diligence?
- Is there pre-existing site history?
- What are the Compounds of Concern (COCs)?
  - Have you identified CECs?
  - Are there the potential for CECs?



Chapter 3 - CEC
Practical Considerations: Case Study Example

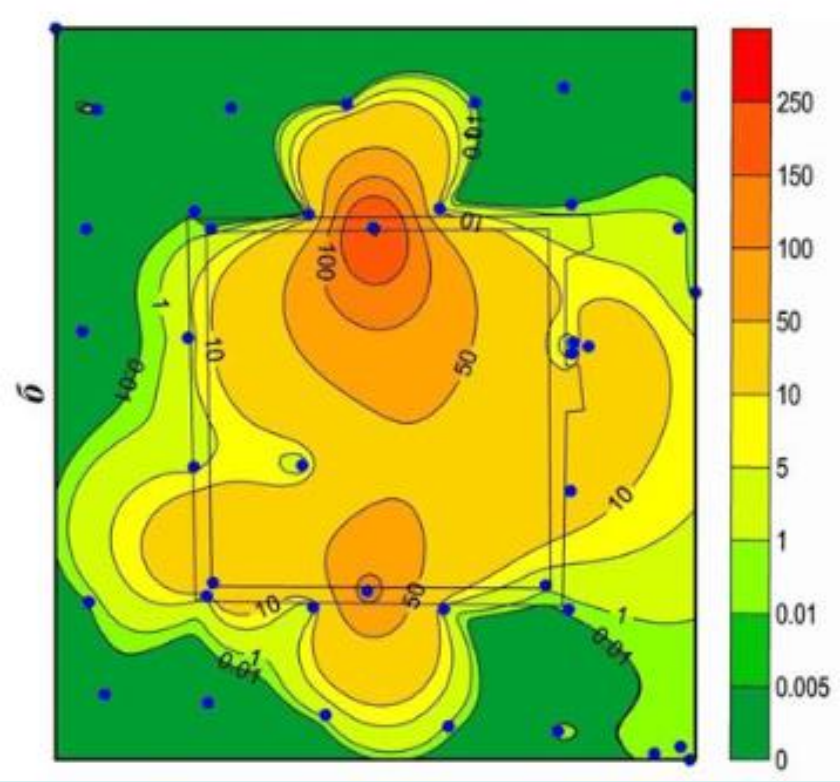
Typical Industrial/Commercial Site with Soil & Groundwater Investigations

- Are there known areas of concern (AOCs)?
- Are there suspected AOCs?
- What type of sampling is being performed?
  - Is sampling equipment needed?
  - What type of personal protective equipment will be necessary?
  - Is there a concern for cross contamination?
  - How will decontamination be performed?

Chapter 3 - CEC
Practical Considerations: Case Study Example

Typical Industrial/Commercial Site with Soil & Groundwater Investigations

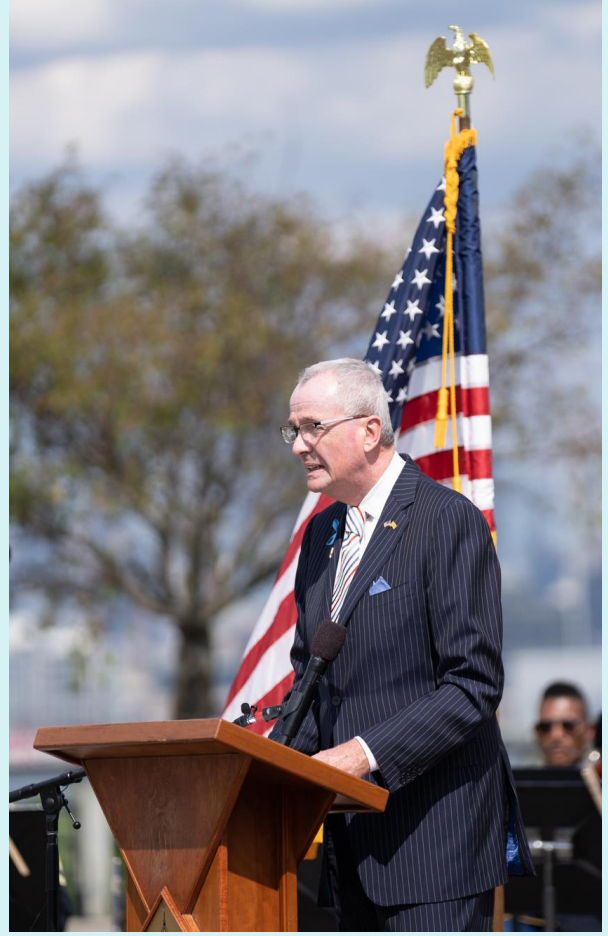
- Is there an understanding of the sampling sequence?
  - Have source areas of contamination or "hot"-spots been identified from previous or current investigations or evaluations?
  - Are Site conditions unknown?
  - How will cross-contamination be managed?



Chapter 3 - CEC
Practical Considerations: Case Study Example

Typical Industrial/Commercial Site with Soil & Groundwater Investigations

- Will investigation derived waste be generated?
  - Will disposal be necessary?
  - Have the IDW materials been characterized?
  - Can the intended disposal facilities accept the generated waste?



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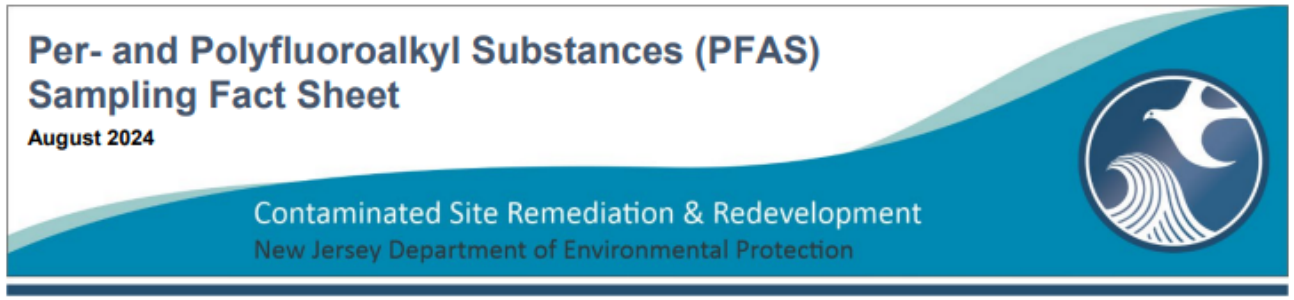
PFAS Sampling Fact Sheet

September 17, 2024

Crystal Pirozek, FSPM Committee Chair, NJDEP BRAP
Jennifer Willemsen, Ph.D., NJDEP BEERA
Contaminated Site Remediation & Redevelopment

PFAS Sampling Fact Sheet

https://dep.nj.gov/wp-content/uploads/srp/pfas_sampling_fact_sheet.pdf



Per- and Polyfluoroalkyl Substances (PFAS) Sampling Fact Sheet

August 2024

Contaminated Site Remediation & Redevelopment
New Jersey Department of Environmental Protection

What are PFAS?

Per- and Polyfluoroalkyl Substances (PFAS) are a group of fluorinated chemicals that have been widely used in industrial processes, firefighting foams, and consumer products since the 1940s. The introduction of fluorine to a compound can alter its physical and chemical properties. PFAS compounds have many applications due to their water-, oil-, and stain-repelling properties and ability to resist temperature extremes and reduce friction. There are thousands of different PFAS, some of which have been more widely used and studied than others. For a detailed list of PFAS sources, refer to "2.5 PFAS Uses and Products" of ITRC's Fact Sheet.

Many PFAS compounds are persistent and mobile in the environment and can bioaccumulate in people and animals over time. Scientific research suggests that exposure to certain PFAS can lead to adverse health outcomes.

Analytical Methods

Selection of PFAS analytical methods can be complex and should include consultation with the certified laboratory. The laboratory should be contacted for details during QAPP development. Pursuant to N.J.A.C. 7:26E-2.2, a project-specific Quality Assurance Project Plan (QAPP) must be developed, including Data Quality Objectives (DQOs) and a Sampling and Analysis Plan. Refer to the NJDEP Office of Quality Assurance (OQA) website for preparation of a QAPP, accessing the QAPP template developed by OQA, and accessing the QAPP checklist. The selection of sample analytical methods for a project should reflect consideration of several factors, such as project data quality objectives, sample matrix, target analyte report list, sample preparation protocols, analytical instrumentation, analytical method options, analytical sensitivity, and laboratory accreditation or certification. Target analyte report lists, sample container requirements, preservatives, and hold times vary by analytical method. Note that sample container sizes and volumes may vary by laboratory or analytical method. The laboratory will provide pre-cleaned sampling containers based on the analytical method selected to meet the project

PFAS Sampling Fact Sheet

Analytical Methods

- Consult with laboratory
- Quality Assurance Project Plan
- Selection considerations
  - Sample matrix
  - Laboratory certification
  - Analyte report list
  - Analytical sensitivity
  - Sample preparation protocols
- Report all compounds detected by method

Method #	537	537.1	533	8327	1633
Issued By	USEPA	USEPA	USEPA	USEPA	USEPA
Date Published	Sept. 2009	Nov. 2018	Nov. 2019	June 2019	August 2021; June 2022; January 2024
Applicable Media	drinking water	drinking water	drinking water	aqueous, non-potable (GW, SW, WW)	Non-DW: GW, SW, WW; Solid: Soil, Sediment, Biosolids, Tissue
Preservative	Cool 0-6°C, Trisma	Cool 0-6°C, Trisma	Cool 0-6°C, Ammonium Acetate	Cool 0-6°C	Cool 0-6°C
Volume/Mass	2 x 250 mL	2 x 250 mL	2 x 250 mL	2 x 250 mL	2 x 250 mL for NPW, GW, SW / 2 x 125mL for NPW, leachate, wastewater / 500 mL or 2 x 8oz for Solids, Soil, Sediment, Biosolids, Tissue
Hold time Extract / Analyze	14 / 28 days	14 / 28 days	28 / 28 days	28 / 30 days	NPW (if refrigerated): 28 days to extraction; NPW (if frozen): 90 days to extraction; Soil/solids: 90 days to extraction

PFAS Sampling Fact Sheet

General Sampling Considerations

- Cross contamination
  - Direct versus indirect
  - Potential sources
    - Decontamination and drilling water
    - Sampling materials
    - Sampling equipment
    - Field clothing
    - Personal care products
    - Food packaging

PFAS Sampling Fact Sheet

General Sampling Considerations

- Follow sampling best practices
  - Clean gloves, clean hands
  - Minimize handling of samples and equipment
  - Avoid touching the sample, the inside of the sample bottle, and the sample lid
  - Use PFAS-free soap and water
  - Collect field blanks
    - ➢ Data quality objectives
    - ➢ Non-dedicated sampling equipment
    - ➢ Materials not known to be PFAS-free

PFAS Sampling Fact Sheet

General Sampling Considerations

- Adsorption/ Negative Bias
  - Always use appropriate sampling equipment/containers
    - ➢ Dictated by method
    - ➢ Provided by laboratory
  - Do not filter samples
  - Follow appropriate sample preservation requirements

PFAS Sampling Fact Sheet

Groundwater Specific Sampling Considerations

- Monitoring well construction
  - Material Considerations
    - PVC and stainless steel acceptable
    - Hydraulic profiling tools and pre-packed well screens may be used if certified to be PFAS-free
    - PFAS in some coated or time-released bentonite pellets and some drilling lubricants (consult with driller)

PFAS Sampling Fact Sheet

Groundwater Specific Sampling Considerations

- Turbidity sensitive parameter
  - The volume-average sampling policy in Chapter 6 of the FSPM does not apply when sampling is limited to non-volatile turbidity sensitive parameters
  - Low-flow or passive sampling methods preferred
  - Traditional volume-average sampling can be used if turbidity levels below 10 NTU (Nephelometric Turbidity Units) can be obtained
  - Do not filter samples
  - Temporary well points should be developed before sample collection
    - ➢ Pre-packed well screens recommended

PFAS Sampling Fact Sheet

Groundwater Specific Sampling Considerations

- Acceptable sampling materials (not all inclusive)
  - HDPE and silicone tubing
  - PFAS-free bladder pumps (HDPE tubing)
  - Peristaltic pumps (HDPE or silicone tubing)
  - Submersible electric pumps (HDPE tubing)
  - HydraSleeve (HDPE or polypropylene)
  - Snap Sampler (HDPE)
  - Dual Membrane Passive Diffusion Bag Sampler
- Materials not referenced may be used if manufacturer certifies them to be PFAS-free or testing (field blank or soak test) shows no PFAS
- Bailers generally not recommended due to inability to control turbidity
- Evaluation of potential PFAS cross contamination from dedicated pumps and related equipment (e.g., tubing, wiring, tethers, etc.)

PFAS Sampling Fact Sheet

Media Specific Sampling Considerations

- Surface water
  - Traditional methods and equipment generally applicable
  - Avoid collection of foams
  - Minimize sediment disturbance
- Soil/Sediment
  - Acceptable materials (e.g., stainless steel, HDPE, silicone, etc.)
  - Consider multiple depths
- Air
  - No validated analytical methods or standards

PFAS Sampling Fact Sheet

Sampling Sequence

- Plan sequence in advance
- Sample PFAS as stand-alone event if possible
    - If concurrent, sample for PFAS before other contaminants
- Proceed from low impact areas to high impact areas
- Collect potable water samples before other media

Test Poll #2

Test Poll #2

If sampling multiple media for PFAS analysis, when should you sample potable water?

A. First
B. Last
C. It does not matter

Test Poll #2

If sampling multiple media for PFAS analysis, when should you sample potable water?

A. First

B. Last

C. It does not matter

PFAS Sampling Fact Sheet

Decontamination Considerations

- Single-use equipment recommended when possible
- Non-dedicated equipment decontamination procedures
  - PFAS-free soap or detergent
  - PFAS-free water
  - Methanol can be considered

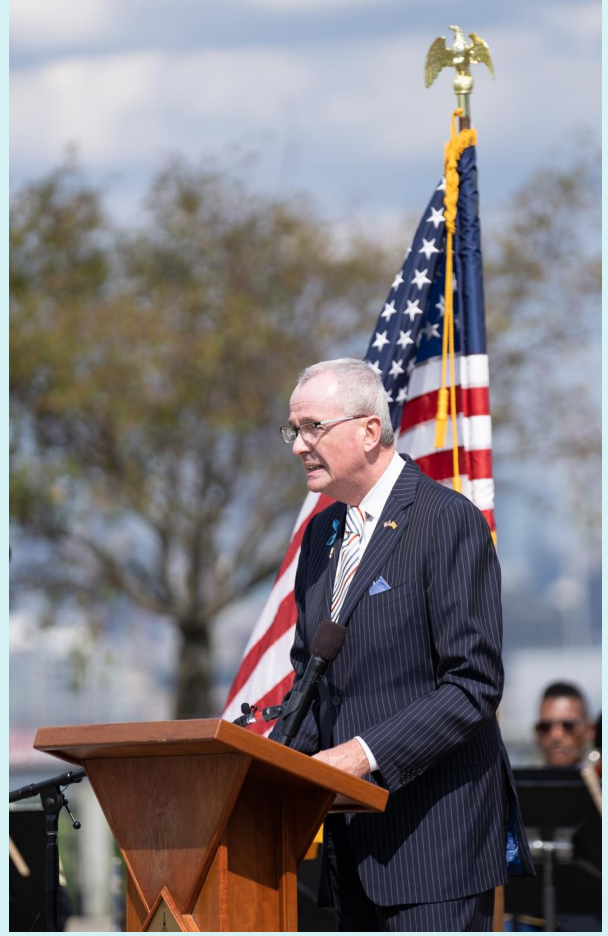
PFAS Sampling Fact Sheet

Investigation Derived Waste Disposal

- Facilities may have limitations and restrictions for PFAS materials
- Waste classification sampling to evaluate handling and disposal options

PFAS Sampling Fact Sheet

Chapter and Section of the FSPM	Topic
Chapter 3, Sec 3.5.2	Examples of adsorptive and desorptive materials
Chapter 5, Sec 5.1.1	Addresses negative bias
Chapter 5, Sec 5.3.1.2.2.1	Limitations in use of bladder pumps
Chapter 5, Sec 5.3.1.2.4 and 5.3.1.2.5	Discussion of preferred bailer materials to use based on adsorption and desorption issues
Chapter 5, Sec 5.3.1.3.2.1.3	Dual Membrane Passive Diffusion Bag Sampler can be used for nonpolar VOCs, SVOCs, metals, ions, cations, inorganics, as well as 1,4 Dioxane, and PFAS.
Chapter 6, Sec 6.2.8	Recommended depth for soil samples for PFAS analysis given compounds are not detected by field screen instruments
Chapter 6, Sec 6.9.6.1	General discussion of PFAS class of compounds related to sampling order and general considerations related to potential cross contamination
Chapter 6, Sec 6.9.6.3.1	Detailed discussion on adsorption and desorption as it relates to tubing
Chapter 6, Table 6.14	Table listing preferred use for each type of tubing



Thank you!

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1,4-Dioxane Sampling Fact Sheet

September 17, 2024

John Bracken, LSRP, Verdantas
Eileen Snyder, Regional Technical Coordinator, Pace Analytical Services

1,4-Dioxane Sampling Fact Sheet

What is 1,4-Dioxane?

1,4-Dioxane (CASRN 123-91-1) (also known as dioxane, p-dioxane, diethylene oxide, 1,4-diethylene dioxide, and glycol ethylene ether) is a synthetic organic compound used in various industrial applications as a solvent. 1,4-Dioxane has mostly been used as a stabilizer for 1,1,1-Trichloroethane. In addition, it has been used as a solvent in the production of a variety of organic chemicals found in paints, lacquers, dyes, antifreeze, deodorants, shampoos, cosmetics, as a food additive and in the formulation of pesticides and food packaging adhesives. Refer to the Interstate Technology Regulatory Council's (ITRC's) History of Use and Potential Source website for specifics. A list of 1,4-Dioxane sampling resources and information can be found below:

ITRC's History of Use and Potential Sources

EPA's Technical Fact Sheet - 1,4-Dioxane

ITRC's Sampling and Analysis 1,4-Dioxane

NJDEP's Field Sampling Procedures Manual

ATSDR Toxicological Profile for 1,4-Dioxane

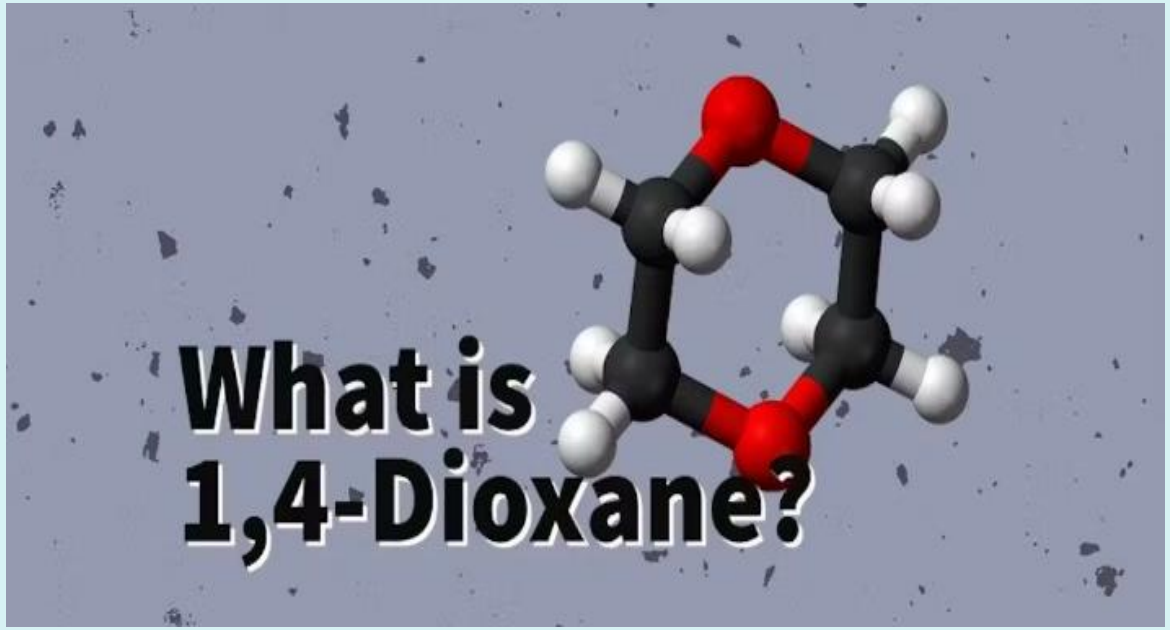
Properties of 1,4-Dioxane

Due to its miscibility in water, 1,4-Dioxane should not accumulate at the water table or exhibit Light Non-Aqueous Phase Liquid (LNAPL) properties (i.e., floating on the water table). With a density of 1.03 g/cm^3, the density of 1,4-Dioxane is very similar to that of water, so when discharged by itself or as a component of an aqueous wastewater, 1,4-Dioxane should not behave like a Dense Non-Aqueous Phase Liquid (DNAPL). That said, one of the principal uses of 1,4-Dioxane is as an

1,4-Dioxane Sampling Fact Sheet

1,4-Dioxane

- Is a synthetic organic compound
- Used as stabilizer for 1,1,1-Trichloroethane (TCA)
- It has been used in various industries in the production of paints, lacquers, dyes, antifreeze, deodorants, shampoos, food additives, formation of pesticides, pharmaceutical and biotech industries, resins, automotive and aviation fluids, etc.
- It is also a chemical process by-product such as polyethylene terephthalate (PET) plastic and polyethylene glycol production, and production of consumer/industrial detergents and cleaning compounds in some forms of ethoxylated surfactants.



1,4-Dioxane Sampling Fact Sheet

1,4-Dioxane Behavior

- It is a colorless liquid with a density slightly greater than water (i.e., >1 g/mL) but can also be a solid below 53 deg F.
- It is completely miscible in water (property of two substances to form a homogeneous solution when mixed regardless of concentration in water) and organic solvents
- Due to its miscibility, 1,4-Dioxane should not exhibit create a separate phase liquid (i.e., NAPL layer).
    - However, if it is mixed with a separate phase liquid such as a solvent discharge it may be included within a DNAPL layer.
- In air, it has a half life of ~1-3 days, but it is relatively resistant to biodegradation in water and soil.

1,4-Dioxane Sampling Factsheet

Analytical Methods

- Consult with laboratory- Analytical section is complex and can be difficult
- Quality Assurance Project Plan
- Selection considerations
  - Sample matrix
  - Laboratory certification
  - Analyte report list
  - Analytical sensitivity
  - Analytical selectivity (Selected Ion Monitoring or SIM)
  - Sample preparation protocols

Method #	522	8260	8260-SIM	8270-SIM	8270-SIM ID
Issued By	USEPA	USEPA	USEPA	USEPA	USEPA
Date Published	2008	2006, rev. 2018	2006, rev. 2018	2014, rev. 2018	2014; rev. 2018
Applicable Media	drinking water (potable water)	aqueous, non-potable (NPW, GW, SW, WW); solids	aqueous, non-potable (NPW, GW, SW, WW); solids	aqueous, non-potable (NPW, GW, SW, WW); solids	aqueous, non-potable (NPW, GW, SW, WW)
Sample Preparation	Solid Phase Extraction (SPE)	5030, 5035	5030, 5035	Liquid-Liquid Extraction (NPW); SPE (solids)	Liquid-Liquid Extraction (NPW)
Analytical Instrumentation	GC/MS-SIM – with Isotope Dilution	GC/MS full scan	GC/MS-SIM – Isotope Dilution may be an option	GC/MS-SIM	GC/MS-SIM with Isotope Dilution
Preservative	Na2O3S (sodium sulfite, dechlorinating agent) / NaHSO4 (sodium bisulfate, antimicrobial agent), < pH 4, </= 10 °C (for DW)	HCL, pH<2, 0-6 ° C (for NPW); DI water & MeOH, 0-6 °C (for solids).	HCl, pH<2, 0-6 °C (for NPW); DI water & MeOH, 0-6 °C (for solids).	0-6 °C (for NPW and Solids)	0-6 °C (for NPW)
Volume/Mass	2 x 500 mL Amber Glass, Teflon Lined (potable water)	3 x 40 mL VOA vials Amber Glass, Teflon Lined (NPW); 3-vial 5-gram Terracore kits or 3 x 5-gram Encores (solids)	3 x 40 mL VOA vials Amber Glass, Teflon Lined (NPW); 3-vial 5-gram Terracore kits or 3 x 5-gram Encores (solids)	2 x 250 mL (or 2 x 500 mL) (or 2 x 1000 mL) Amber (for NPW); 4 oz jar (solids)	2 x 250 mL (or 2 x 500 ml) (or 2 x 1000 mL) Amber (for NPW)
Hold time Extract / Analyze	28 days	14 days (NPW); 48 Hours (extrude/freeze)	14 days (NPW); 48 Hours (extrude/freeze)	7 days (NPW); 14 days (solids)	7 days (NPW)

1,4-Dioxane Sampling Fact Sheet

Analytical Methods : Aqueous

- Method sensitivity (reporting limit)
- Analyte recovery potential
- Ability of the approach to achieve the method defined quality control (QC) criteria
- Isotope Dilution for analyte recovery correction may be an option

1,4-Dioxane Sampling Fact Sheet

Analytical Methods : Soil and Sediment

- 8260 or 8270 full scan is typically used
- SIM is an option
- Percent moisture levels impact sensitivity (reporting limit)
- Method 5035 Encore or Terracore sample collection

1,4-Dioxane Sampling Fact Sheet

Analytical Methods : Air

- Method TO-15 Full Scan
- Canister and flow controller collection
- Vapor intrusion applications

1,4-Dioxane Sampling Fact Sheet: Analytical Methods

Analytical method selection depends on project DQOs.

The LSRP and the Laboratory discuss the project scope and select an approach for the project DQOs.

Analytical approach options include:

- ✓ Sample analysis by 8260 purge and trap and GC/MS analysis
- ✓ Sample analysis by 8270 organic extraction and GC/MS analysis
- ✓ Sample analysis by TO-15 (GC/MS analysis) with canister collection for Air sample matrices for Vapor Intrusion applications

1,4-Dioxane Sampling Fact Sheet: Analytical Method Options

Sample analysis by purge and trap and GC/MS analysis:

- VOA full scan by 8260
- VOA SIM by 8260-SIM
- VOA SIM by 8260-SIM with Isotope Dilution

Sample analysis by organic extraction and GC/MS analysis:

- SVOC full scan by 8270
- SVOC SIM by 8270-SIM
- SVOC SIM by 8270-SIM with Isotope Dilution

Sample analysis by TO-15 (GC/MS analysis) with canister collection for Air sample matrices for Vapor Intrusion applications

1,4-Dioxane Sampling Fact Sheet: Analytical Method Selection

The LSRP and project team work with the Laboratory to clarify the project scope:

- ✓ What is the applicable regulatory program? NJDEP CSRR
- ✓ What remediation standards apply? NJ SRS (N.J.A.C. 7:26D) & NJ GWQS (N.J.A.C. 7:9C)
- ✓ What additional analytical parameters are requested and what target analytes need to be reported for Soil and for GW samples?
- ✓ The Laboratory verifies they hold NJ-certification to report the requested target analytes in each of the project sample matrices
- ✓ The Laboratory verifies the analytical approach needed to achieve the achieve the analytical sensitivity, selectivity and analyte recovery needed to meet the project Data Quality Objectives (DQOs)

1,4-Dioxane Sampling Fact Sheet: Working with the Lab to Develop a Project QAPP

The LSRP reviews the sample analytical approach proposed by the Laboratory:

- ✓ Analytical parameters and target analytes of concern listed with Laboratory RLs/MDLs
- ✓ 1,4-Dioxane can be reported by the Lab at a level of sensitivity (RL) needed to meet the applicable NJDEP remediation standards (NJ-GWQS 0.4 µg/L; NJ-SRS MGW 0.067 mg/kg)
- ✓ The Laboratory confirms that a modified method with Isotope Dilution with SIM will be used to analyze and report 1,4-Dioxane as a single analyte to achieve the sensitivity, selectivity and analyte recovery needed to meet the project DQOs, noting the low level NJ-GWQS
- ✓ The LSRP includes the Laboratory documents in the project QAPP

1,4-Dioxane Sampling Fact Sheet

Sampling Sequence

- Plan sequence in advance
- Sampling sequence of 1,4-Dioxane should be determined based on chemical group(s) analyzed (i.e., VOCs, SVOCs, etc.), or if sampling with PFAS, in which PFAS would be collected initially, followed by VOCs and SVOCs, etc.
- Proceed from low impact areas to high impact areas
- Collect potable water samples before other media

1,4-Dioxane Sampling Fact Sheet

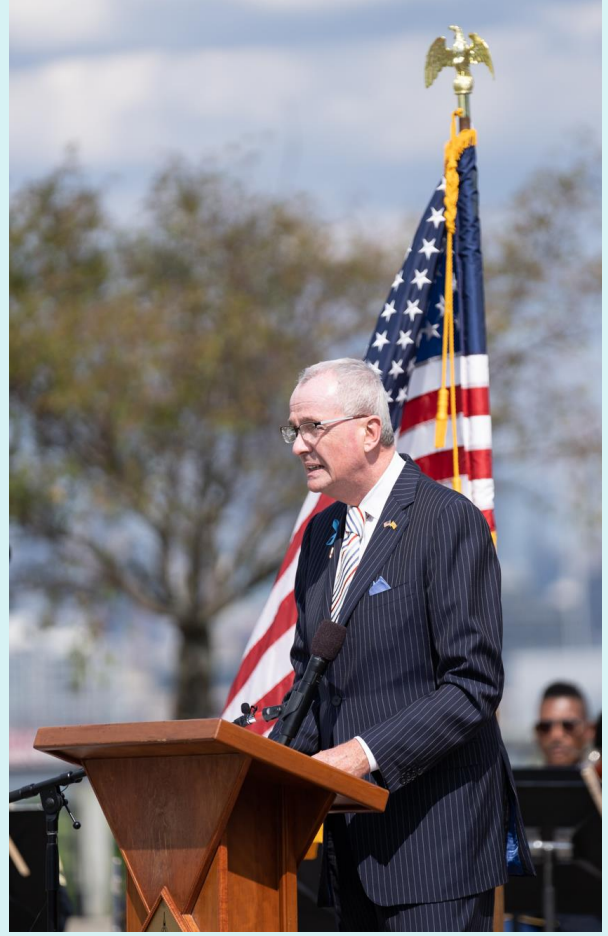
Decontamination Considerations

- Single-use equipment recommended when possible
- Non-dedicated equipment decontamination procedures
  - 1,4-Dioxane-free soap or detergent
    - Liquid detergents with surfactant ingredients can have trace 1,4-Dioxane impurities
  - 1,4-Dioxane-free water
  - Methanol can be considered

1,4-Dioxane Sampling Fact Sheet

Investigation Derived Waste Disposal

- Facilities may have limitations and restrictions for 1,4-Dioxane materials
- Waste classification sampling to evaluate handling and disposal options



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FSPM Chapter 3 Training

September 17, 2024

Questions?

Attainment Guidance Training Next!

September 17, 2024

BREAK!

Return at 11:15 a.m.

Attainment Guidance Version 3.0 - Intro

September 17, 2024

Greg Neumann, BEERA
Contaminated Site Remediation & Redevelopment

Attainment Committee

- Attainment Guidance revised by the Attainment Committee via the stakeholder process through a collaborative effort.

Committee Members

Department	External
Greg Neumann – Chair	Adam Hackenberg - Langan
Branko Trifunovic	James Kearns – Kinder Morgan
Alex Iannone	Stephen Posten – WSP
	Theodoros “Ted” Toskos - Jacobs

Attainment Guidance

Introduction and Structural Changes

Attainment Guidance - Overview

- Introduction and structural changes
- Revisions to guidance to address common issues encountered during DEP reviews
- New provisions of guidance
- Revisions to address guidance inconsistencies

Structural Changes Version 2.0 vs 3.0

- The compliance averaging methodologies were previously located in Appendix A of the Version 2. As these methodologies are an integral part of the guidance, they have been relocated to the main body of the document – Section 12
- Section 12 includes guidance on Functional Area development and proper application of the compliance avg. methods (arithmetic mean, 95%UCL of the Mean, SWA, 75%-10x option)
- New section on compliance averaging for historic fill (Section 12.5)
- New Appendix A – data deliverables and examples
- New Appendix C – Non-detect values

Structural Changes Version 2.0 vs 3.0, continued

- Section 12.1.5 – new section – Function Area development in conjunction with an Alternate Remediation Standard

- Section 12.6 – Application of 75%-10x option. Additional guidance and considerations when this option is utilized near property boundaries

Attainment Guidance

Revisions to Guidance to Address Common Issues Observed with Department Reviews

Clarifications made to guidance to address common issues observed during DEP review

- Delineation – AOC Specific Maps

- Data Deliverables for compliance averaging:
  - Arithmetic Mean
  - 95% Upper Confidence Level
  - 75%/10x
  - Spatially Weighted Averaging

Delineation – Regulatory Requirements

- Delineation to the RSRS and/or NRSRS, and SRS-MGW is required pursuant to N.J.A.C. 7:26E-4.2 (a) 1., 2., and 3.
- As per the NJDEP January 2020 Policy Statement – *Interpretation of the Technical Requirements for Site Remediation requirement to "complete the remedial investigation."*

> If the remedial investigation does not include actual clean zone sampling data to demonstrate contaminant delineation to the applicable remediation standards and screening criteria, such sampling data are required to demonstrate attainment of the applicable remediation standards at the conclusion of the remedial action and prior to the Department issuing a remedial action permit, if applicable, and issuance of the Response Action Outcome (RAO).

- What does this mean? Compliance averaging is a remedial action – complete delineation on sample-by-sample basis is required to utilize it

Delineation is critical when using compliance averaging

- Delineation is critical to ensure that the concentrations being averaged accurately reflect what the receptor is being exposed to
- Sample points that are not delineated represent an “unknown” and one cannot assume the contaminant concentration decreases
- Environmental data does not always follow typical gradients. Preferential pathways may cause sample concentrations to increase in the direction opposite from the discharge location. Incomplete delineation may exclude data points from the calculation resulting in an inaccurate final calculated value
- Unlike other remedies (i.e. excavation) where post-remediation sampling can be used to address contamination that is not delineated; there is NO follow up sampling conducted when using compliance averaging

Test Poll #3

Test Poll #3

Sample x sample delineation is critical before implementing compliance averaging.

A. True
B. False

Test Poll #3

Sample x sample delineation is critical before implementing compliance averaging.

A. True

B. False

Delineation documentation

- Reports with Areas of Concern (AOCs) addressed via compliance averaging need to contain AOC figures that clearly demonstrate complete horizontal/vertical delineation
- Figures that demonstrate complete delineation should already exist, as AOC specific maps/figures are required pursuant to N.J.A.C. 7:26E 1.6 (b)8

8. Maps and figures, with map scale and orientation, including:

   i. Site location, land use, receptor evaluation, and area of concern maps;

   ii. Sample location map(s), that include the following:

      (1) Field identification numbers for all samples;

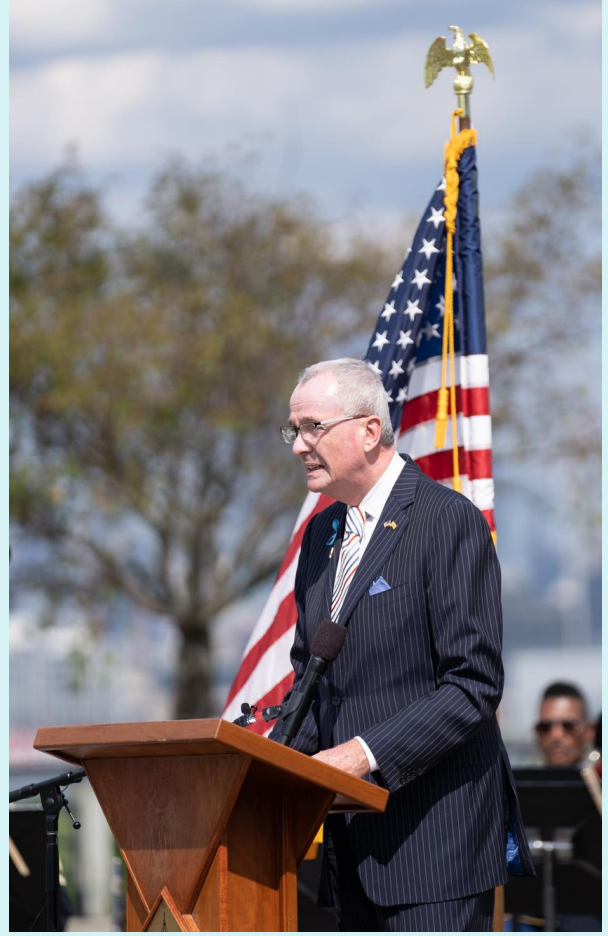
      (2) Sample locations, sample depths and contaminant concentrations plotted on the map; and

      (3) If data for more than 25 samples are presented for an area of concern, soil, ground water and sediment contaminant isopleth maps and cross section diagram(s), including the horizontal and vertical distribution of contaminants in each media, with sample point location numbers and contaminant concentrations; and

Note: contaminant concentrations plotted on map.

Delineation documentation, continued

- Since figures showing complete delineation already exist, it would be MOST HELPFUL to pull them into the report where compliance averaging is utilized
- If the figures are present in another document, then that document should be referenced and their location (section/pg. #) provided
- In instances where delineation is NOT COMPLETE on a sample x sample basis, and the investigator elects to implement compliance averaging, then a variance to 7:26E -4.2 must be proposed, along with a technical justification and information required pursuant to 7:26E 1.7 – Variance- as part of the report where compliance averaging is discussed



Thank you!

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Clarifications Due to Common Issues: Data Deliverables for Compliance Averaging

September 17, 2024

Branimir (Branko) Trifunovic, BEERA
Alex Iannone, BEERA

Deliverables for 95%UCL, Arithmetic Mean & 75%/10x

Compliance Averaging Methods Refresher

- **Arithmetic Mean**
  - Fewer than 10 samples
  - Simple addition and division
- **95% UCL (Upper Confidence Limit) of the Mean**
  - More than 9 samples
  - Requires use of a program like EPA's ProUCL
- **75%/10x**
  - Post-remedial
  - Compliant if 75% of samples are below standard and none are 10x higher than the standard

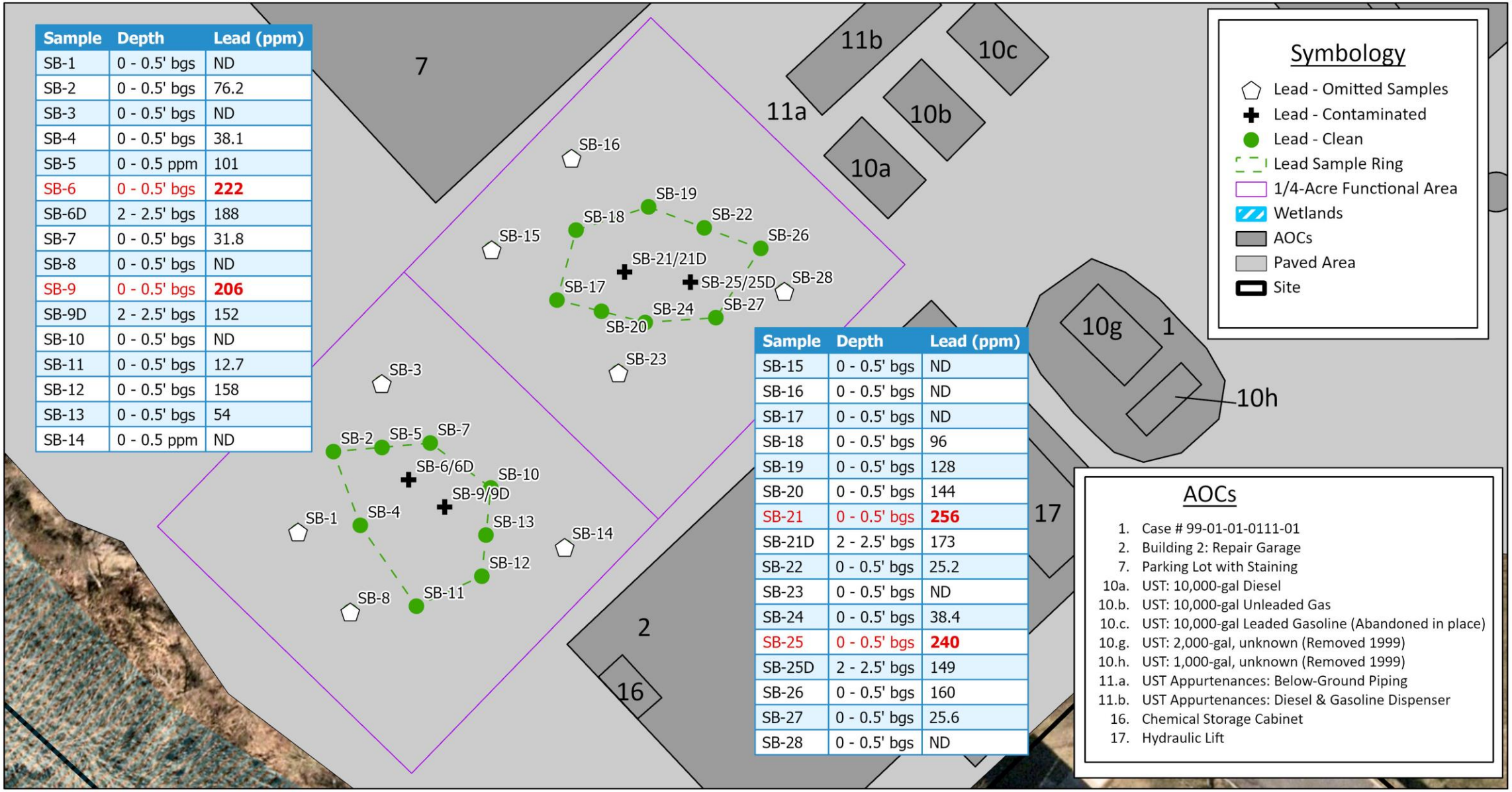
Deliverables by Method

Arithmetic Mean	95% UCL	75%/10x
Figure showing samples used	Figure showing samples used	Figure showing samples used + remediation area
Table showing samples used	Table showing samples used	Table showing samples
	Input Data	Remediation Volume
	Output Data	

Data Deliverables in More Detail

- Figure detailing which samples are included in the calculation
- Table detailing which samples are included in the calculation
- Input data for ProUCL or other program used
- ProUCL or other program outputs
- For 75%/10x, figure showing remediation area footprint
- For 75%/10x, narrative detailing remediation area volume

Lead Functional Area - Ingestion Dermal



Sample	Depth	Lead (ppm)
SB-1	0 - 0.5' bgs	ND
SB-2	0 - 0.5' bgs	76.2
SB-3	0 - 0.5' bgs	ND
SB-4	0 - 0.5' bgs	38.1
SB-5	0 - 0.5 ppm	101
SB-6	0 - 0.5' bgs	**222**
SB-6D	2 - 2.5' bgs	188
SB-7	0 - 0.5' bgs	31.8
SB-8	0 - 0.5' bgs	ND
SB-9	0 - 0.5' bgs	**206**
SB-9D	2 - 2.5' bgs	152
SB-10	0 - 0.5' bgs	ND
SB-11	0 - 0.5' bgs	12.7
SB-12	0 - 0.5' bgs	158
SB-13	0 - 0.5' bgs	54
SB-14	0 - 0.5 ppm	ND

Sample	Depth	Lead (ppm)
SB-15	0 - 0.5' bgs	ND
SB-16	0 - 0.5' bgs	ND
SB-17	0 - 0.5' bgs	ND
SB-18	0 - 0.5' bgs	96
SB-19	0 - 0.5' bgs	128
SB-20	0 - 0.5' bgs	144
SB-21	0 - 0.5' bgs	**256**
SB-21D	2 - 2.5' bgs	173
SB-22	0 - 0.5' bgs	25.2
SB-23	0 - 0.5' bgs	ND
SB-24	0 - 0.5' bgs	38.4
SB-25	0 - 0.5' bgs	**240**
SB-25D	2 - 2.5' bgs	149
SB-26	0 - 0.5' bgs	160
SB-27	0 - 0.5' bgs	25.6
SB-28	0 - 0.5' bgs	ND

	SRS IDEP
Lead	200 ppm

Former Greener Grasses Bus Company

Table 1. Data Tables for Functional Areas 1 and 2

Functional Area 1		
Sample ID	Depth (ft bgs)	Lead Concentration (mg/kg)
SB-2	0-0.5	76.2
SB-4	0-0.5	38.1
SB-5	0-0.5	101
SB-6	0-0.5	222
SB-7	0-0.5	31.8
SB-9	0-0.5	206
SB-10	0-0.5	ND (0.31)*
SB-11	0-0.5	12.7
SB-12	0-0.5	158
SB-13	0-0.5	54.0

Functional Area 2		
Sample ID	Depth (ft bgs)	Lead Concentration (mg/kg)
SB-17	0-0.5	ND (0.31)*
SB-18	0-0.5	96.0
SB-19	0-0.5	128
SB-20	0-0.5	144
SB-21	0-0.5	256
SB-22	0-0.5	25.2
SB-24	0-0.5	38.4
SB-25	0-0.5	240
SB-26	0-0.5	160
SB-270	0-0.5	25.6

*the value in parentheses for the non-detect values is half the reporting limit

Table 2. ProUCL Inputs for Functional Areas 1 and 2

Functional Area 1	
Lead	D_Lead
76.2	1
38.1	1
101	1
222	1
31.8	1
206	1
0.31	0
12.7	1
158	1
54.0	1

Functional Area 2	
Lead	D_Lead
0.31	0
96.0	1
128	1
144	1
256	1
25.2	1
38.4	1
240	1
160	1
25.6	1

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.2 4/2/2024 11:18:28 AM
From File	ProUCL Input_a.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Lead

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	9	Number of Non-Detects	1
Number of Distinct Detects	9	Number of Distinct Non-Detects	1
Minimum Detect	12.7	Minimum Non-Detect	0.31
Maximum Detect	222	Maximum Non-Detect	0.31
Variance Detects	6034	Percent Non-Detects	10%
Mean Detects	99.98	SD Detects	77.68
Median Detects	76.2	CV Detects	0.777
Skewness Detects	0.643	Kurtosis Detects	-1.199
Mean of Logged Detects	4.264	SD of Logged Detects	0.953

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.895	**Shapiro Wilk GOF Test**
1% Shapiro Wilk Critical Value	0.764	Detected Data appear Normal at 1% Significance Level
Lilliefors Test Statistic	0.176	**Lilliefors GOF Test**
1% Lilliefors Critical Value	0.316	Detected Data appear Normal at 1% Significance Level

Detected Data appear Normal at 1% Significance Level

Note GOF tests may be unreliable for small sample sizes

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	90.01	KM Standard Error of Mean	25.37
90KM SD	75.64	95% KM (BCA) UCL	133.1
95% KM (t) UCL	136.5	95% KM (Percentile Bootstrap) UCL	131.2
95% KM (z) UCL	131.7	95% KM Bootstrap t UCL	149.8
90% KM Chebyshev UCL	166.1	95% KM Chebyshev UCL	200.6
97.5% KM Chebyshev UCL	248.4	99% KM Chebyshev UCL	342.4

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.22	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.733	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.145	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.284	Detected data appear Gamma Distributed at 5% Significance Level

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 1% Significance Level

Suggested UCL to Use

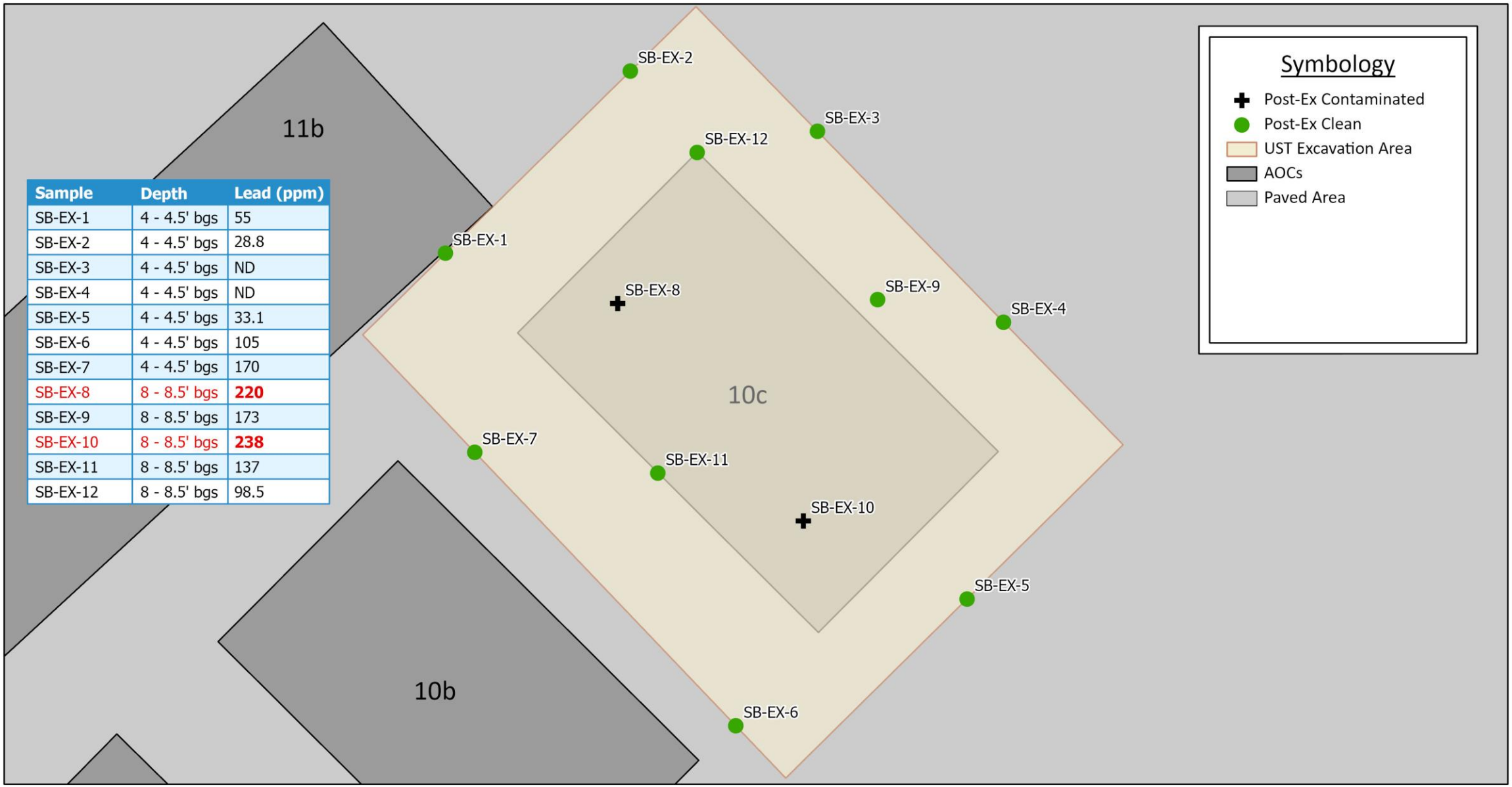
95% KM (t) UCL	136.5

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness using results from simulation studies.

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

UST 10c: 10,000-gal Leaded Gasoline Post-Ex Data



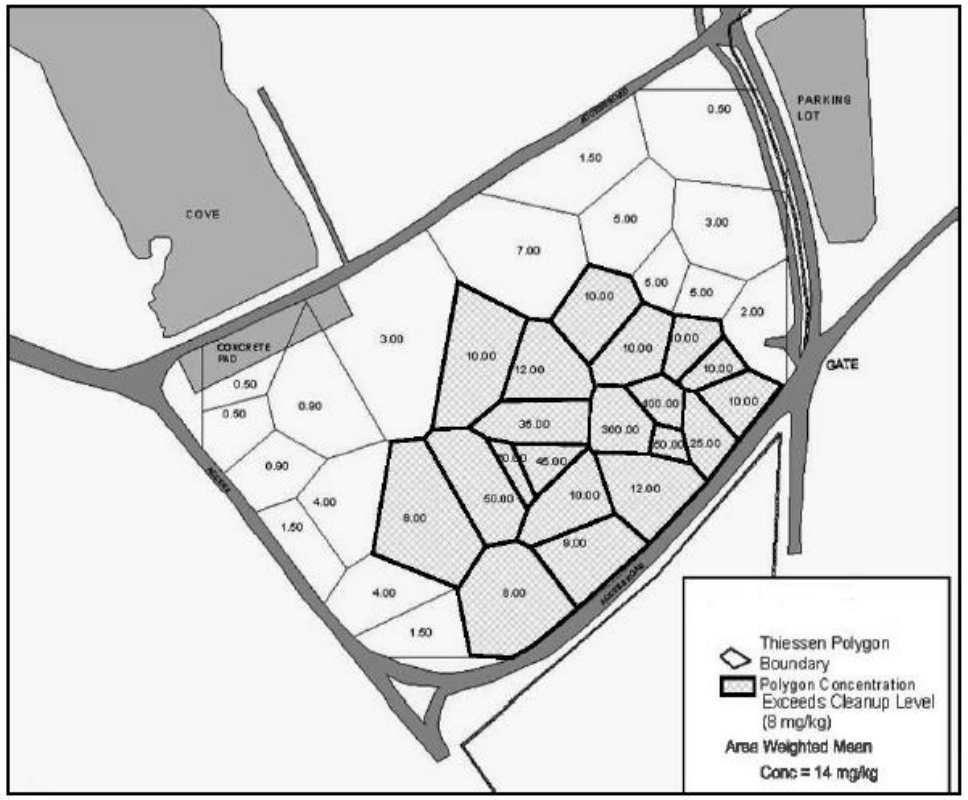
Sample	Depth	Lead (ppm)
SB-EX-1	4 - 4.5' bgs	55
SB-EX-2	4 - 4.5' bgs	28.8
SB-EX-3	4 - 4.5' bgs	ND
SB-EX-4	4 - 4.5' bgs	ND
SB-EX-5	4 - 4.5' bgs	33.1
SB-EX-6	4 - 4.5' bgs	105
SB-EX-7	4 - 4.5' bgs	170
SB-EX-8	8 - 8.5' bgs	**220**
SB-EX-9	8 - 8.5' bgs	173
SB-EX-10	8 - 8.5' bgs	**238**
SB-EX-11	8 - 8.5' bgs	137
SB-EX-12	8 - 8.5' bgs	98.5

	SRS IDEP
Lead	200 ppm

Former Greener Grasses Bus Company

Spatially Weighted Averaging (SWA) Deliverables

Spatially Weighted Averaging (SWA) Deliverables



Note: The SWA Deliverables should be readily available as those inputs are necessary to run the SWA application.

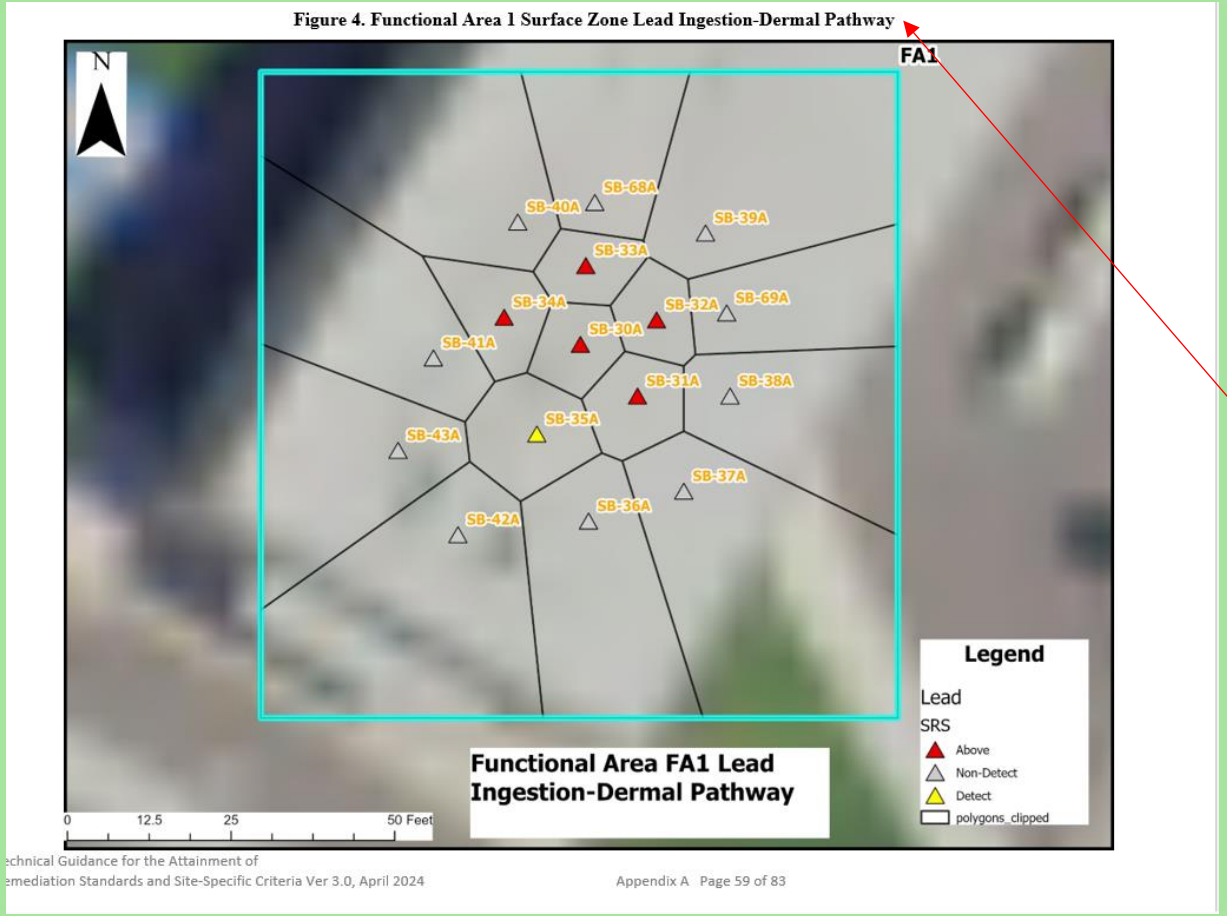
Update

- Example deliverables for SWA submittals were added to the *Attainment Guidance Appendix A*
  - Purpose: To clarify what SWA deliverables should be included in the submittal
  - Tables and Figures

What is SWA?

- SWA involves the creation of polygons based on the proximity of sampling point locations and a defined functional area boundary
  - "Polygons are defined by the perpendicular bisectors of the lines between all points" *Section 12.4 Attainment Guidance*
- The corresponding polygon assumes the contaminant concentrations detected at the sampling location. The polygon concentration is weighted (i.e multiplied) by its percentage of the total functional area to generate a Weighted Value
- The Weighted Values for each polygon are added together to calculate a SWA for the given functional area

Spatially Weighted Averaging (SWA) Deliverables



Why are SWA Deliverables Important?

- SWA is serving as the remedial action for a given area and the deliverables document compliance with the *Attainment Guidance*

- The SWA Deliverables should be readily available as those inputs are necessary to run the SWA application
- Two major Components:
  - A separate Figure for each pathway, contaminant, functional area, and vertical zone should be submitted labeled as such.
    - Sample locations should be labeled, and exceedances identified.
    - Any remediated polygons should be identified in some manner.
  - A Table corresponding with each Figure should also be submitted….

Note: The SWA Deliverables should be readily available as those inputs are necessary to run the SWA application.

Spatially Weighted Averaging (SWA) Deliverables

Table 4. Functional Area 1 Surface Zone Lead Ingestion-Dermal Pathway

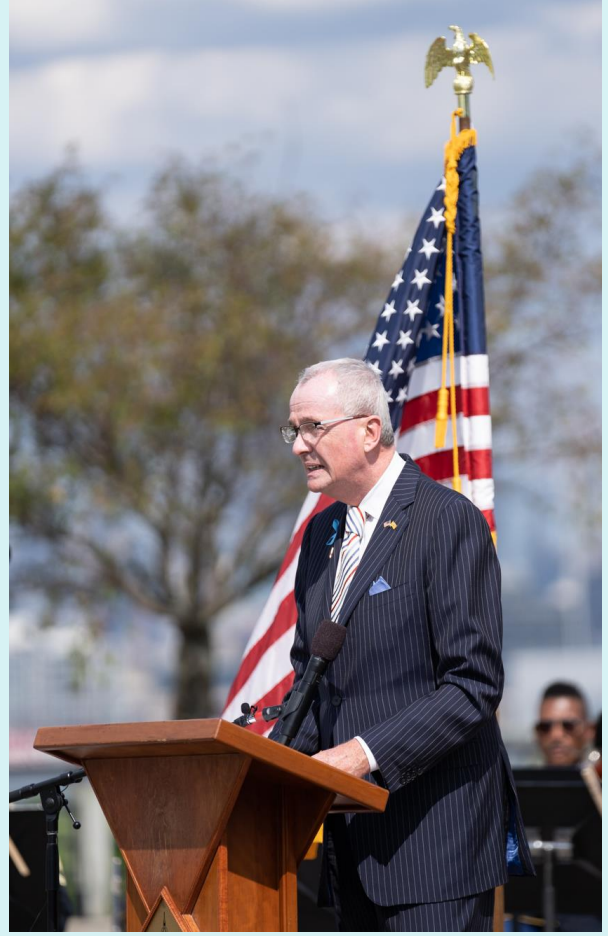
Sample ID	X Coord	Y Coord	Depth (ft)	Lead (mg/kg)	Polygon Area (sq ft)	Percent of Total Area	Weighted Value (mg/kg)	Remediated
SB-35A	325725.3861	405133.7283	1.5-2	175	269.404625	2.80%	4.904873172	N
SB-42A	325713.3314	405118.3485	1.5-2	0.25	1226.911928	12.76%	0.031910829	N
SB-31A	325740.766	405139.5479	1.5-2	**15000**	187.5823432	1.95%	292.730451	Y
SB-36A	325733.2841	405120.4265	1.5-2	25	767.4088548	7.98%	1.995958471	N
SB-34A	325720.3979	405151.6027	1.5-2	**380**	211.4256395	2.20%	8.358453599	N
SB-37A	325747.8326	405124.999	1.5-2	0.25	1321.9576	13.75%	0.034382878	N
SB-41A	325709.5902	405145.3674	1.5-2	0.25	789.0181968	8.21%	0.020521623	N
SB-30A	325732.037	405147.4458	1.5-2	**3000**	149.379706	1.55%	46.62271296	N
SB-32A	325743.6758	405151.187	1.5-2	**1200**	150.3658844	1.56%	18.77220315	N
SB-69A	325754.3795	405152.2519	1.5-2	0.25	479.1328121	4.98%	0.012461795	N
SB-68A	325734.245	405169.139	1.5-2	0.25	479.0768515	4.98%	0.01246034	N
SB-33A	325732.8684	405159.5006	1.5-2	**680**	146.5097289	1.52%	10.36477942	N
SB-38A	325754.8992	405139.5479	1.5-2	0.25	660.3695262	6.87%	0.017175592	N
SB-39A	325751.1581	405164.4888	1.5-2	0.25	990.6148329	10.31%	0.025764963	N
SB-40A	325722.4764	405166.1512	1.5-2	40	1043.648047	10.86%	4.343089131	N
SB-43A	325704.1864	405131.2343	1.5-2	0.25	739.2277643	7.69%	0.019226621	N
				Totals	**9612.034341**	**100.00%**	**388.266**	

1 2 3 4 5 6 7 8 *9

SWA FAILED: 390 mg/kg > Residential Ingestion-Dermal Soil Remediation Standard 200 mg/kg

- The Corresponding Table should clearly state the pathway, contaminant, functional area, and vertical zone
- The Tables should include the following columns:
  - Sample ID (1)
  - X & Y (2 & 3)
  - Depth (4)
  - Contaminant Concentration (5)
  - Polygon Area (6)
  - Percent of Total Area (7)
  - Weighted Value (8)
  - Remediated (9)*
- Whether the Spatially Weighted Average passes or fails should be clearly stated and compared with the applicable Soil Remediation Standard
- Column 5 x Column 7 = Column 8

Note: The SWA Deliverables should be readily available as those inputs are necessary to run the SWA application.



Thank you!

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Attainment Guidance Version 3.0 Training

September 17, 2024

Questions?

New Provisions of Guidance:
Averaging Associated with Historic Fill

September 17, 2024

Branko Trifunovic, BEERA
Contaminated Site Remediation & Redevelopment

Historic Fill Averaging Update

- Adding an attainment option that can be used in addition to options provided in the Historic Fill Material Technical Guidance
- The compliance attainment guidance assumes a point discharge which doesn't apply to historic fill
- The historic fill guidance recommends a number of samples too small for averaging
- Characterization and delineation according to historic fill guidance stipulations is required
- Functional areas according to attainment guidance are required

Compliance Averaging Historic Fill Sampling Protocol

- Minimum samples depends on the functional area size
- **0.25 acres – residential for the ingestion-dermal pathway**
  - 3 samples per 0.25-acre functional area
- **0.5 acres – residential for the inhalation pathway**
  - 4 samples per 0.5-acre functional area
- **2 acres – non-residential**
  - 9 samples per 2-acre functional area

Residential Ingestion-Dermal

Figure 10

Compliance with a residential ingestion/dermal based SRS for 1 acre site = Four ¼ acre sized Functional Areas with 3 samples in each one

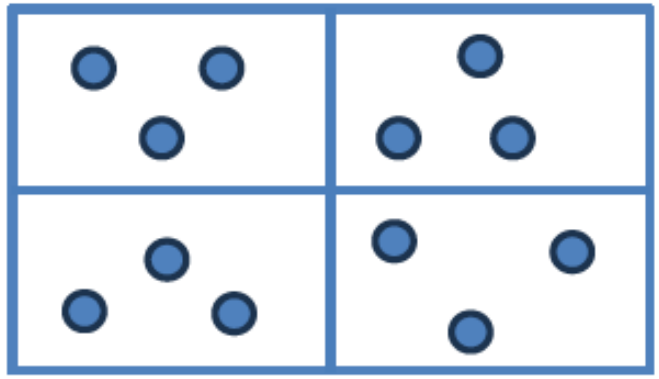
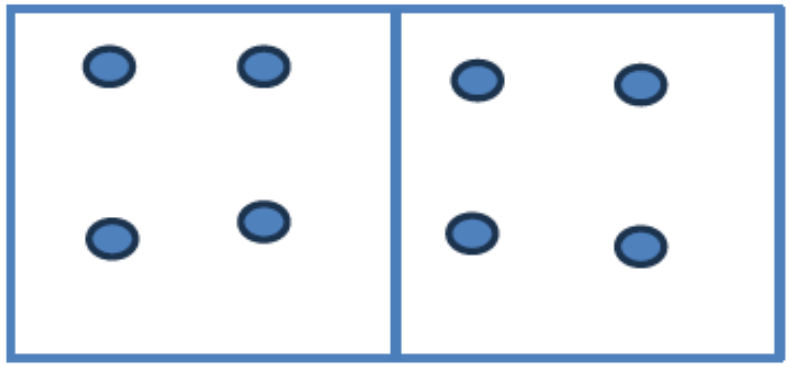


Figure 11

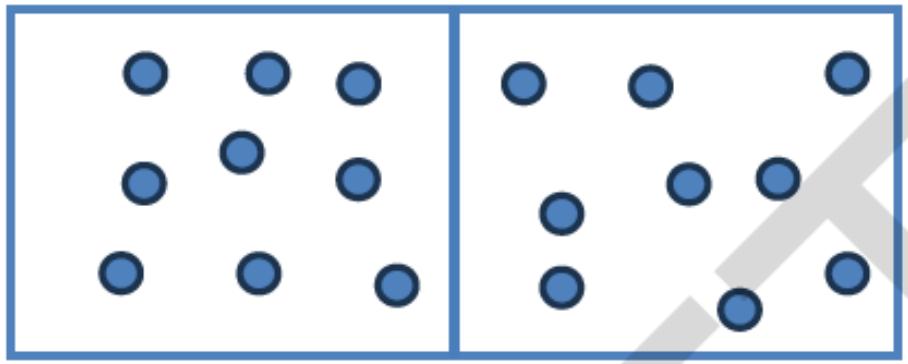
Compliance with a residential inhalation-based SRS for 1 acre site = Two 1/2 acre sized Functional Areas with 4 samples in each one



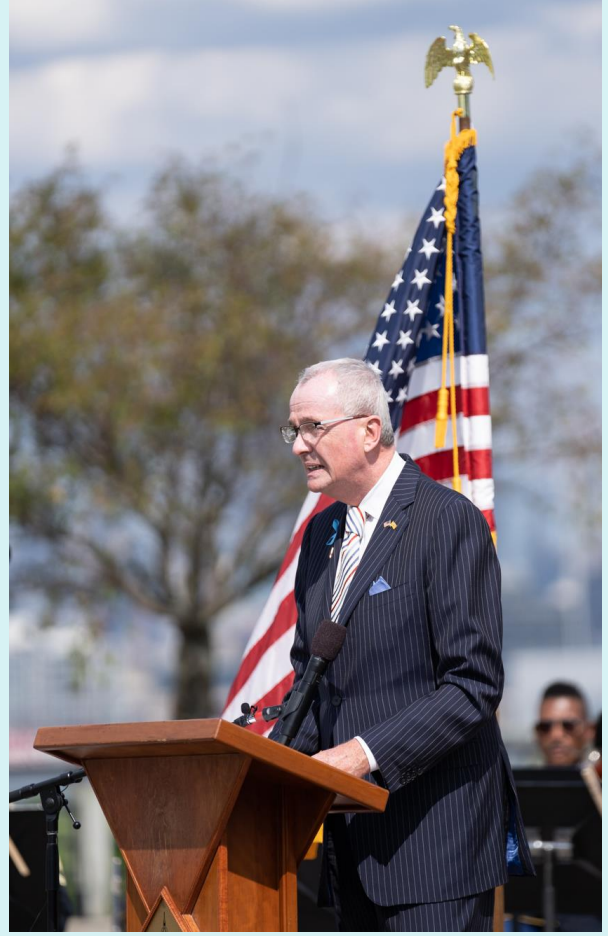
Residential Inhalation

Figure 12

Compliance with a non-residential SRS for a 4 acres site = Two 2-acre sized Functional Areas, with a minimum of 9 samples in each one.



Non-Residential



Thank you!

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New Provisions of Guidance: Property Boundary Contamination Associated with 75/10X Compliance Option

September 17, 2024

Greg Neumann, BEERA
Contaminated Site Remediation & Redevelopment

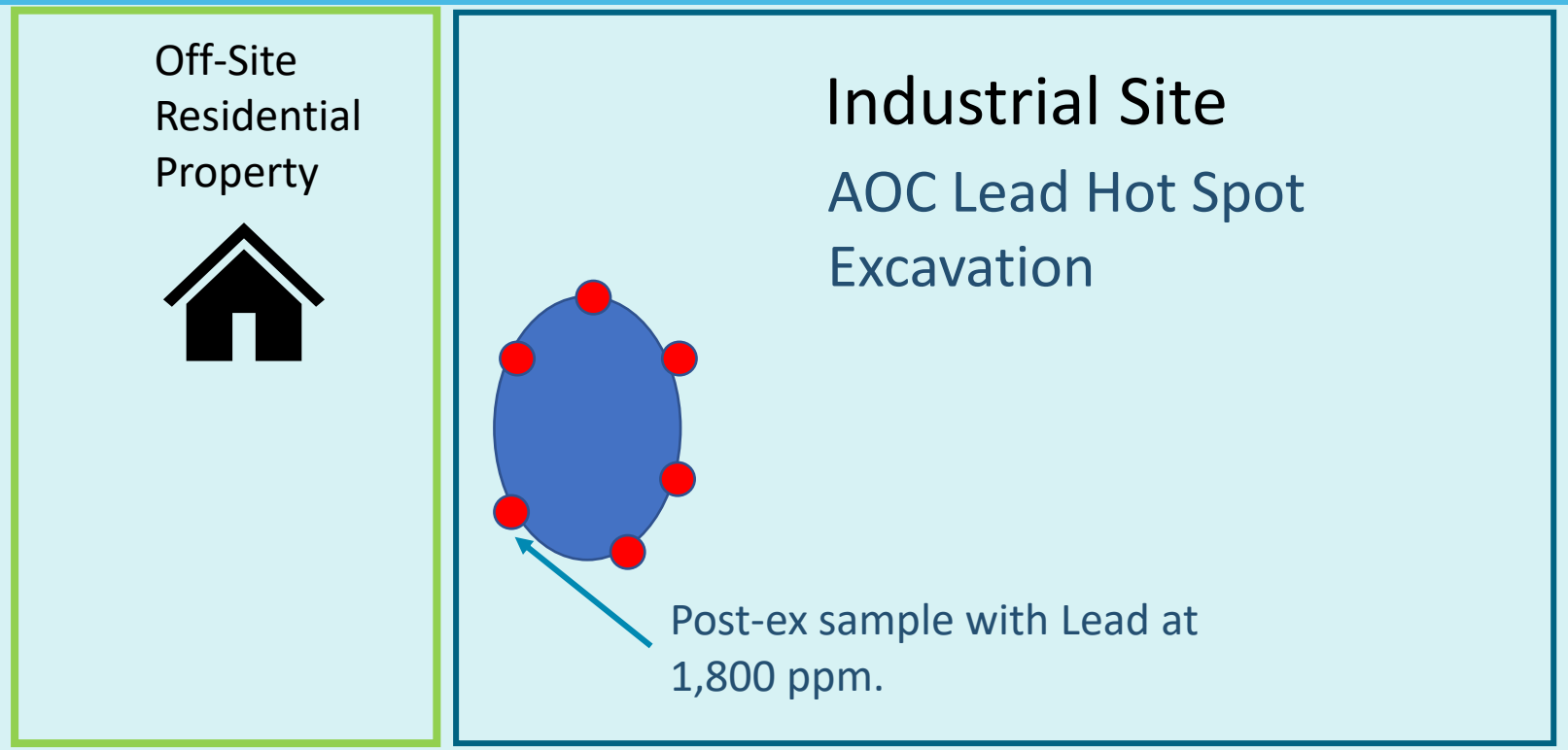
75%-10X compliance option near property boundary

Delineation of Pb at 1,800 ppm, in the direction of the residential property is required pursuant to N.J.A.C. 7:26E 4.2 (a) 1.i, 2, and 3. to document that contamination is not migrating off-site at concentrations above 200 ppm

Investigator should use professional judgment to determine when additional delineation sampling should take place

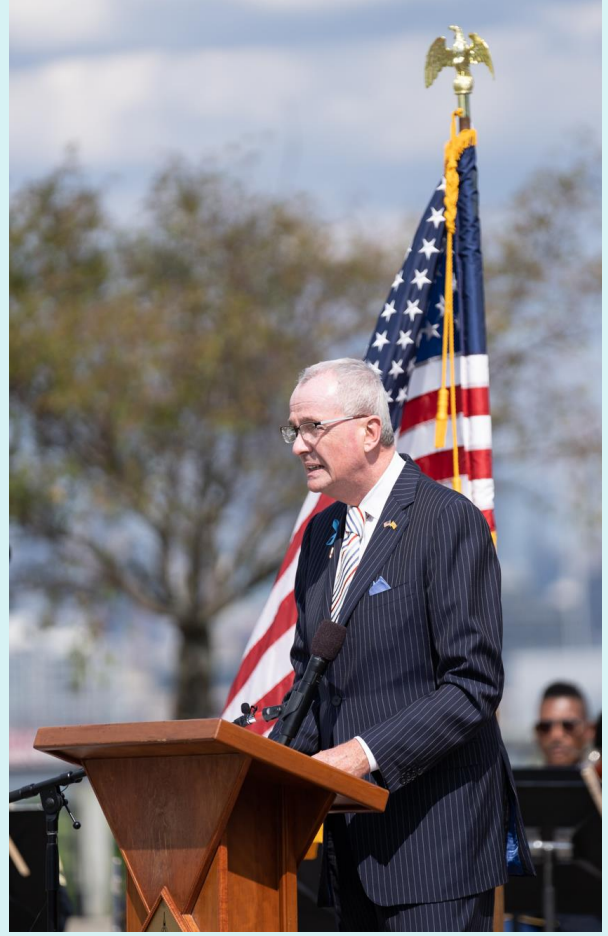
Site specific factors:

Concentration, distance between sample and property boundary, slope of property in area, potential for erosion, etc.



Pb Residential Ingestion/dermal SRS = 200 ppm

10 x 200ppm = 2,000 ppm



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New Provisions of Guidance: Functional Area Development in Conjunction with Alternate Remediation Standards (ARS)

September 17, 2024

Ted Toskos
Jacobs

Functional Area (FA)

- "**Functional area**" means an area of fixed size which corresponds to the areas of typical residential and non-residential sites
- The purpose of the functional area is to provide a fixed area, related to an AOC, where the samples from within the FA may be addressed with compliance averaging

Functional Area – Sample Selection

- Use the data necessary to delineate the AOC encompassed by the functional area(s)
- Data below regulatory concern other than those needed to delineate the AOC would not be included (except in Spatially Weighted Averaging)
- Data from AOCs that are not of regulatory concern also would not be included

Functional Area Default Sizes

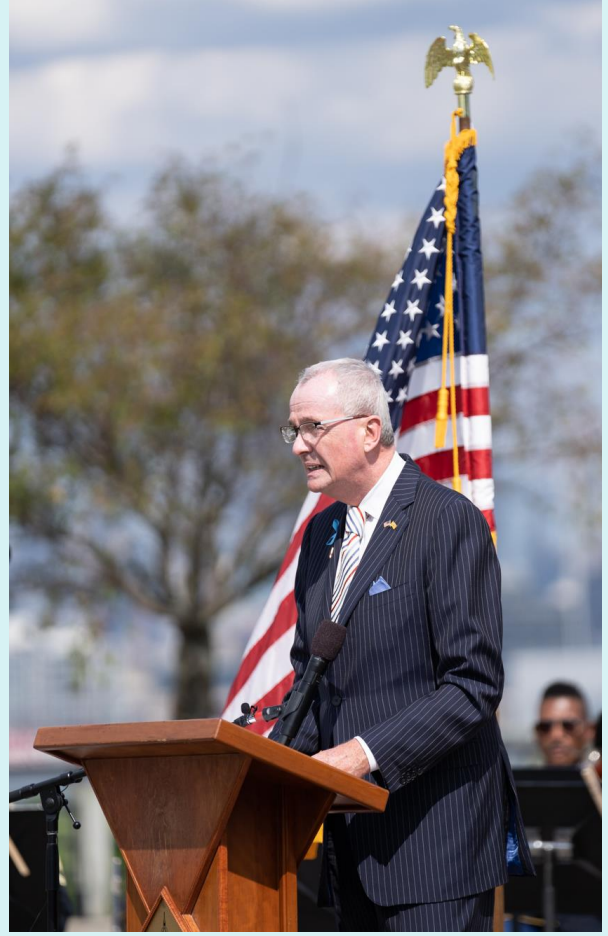
- Default sizes of Functional Areas as presented in the Attainment Guidance are:
  - Residential
    - Ingestion/Dermal - 0.25 acres
    - Inhalation - 0.5 acres
  - Non-residential - 2.0 acres

Functional Area Size Development with an Alternate Remediation Standard

- If an **Alternate Remediation Standard** (ARS) is developed following *"Alternative Remediation Standards Technical Guidance for Soil for the Ingestion-Dermal and Inhalation Exposure Pathways"* based on an exposure scenario **other than** residential or non-residential (***e.g.*, recreational land use**), and the ARS is approved by the Department;
- *AND* the investigator chooses to utilize **compliance averaging** in conjunction with the ARS and also develop Functional Areas **sizes** that are **different** than those contained in this guidance;
- *THEN* a Technical Consultation with the Department should be requested.

Functional Area Size Development with an Alternate Remediation Standard

- Using this option requires:
  - Recording of an institutional control-only Deed Notice,
  - Soil Remedial Action Permit (S-RAP) and
  - Limited Restricted Use Response Action Outcome (RAO)
- This is necessary to ensure that the remedy remains protective in the event of **future land use** changes to residential use



Thank you!

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New Provisions of Guidance: Single Vertical Zone for Compliance Averaging for Migration to Groundwater (MGW) Pathway

September 17, 2024

Steve Posten
WSP USA Environment & Infrastructure Inc.

Compliance Averaging for MGW-SRS

- Default Migration to Groundwater (MGW) SRS calculated using the EPA Soil-Water Partition Equation (SWPE):

$$MGW_c = GWRS * \frac{mg}{1000\mu g} * \left\{ (K_{oc} * f_{oc}) + \frac{\theta_w + (\theta_a * H')}{\rho_b} \right\} * DAF$$

GWRS = ground water remediation standard (ug/L)
f_{oc} = organic carbon content of soil (kg/kg)
K_{oc}=soil organic carbon-water partition coefficient (L/kg)
K_d = soil-water partition coefficient (L/kg)
θ_w = water-filled soil porosity (L_{water}/L_{soil})
θ_a = air-filled soil porosity (L_{air}/L_{soil})
H' = Henry's law constant (dimensionless)
ρ_b = dry soil bulk density (kg/L)
DAF = dilution-attenuation factor

Compliance Averaging for MGW-SRS

- A component of the SWPE is the Dilution Attenuation Factor (DAF):

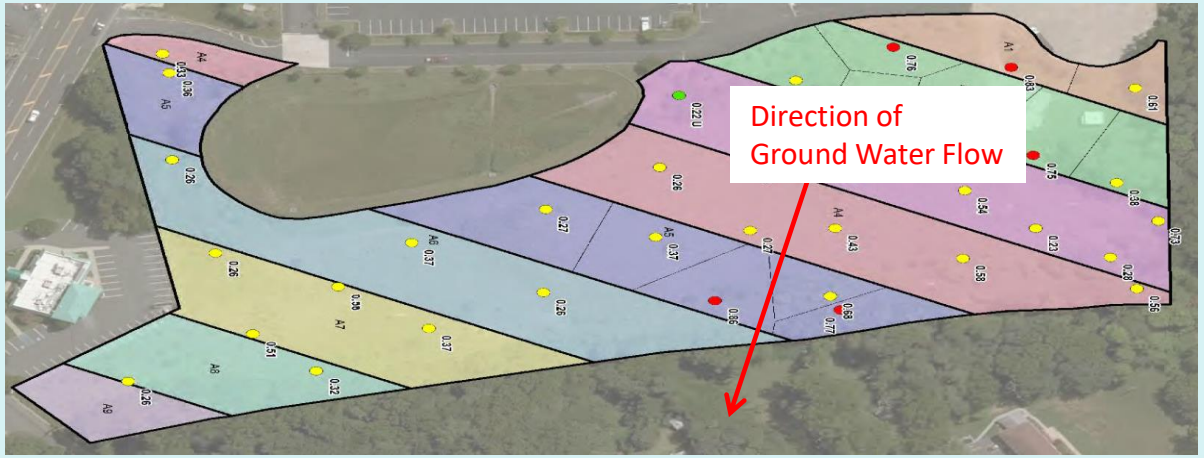
$$DAF = 1 + \frac{K * i * d}{I * L}$$

DAF = dilution-attenuation factor (unitless)
K = aquifer hydraulic conductivity (m/yr)
i = aquifer gradient (unitless)
d = mixing zone depth (m)
I = infiltration rate (m/yr)
L = length of area of concern parallel to ground water flow (m)

NJDEP default = 30 m (100 ft) = length of one side of ¼ acre square residential parcel

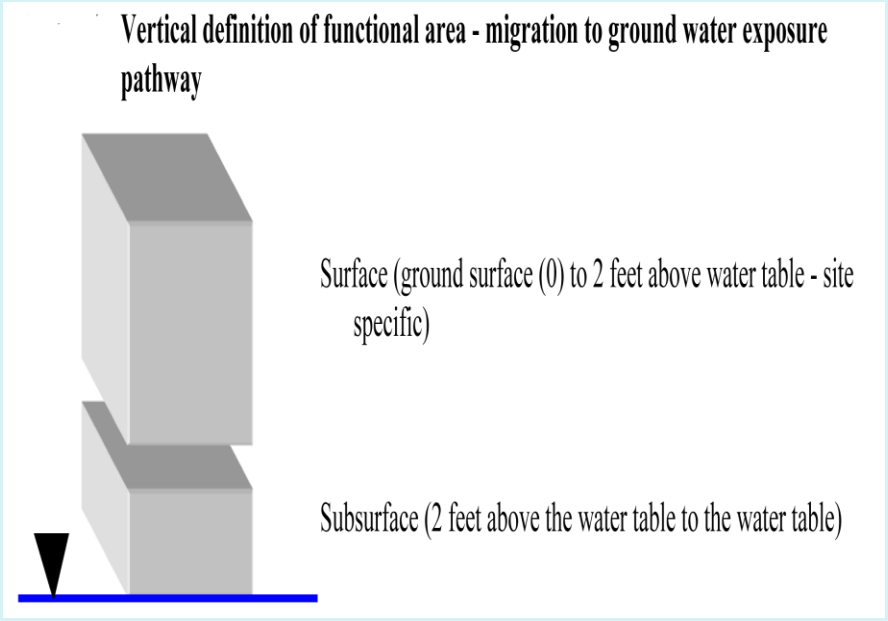
Compliance Averaging for MGW-SRS

- Length constraint incorporated into calculation of MGW-SRS requires that compliance averaging be performed within separate 100 ft lengths oriented along the direction of groundwater flow (width based on data defining extent of contamination)



Compliance Averaging for MGW-SRS

- In addition to the difficulty in establishing 100 ft lengths across the site/AOC, earlier guidance additionally required that compliance averaging be performed within two separate vertical zones:



This stipulation added complexity to the process, typically resulted in insufficient data for analysis and led to very limited application of compliance averaging for MGW-SRS

Compliance Averaging for MGW-SRS

- The committee reviewed the assumptions behind the derivation of the default MGW-SRS contained in EPA's description of the SWPE, and determined that use of a single vertical zone was appropriate for compliance averaging analyses:

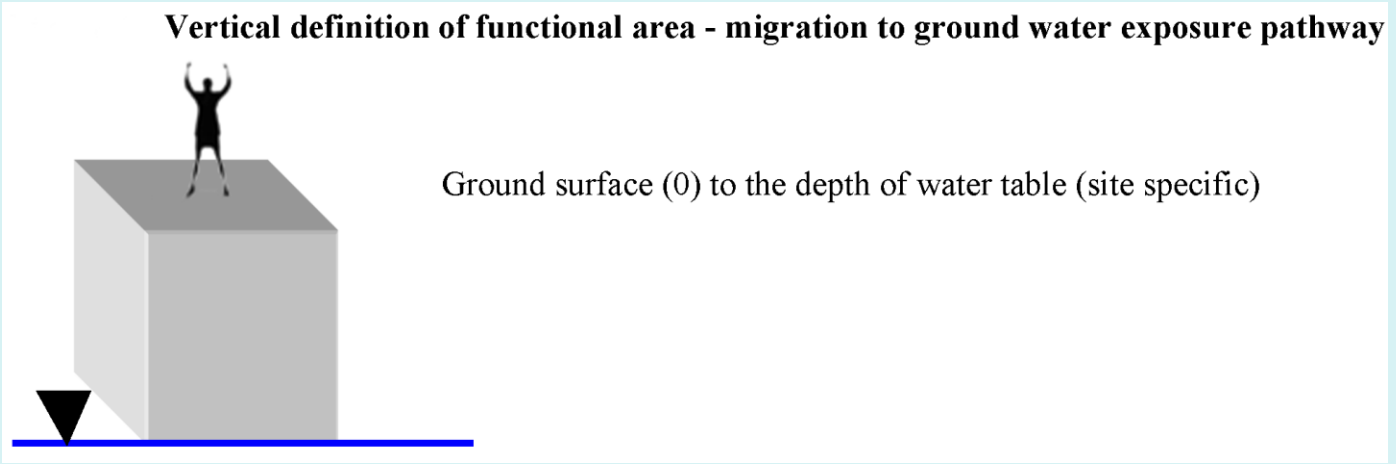
Highlight 2: Simplifying Assumptions for the Migration to Ground Water Pathway

- The source is infinite (i.e., steady-state concentrations will be maintained in ground water over the exposure period of interest).
- Contaminants are uniformly distributed throughout the zone of contamination.
- Soil contamination extends from the surface to the water table (i.e., adsorption sites are filled in the unsaturated zone beneath the area of contamination).
- There is no chemical or biological degradation in the unsaturated zone.
- Equilibrium soil/water partitioning is instantaneous and linear in the contaminated soil.
- The receptor well is at the edge of the source (i.e., there is no dilution from recharge downgradient of the site) and is screened within the plume.
- The aquifer is unconsolidated and unconfined (surficial).
- Aquifer properties are homogeneous and isotropic.
- There is no attenuation (i.e., adsorption or degradation) of contaminants in the aquifer.
- NAPLs are not present at the site.

(EPA Soil Screening Guidance: Technical Background Document, May 1996)

Compliance Averaging for MGW-SRS

- As a result, the updated guidance incorporates the need for only a single vertical zone for MGW-SRS compliance averaging analyses (using highest concentration sample from withing each boring across the full unsaturated thickness above the water table)



Test Poll #4

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How many vertical functional areas are needed to use compliance averaging for the SRS-MGW?

A. 1 – from ground surface to depth of water table
B. 2 - including one surface FA and one sub-surface FA

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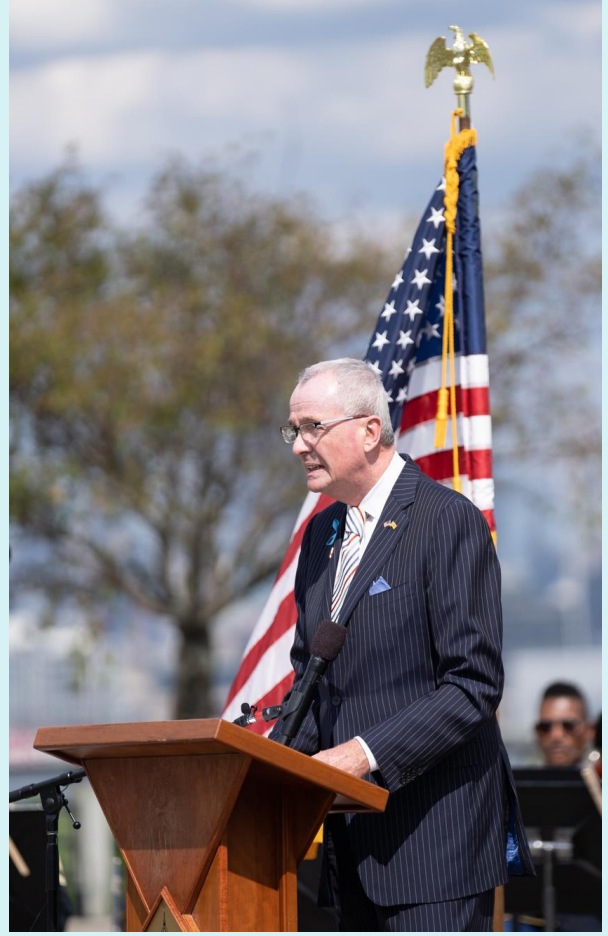

Thank you!

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Changes Resulting from Inconsistencies in Existing Guidance: Treatment of Non-Detect (ND) Values

September 17, 2024

Adam Hackenberg
Langan Engineering & Environmental Services

Treatment of Non-Detect Data

What value should I use when averaging using results that are non-detects (NDs)?

Inconsistent Approach in the "Old" Guidance (July 2021, Version 2.0):

Compliance / Averaging Method	Value to be Used for ND
Arithmetic Mean	"zero (0)"
95% UCL	"method detection limit (MDL)"
Spatially Weighted Averaging	"reporting limit" (RL)

Treatment of Non-Detect Data

The Decision-Making Process

- Selection of a value to represent ND is a subject that has been debated for decades[1]
- Commonly used values are between the MDL (usually lower) and RL (usually higher)
- The merits of the various approaches were extensively discussed amongst the Attainment Committee members and CCSR Management
- The RL was chosen as the basis for the value to be used because it is derived from instrument calibration rather than statistically[2]
- ½ of the RL was chosen to mitigate high bias that would result from using the RL

Notes:
1 – E.g., Currie, L.A., "Limits for Qualitative Decision and Quantitative Determination", Anal. Chem., 40:586 (1968)
2 - "Reporting limit" means, for a compound analyzed by a particular method, the sample equivalent concentration (that is, based on sample specific preparation and analysis factors), for organics, associated with the lowest concentration standard used in the calibration of the method and for inorganics, derived from the concentration of that analyte in the lowest level check standard (which could be the lowest calibration standard in a multi-point calibration curve)."

Treatment of Non-Detect Data

Sample/Analyte-Specific RLs v. *Target RLs from the SRS*

		2023 New Jersey Project Data*			*SRS RLs*
Chemical Name	Units	Sample Count	Minimum RL	**Median RL**	*RL Specified in 7:26D*
Tetrachloroethene	ug/kg	902	0.208	**1.3**	*5.0*
Trichloroethene	ug/kg	899	0.26	**1.2**	*5.0*
Vinyl Chloride	ug/Kg	830	0.399	**1.3**	*5.0*

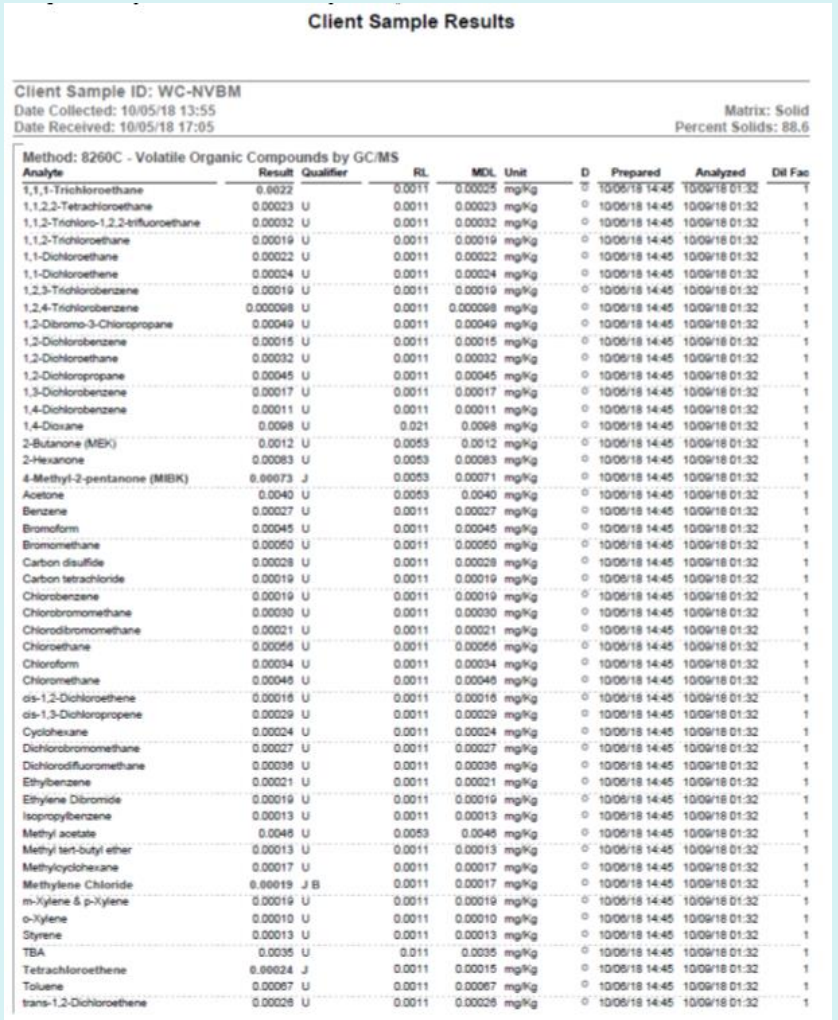
**** 2023 New Jersey project data represent around 900 individual samples from 40 different sites.***

Treatment of Non-Detect Data

Final Consensus-Based Decision:

- *For non-detect (ND) values, enter ½ of the RL concentration for the specific analyte as reported in the laboratory analytical data package*
- *In instances where ½ of the laboratory derived RL concentration is less than the Method Detection Limit (MDL), then the laboratory derived MDL concentration for the specific analyte(s) should be used to replace ND*

Treatment of Non-Detect Data



Client Sample Results

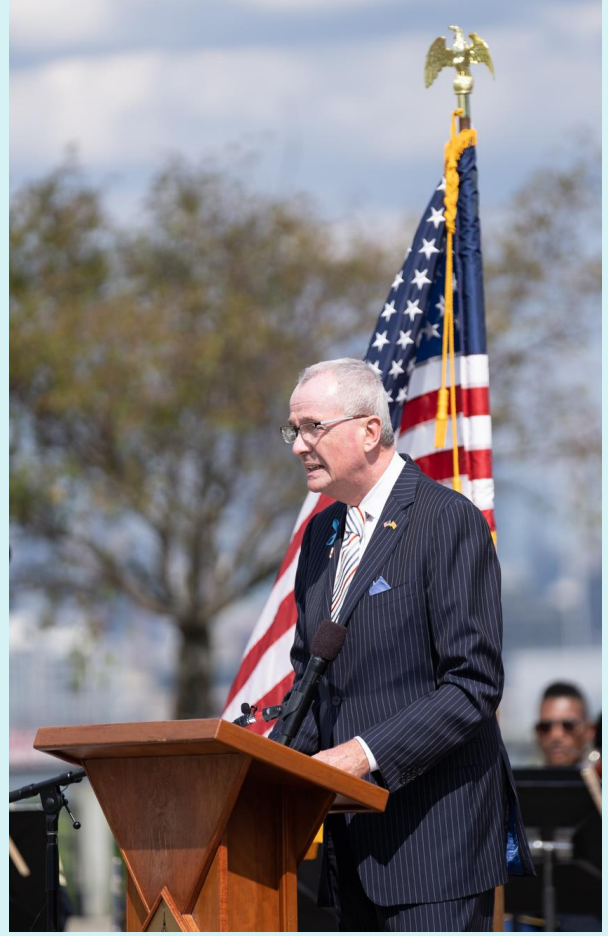
Client Sample ID: WC-NVBM
Date Collected: 10/05/18 13:55
Date Received: 10/05/18 17:05
Matrix: Solid
Percent Solids: 88.6

Method: 8260C - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1-Trichloroethane	0.0022		0.0011	0.00025	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
1,1,2,2-Tetrachloroethane	0.00023	U	0.0011	0.00023	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
1,1,2-Trichloro-1,2,2-trifluoroethane	0.00032	U	0.0011	0.00032	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
1,1,2-Trichloroethane	0.00019	U	0.0011	0.00019	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
1,1-Dichloroethane	0.00022	U	0.0011	0.00022	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
1,1-Dichloroethene	0.00024	U	0.0011	0.00024	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
1,2,3-Trichlorobenzene	0.00019	U	0.0011	0.00019	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
1,2,4-Trichlorobenzene	0.000098	U	0.0011	0.000098	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
1,2-Dibromo-3-Chloropropane	0.00049	U	0.0011	0.00049	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
1,2-Dichlorobenzene	0.00015	U	0.0011	0.00015	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
1,2-Dichloroethane	0.00032	U	0.0011	0.00032	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
1,2-Dichloropropane	0.00045	U	0.0011	0.00045	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
1,3-Dichlorobenzene	0.00017	U	0.0011	0.00017	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
1,4-Dichlorobenzene	0.00011	U	0.0011	0.00011	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
1,4-Dioxane	0.0098	U	0.021	0.0098	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
2-Butanone (MEK)	0.0012	U	0.0053	0.0012	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
2-Hexanone	0.00083	U	0.0053	0.00083	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
4-Methyl-2-pentanone (MIBK)	0.00073	J	0.0053	0.00071	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
Acetone	0.0040	U	0.0053	0.0040	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
Benzene	0.00027	U	0.0011	0.00027	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
Bromoform	0.00045	U	0.0011	0.00045	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
Bromomethane	0.00050	U	0.0011	0.00050	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
Carbon disulfide	0.00028	U	0.0011	0.00028	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
Carbon tetrachloride	0.00019	U	0.0011	0.00019	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
Chlorobenzene	0.00019	U	0.0011	0.00019	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
Chlorobromomethane	0.00030	U	0.0011	0.00030	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
Chlorodibromomethane	0.00021	U	0.0011	0.00021	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
Chloroethane	0.00056	U	0.0011	0.00056	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
Chloroform	0.00034	U	0.0011	0.00034	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
Chloromethane	0.00046	U	0.0011	0.00046	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
cis-1,2-Dichloroethene	0.00016	U	0.0011	0.00016	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
cis-1,3-Dichloropropene	0.00029	U	0.0011	0.00029	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
Cyclohexane	0.00024	U	0.0011	0.00024	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
Dichlorobromomethane	0.00027	U	0.0011	0.00027	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
Dichlorodifluoromethane	0.00036	U	0.0011	0.00036	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
Ethylbenzene	0.00021	U	0.0011	0.00021	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
Ethylene Dibromide	0.00019	U	0.0011	0.00019	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
Isopropylbenzene	0.00013	U	0.0011	0.00013	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
Methyl acetate	0.0046	U	0.0053	0.0046	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
Methyl tert-butyl ether	0.00013	U	0.0011	0.00013	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
Methylcyclohexane	0.00017	U	0.0011	0.00017	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
Methylene Chloride	0.00019	J B	0.0011	0.00017	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
m-Xylene & p-Xylene	0.00019	U	0.0011	0.00019	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
o-Xylene	0.00010	U	0.0011	0.00010	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
Styrene	0.00013	U	0.0011	0.00013	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
TBA	0.0035	U	0.011	0.0035	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
Tetrachloroethene	0.00024	J	0.0011	0.00015	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
Toluene	0.00067	U	0.0011	0.00067	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1
trans-1,2-Dichloroethene	0.00026	U	0.0011	0.00026	mg/Kg	☼	10/06/18 14:45	10/09/18 01:32	1

Required Documentation

Appendix C: For each sample where ½ of the RL is being used to replace a ND value in the calculation, the Analytical Results Summary Form (N.J.A.C 7:26E - Appendix A, II Reduced Deliverable Requirements at (b)1, (c)1, (d)1, and (e)1.) shall be submitted to document that the appropriate concentration has been used in the compliance averaging calculation.



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Attainment Guidance Version 3.0 Training

September 17, 2024

Questions?

https://forms.office.com/g/hXQRuABrcp