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Site Assessment and Contaminants of Emerging Concern

ASTSWMO

SITE ASSESSMENT FOCUS GROUP

April 25, 2023

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Appendices

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List of Acronyms

ASTSWMO – Association of State and Territorial Solid Waste Management Officials

CA – Cooperative Agreement

CECs – Contaminants of Emerging Concern

CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act

EPA – U.S. Environmental Protection Agency

USGS – U.S. Geological Survey

PFAS – Per- and polyfluoroalkyl substances

States – States and Territories

VOCs – Volatile Organic Compounds

UCMB – Unregulated Contaminant Monitoring Rule

GAC – Granulated Activated Carbon

ARARs – Applicable Relevant, and Appropriate Requirements

MCLs – Maximum Contaminant Levels

Acknowledgements

This document was prepared by the Association of State and Territorial Solid Waste Management Officials (ASTSWMO) Site Assessment Focus Group (Focus Group), with assistance from the U.S. Environmental Protection Agency (EPA) under Cooperative Agreement (CA) RT-83870001.

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The Focus Group would also like to express its appreciation to the following individuals who assisted in the development of this report:

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Executive Summary

In their work to protect human health and the environment, environmental programs are sometimes confronted with Contaminants of Emerging Concern (CECs), for which health impacts, federal regulatory standards, and laboratory standards may not be well established or present. Possible barriers to clear guidelines and standards may be the absence of data on the cumulative effects or entire chemical class of CECs, for example per- and polyfluoroalkyl substances (PFAS), the health impacts of individual CECs or the persistence and presence of CECs at high concentrations. States and Territories (States) face increasing pressure to evaluate and investigate these CECs, even in the absence of clear federal standards. As a result, States use a variety of approaches to assess CECs and some States develop their own screening levels and regulatory standards, leading to large inconsistencies between States.

The States face uncertainty on how to assess and address CECs in their Site Assessment Programs and beyond. The ASTSWMO Site Assessment Focus Group explored how States approached this challenge, what strategies were successful, and what barriers hindered assessment and progress in addressing CECs.

To achieve this, the Focus Group created and provided a data collection tool to all States. The goal of the data collection tool is as follows:

- Obtain, summarize, and report information about State's assessment of Contaminants of Emerging Concern (CECs);
- Provide key findings and recommendations about what strategies support States assessing CECs;
- Provide key findings about the barriers that hinder States assessing CECs; and,
- Identify where ASTSWMO, EPA, and States can help each other be prepared to assess and address CECs.

Most States conduct site-specific and groundwater sampling based on expected PFAS releases with the majority of responding States expecting to sample for PFAS in the next one to five years.

Based on these key findings, the Focus Group recommends communication and collaboration between the States, Territories, EPA and ASTSWMO to help address CECs in their State Site Assessment Programs and beyond. The Focus Group is currently expanding on this project by collaborating with the States and Territories (States) on PFAS. The new project involves identifying States most current approach or “road map” on addressing PFAS. The Focus Group’s goal is to gather, review, and share these “PFAS Road Maps” with States and Territories to support PFAS assessment work.

Section 1.0: Introduction

Section 1.1 What are Contaminants of Emerging Concern (CECs)

The ASTSWMO Contaminants of Emerging Concern Steering Committee defines CECs to include any physical, chemical, biological, or radiological substance or matter in any environmental media that may pose a risk to human and/or ecological health, is under regulated, and the presence, frequency of occurrence or source of which is not well understood, routinely, monitored, and/or may lack analytical methods.

This data collection tool considered the following CECs:

- Per- and Polyfluorinated alkyl substances (PFAS)
- Pesticides, Herbicides, Fungicides
- Nanomaterials/Microplastics
- Pharmaceuticals
- Neonicotinoids, hormones and sterols

Site Assessment programs must be prepared to evaluate CECs with the understanding that not all properties/receptors will want to participate and not all sources/responsible parties for released CECs will be willing to accept liability for investigating and remediating new chemicals that were not previously regulated. Site Assessment programs must also be prepared for responding to concerns that the costs associated with additional testing, analysis, and remediation will exceed projected budget forecasts. At the same time, Site Assessment programs must evaluate the risk of not assessing for CECs sooner – and not identifying potential environmental and human health impacts earlier - especially as other State programs begin to or are already doing so.

Section 1.2 Project Goal

The Site Assessment Focus Group identified CECs, and the uncertainty about how to assess and address CECs, as a challenge many States face in their Site Assessment Programs and beyond. The Focus Group was interested in determining how States approached this challenge, what strategies were successful, and what barriers hindered assessment and progress in addressing CECs.

To achieve this, the Focus Group created and provided a data collection tool to all States. The goal of this research is as follows:

- Obtain, summarize, and report information about State's assessment of CECs;
- Provide key findings and recommendations about what strategies support States assessing CECs;

- Provide key findings about the barriers that hinder States assessing CECs; and
- Identify where ASTSWMO, EPA, and States can help each other be prepared to assess and address CECs.

Section 1.3 Additional PFAS Resources

This report shares the results of the responses to a data collection tool on CECs provided in January and February 2022. The regulation and latest state of the science on CECs, and especially PFAS, are rapidly evolving. To stay up to date on the most recent information, the Site Assessment Focus Group recommends the resources below should be reviewed frequently and updated as needed.

Environmental Council of States (ECOS) PFAS website <https://www.ecos.org/pfas/> including the [ECOS White Paper: Processes and Considerations for Setting State PFAS Standards](#), which was published February 2020, updated in April 2021 and March 2022; Interstate Technology Regulatory Council (ITRC) PFAS website: <https://pfas-1.itrcweb.org/>

The results of the data collection tool were presented at the ASTSWMO August 2022 CERCLA and Brownfields Symposium in the presentation *Emerging Contaminants & CERCLA Sites: Challenges and Response Strategies*, by the Site Assessment and Post Construction Focus Groups.

Section 2.0: Data Collection Tool Methods

The prospect of finding data on how State programs deal with CECs is complicated since each State has differing levels of involvement and concern for addressing CECs. Due to the varying degree of involvement at the State level, the ASTSWMO Site Assessment focus group developed a data collection tool to inquire and evaluate resources State Site Assessment Programs have to identify CECs. The primary focus of the tool was to glean information on the status of CEC investigations, regulations, and issues facing States and U.S. Territories. The tool was developed to identify the following:

Which CECs are States interested in;

Where investigations have been focused;

The main industries of concern;

The State, Federal, or other funding programs the investigations performed under;

The environmental media investigated;

What guidance materials have been developed; and,

What mechanism is used to develop regulatory standards for CECs.

The CECs data collection tool is included as Appendix A for reference.

Each regional representative of the Site Assessment focus group was tasked to request reply to the data collection tool from each of the region’s States governing site assessment programs. The tool consisted of ten questions. Thirty-three responses were received from 28 States Four States had more than one response, possibly reflecting different agencies or programs addressing PFAS.

Section 3.0: Data & Results

Section 3.1 CEC investigations – Q1, Q2, Q4, Q5, Q7

The data collection tool included several questions about whether and how States assess CECs in their Site Assessment Programs. This included questions about whether States had conducted any CEC investigations, whether States were planning to sample for PFAS in the next years, whether States sampled for CECs under a federal agreement, and whether States had an approved lab method for analyzing soil and groundwater. The questions and responses are described in more detail below.

Q1a: Has your State conducted any investigations for the following CECs in the environment (soil, groundwater, surface water, wastewater, building materials, etc.): (i) PFAS; (ii) 1,4 Dioxane; (iii) Pesticides, herbicides, fungicides; or (iv) Others - please list CECs?

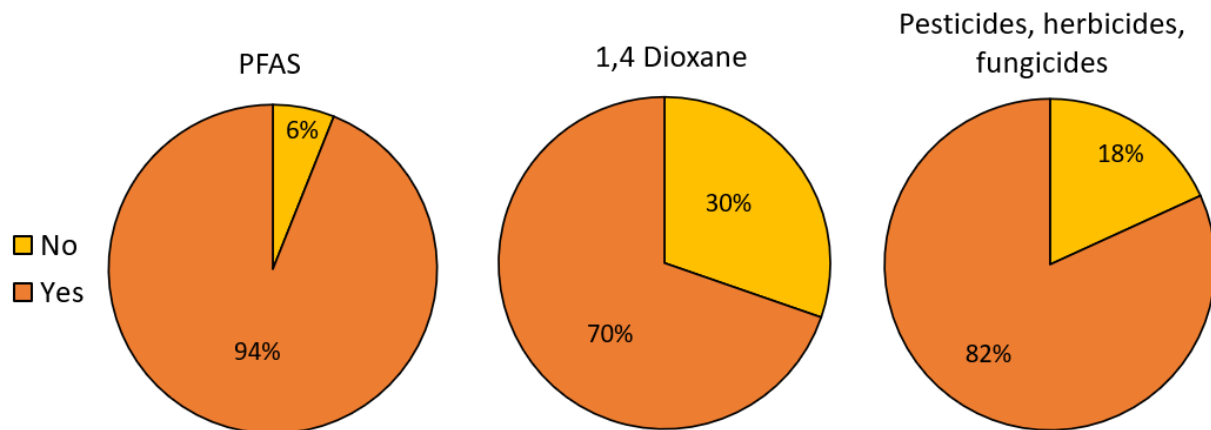


Figure 1: Responses to the question: Has your State conducted any investigations for the following CECs in the environment?

Of the thirty-three responses, thirty-one States had conducted investigations for PFAS, twenty-three States for 1,4 Dioxane, and twenty-seven States for pesticides, herbicides, and fungicides. Some States also reported investigating perchlorates, polychlorinated biphenyls (PCBs), pharmaceuticals, neo-nicotinoids, hormones, sterols, and volatile organic compounds (VOCs).

Q1b: Has your CEC investigation approach been (i) site-specific; (ii) industry-specific; (iii) regional; (iv) State-wide?

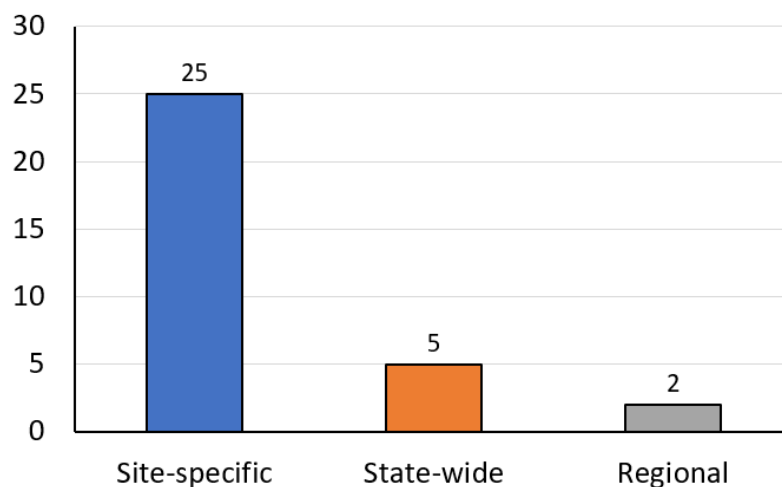


Figure 2: Response to the question: Has your CEC investigation approach been (i) site-specific; (ii) industry-specific; (iii) regional; (iv) State-wide?

Of the thirty-three responses, the majority (twenty-five) indicated conducting site-specific investigations. Only five States reported state-wide investigations. States were also asked to provide a brief discussion of the investigation they conducted. Generally, most responses discussed site-specific sampling based on suspected PFAS releases and sampling drinking water.

Q2: How likely is it that your State will sample sites for PFAS in the next: (i) 1 year, (ii) 5 years (iii) 10 years, or (iv) some years?

Of the thirty-two responses, the majority (twenty-six) expected to sample for PFAS within the next one to ten years. Only one State was unsure that PFAS sampling would happen within the next ten years, four States did not respond for five and ten years out. One State of the thirty-three responses to the data collection tool did not respond to this question.

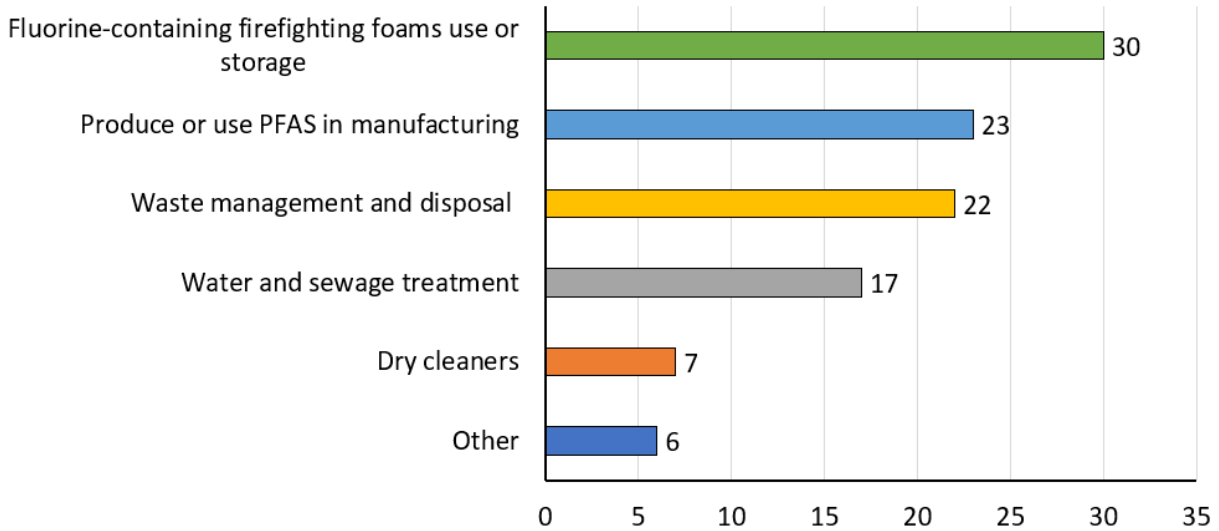


Figure 3: Responses to the question: What facilities or industries has your State identified to be associated with PFAS in the environment?

Q4: What facilities or industries has your State identified to be associated with PFAS in the environment?

Thirty States indicated they found PFAS associated with fluorine-containing firefighting foams, specifically areas where fluorine-containing firefighting foams are stored, used, or released such as firefighting training areas, airport hangars, and aircraft and vehicle crash sites. Twenty-three States said they found PFAS associated with facilities that produce or use PFAS or PFAS-containing products in manufacturing such as metal and textile plating and coating facilities, semi-conductor facilities.

Twenty-two States responded they found PFAS associated with waste management and disposal areas including landfills, incinerators, recycling facilities, composting facilities, land applied biosolids, and open burn/open detonation (OB/OD) facilities.

Seventeen States said they found PFAS associated water and sewage treatment systems and downstream water bodies. Seven States responded that PFAS were associated with dry cleaners, and six States responded “Other,” which included septic systems, land application of biosolids, air deposition, agricultural chemicals and ethanol production, and a tannery.

Q5: Has your State sampled for CECs under a federal memorandum or cooperative agreement?

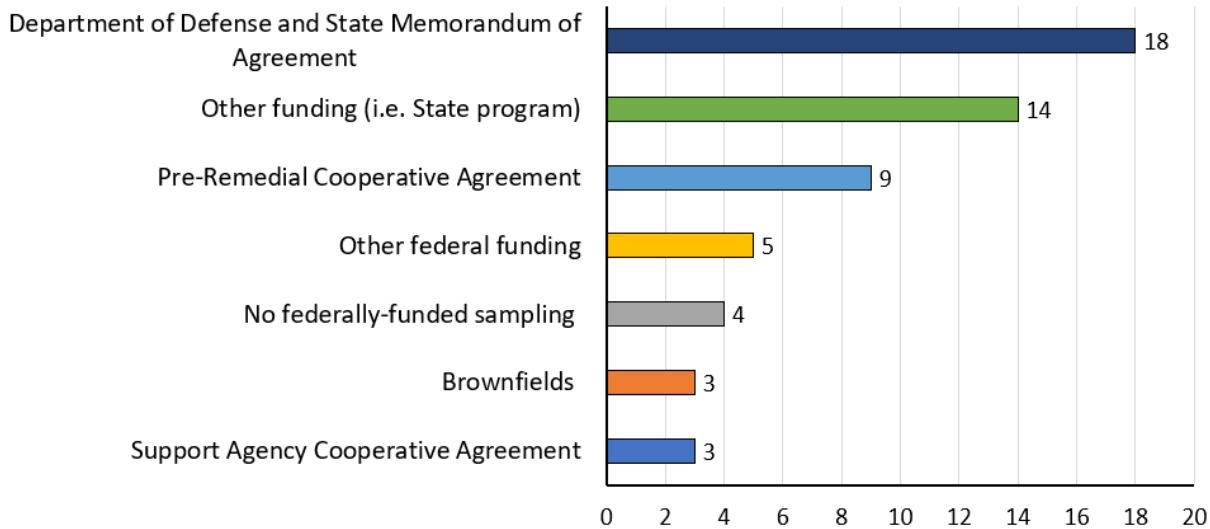


Figure 4: Responses to the question: Has your State sampled for CECs under a federal memorandum or cooperative agreement?

The most common funding sources for CEC investigations were the Department of Defense (DOD) and State Memorandum of Agreement (18) and other funding, such as a State program (14). Only a handful of States have conducted CEC investigations under a Pre-Remedial Cooperative Agreement (9), other federal funding (5), Brownfields (3), or a Support Agency Cooperative Agreement (3). Other federal funding sources mentioned included a Federal Facility Agreement, the Unregulated Contaminant Monitoring Rule (UCMR), Interagency Service Agreement, and the U.S. Geological Survey. Other State sources of funding included a Water Quality Assurance Revolving Fund, State bonds and Site Settlement Trusts, State Program and General Funds, and Watershed funds.

Q7: Does your State have approved lab methods for analyzing soil and groundwater samples for CECs?

An important consideration when conducting sampling for CECs is what lab methods to use and whether or not accepted lab methods exist for the media analyzed. Twenty-one States had accepted lab methods, nine said they did not, and three did not respond. Most States said they were using EPA methods or other federal methods, such as EPA 533 and 537.1 and 1633.

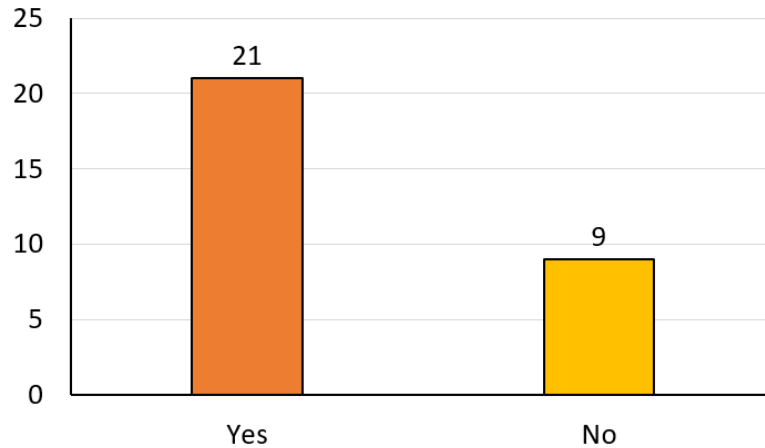


Figure 5: Responses to the question: Does your State have approved lab methods for analyzing soil and groundwater samples for CECs?

Section 3.2 Actions after identifying CECs - Q3, Q6

The data collection tool included two questions about possible State actions post CEC investigation and in the CERCLA process. The questions and responses are described in more detail below.

Q3: What actions has your State taken after identifying CEC contamination at a site?

States provided a variety of responses to the open-ended question about actions taken after identifying CEC contamination. These include voluntary and required follow-up investigation, mitigation and remediation. A priority was to eliminate exposure if drinking water was found to be impacted by providing alternate sources of water such as bottled water, treating impacted wells with granular activated carbon (GAC) or pump and treat – or by taking the impacted wells offline.

Q6: Has your State experienced issues with assessing and moving forward with NPL listings, removal actions, or the CERCLA five-year review process at sites with CECs?

Six States reported that CECs can have challenges moving forward at a site because lack of federal standards or listing as a hazardous waste can result in responsible parties or federal facilities not fully accepting PFAS as an Applicable, Relevant, and Appropriate Requirements (ARARs) or the driver for a removal action. While the majority (twenty-four) of respondents said they did not have any issues, this may have been because they have not yet had a site where CECs would have been the driver for an NPL listing, removal action, or a major decision factor in the CERCLA five-year review process.

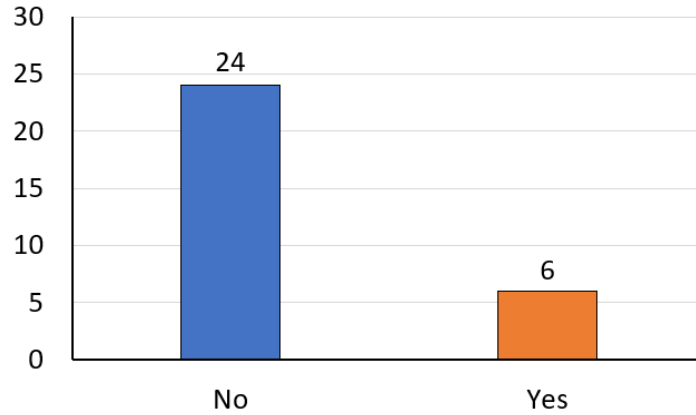


Figure 6: Responses to the question: Has your State experienced issues with assessing and moving forward with NPL listings, removal actions, or the CERCLA five-year review process at sites with CECs?

Section 3.3 CEC policy – Q8, Q9, Q10

The data collection tool included questions about States developing policy, guidance, or standards around CECs. The questions and responses are described in more detail in below.

Q8: Is your State environmental or health agency in the process of developing or adopting guidance, requirements (i.e., ARARs), standards, and/or statutes/regulations regarding PFAS? If yes, please provide brief discussion and adopted guidance/statutes, as well as a link to primary sources/approved methods.

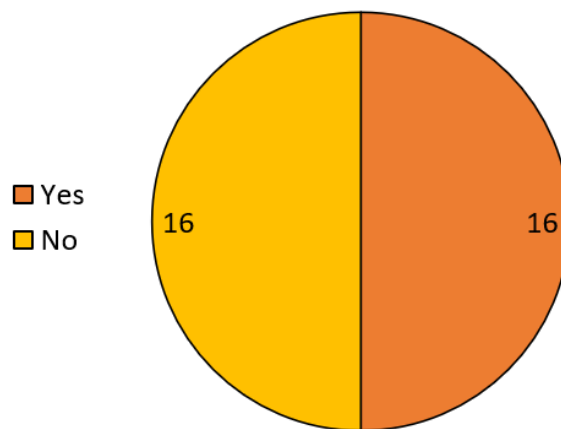


Figure 7: Responses to the question: Is your State environmental or health agency in the process of developing or adopting guidance, requirements (i.e. ARARs), standards, and/or statutes/regulations regarding PFAS?

Of the thirty-two responses, half (sixteen) reported that they were in the process of developing or adopting PFAS standards or guidance. The type of standards being developed included State maximum contaminant levels (MCLs) for drinking water, groundwater standards, soil cleanup standards, screening levels, hazardous constituent under hazardous waste regulations, and banning the use of PFAS-containing firefighting foam. One respondent left the question blank.

Q9: For each of the following, please respond if your State has a mechanism to create or establish a regulatory standard for CECs (soil, groundwater, surface water, wastewater, etc.).

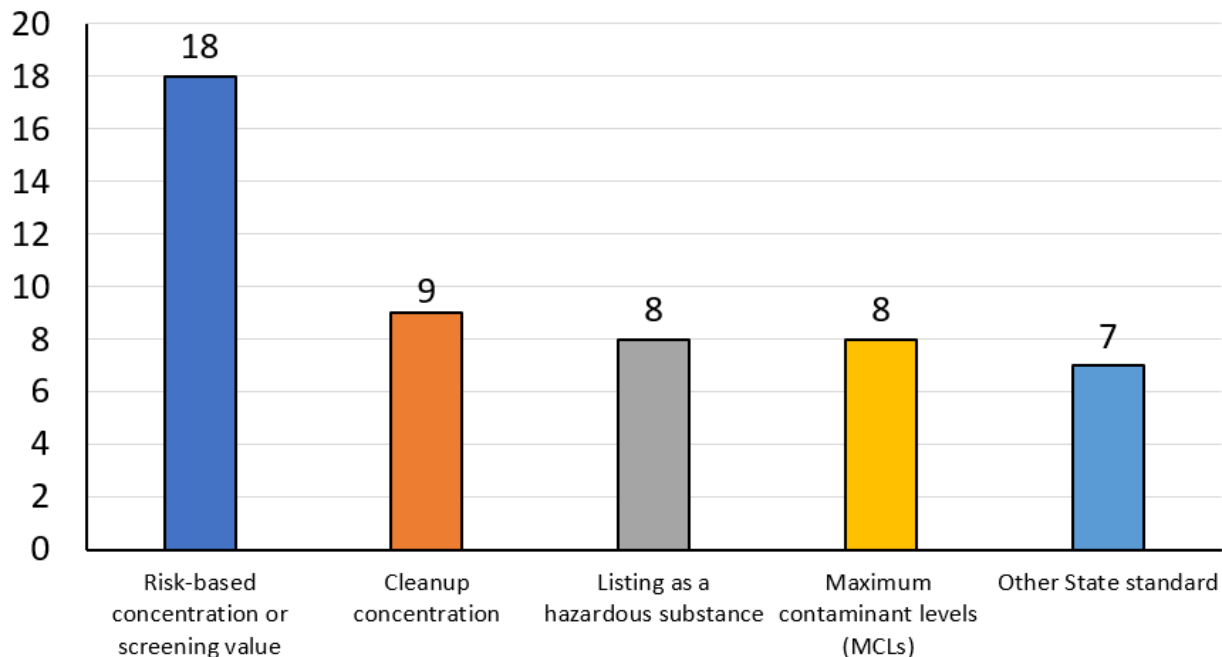


Figure 8: Responses to the question: For each of the following, please respond if your State has a mechanism to create or establish a regulatory standard for CECs (soil, groundwater, surface water, wastewater, etc.).

States have a variety of mechanisms for establishing regulatory standards for CECs in the environment. The most common mechanism is developing risk-based concentrations or screening values; of the thirty-two responses, eighteen reported this mechanism. Additional mechanisms included cleanup concentration (9), listing as a hazardous substance (8), maximum contaminant levels (8), or other State standards (7). Some States reported that the State Health Department will develop health-based values that the environmental agency can use to develop cleanup and risk-based concentrations.

Q10: In your opinion, what are the greatest risks and/or benefits (opportunity costs) for your State Site Assessment Program delaying PFAS investigations prior to EPA’s potential designation as a hazardous substance?

Twenty-six States responded to this open-ended question. Ten States mentioned that the greatest risk from delaying PFAS investigation included a delay in identifying and preventing exposure to PFAS from the environment and a delay in identifying the extent of PFAS contamination in the environment and on-going migration of existing contamination. As one State said, “*Our most significant mission is to protect public health and the environment. Delaying investigations may lead to unacceptable delays in protecting people from exposure to PFAS compounds.*” Several States also said that the lack of being able to fully enforce PFAS investigation and cleanup is a risk. Other risks mentioned included the need to go back to look for PFAS later, the lack of certainty in treatment, and that information changes. Benefits to delaying PFAS investigation included waiting for the science and standards to mature and having consistency among standards with EPA.

Section 4.0: Key Findings and Recommendations

The Focus Group’s goal for this research project is to help address States’ and Territories’ uncertainty of tackling CECs in their Site Assessment Programs and beyond. Based on the responses to the data collection tool, the following key findings were identified:

The majority of States conduct CEC investigations such as soil, groundwater, surface water, wastewater, building materials, etc. for PFAS, 1,4 Dioxane, pesticides, herbicides, fungicides, perchlorates, PCBs, pharmaceuticals, neonicotinoids, hormones, and sterols.

Most States conduct site-specific and groundwater sampling based on suspected PFAS releases.

The majority of responding States expect to sample for PFAS in the next one to five years.

States’ PFAS sampling indicates PFAS contamination is mainly associated with the following operations and facilities: fluorine-containing firefighting foams, PFAS-producing/containing products manufacturing, waste management, dry cleaners, and septic systems.

The most common financial sources for CEC investigations are from Department of Defense and State Memorandum of Agreement funds, followed by State program funding; few States have conducted CEC investigations under a Pre-Remedial Cooperative Agreement or with other federal funding sources.

About two-thirds of respondents have accepted CEC lab methods, the majority of them are using EPA methods or other federal methods.

States' actions taken after identifying CEC contamination vary from voluntary to required follow-up investigations, mitigation and remediation; top priorities are to eliminate exposure to impacted drinking water and to provide alternate drinking water sources.

Some States reported that CECs can have complication moving a site forward to an NPL listing due to the lack of federal standards, resulting in responsible parties not accepting PFAS as an ARAR or as a driver for removal action.

Based on these key findings, the Focus Group recommends communication and collaboration between the States, Territories, EPA and ASTSWMO will help address CECs in their State Site Assessment Programs and beyond. The Focus Group is currently collaborating with the States and Territories on PFAS for their next research project. It involves identifying their most current approach or "road map" on addressing this CEC. The Focus Group's goal is to gather, review, and share these "PFAS Road Map" with States and Territories to support PFAS assessment work.

APPENDICES

Appendix A: ASTSWMO Data Collection Tool

Appendix A: ASTSWMO Data Collection Tool

Title: *Site Assessment Programs and Contaminants of Emerging Concern*

Introduction: The ASTSWMO Site Assessment Focus Group has created this data collection tool to evaluate the resources Site Assessment Programs have to identify Contaminants of Emerging Concern (CEC).

The ASTSWMO Contaminants of Emerging Concern Steering Committee "defines CECs to include any physical, chemical, biological, or radiological substance or matter in any environmental media that may pose a risk to human and/or ecological health, is under regulated, and the presence, frequency of occurrence or source of which is not well understood, routinely monitored, and/or may lack analytical methods."

1. Has your State conducted any investigations for the following CECs in the environment (soil, groundwater, surface water, wastewater, building materials, etc.)? (Y/N)
 - a. PFAS? (Y/N)
 - b. 1,4 Dioxane? (Y/N)
 - c. Pesticides, herbicides, fungicides? (Y/N)
 - d. Others? Please list CECs. (short answer)
 - e. Has your CEC investigation approach been (multiple choice)
 1. Site-specific
 2. Industry-specific
 3. Regional
 4. State-wide
 - f. If your State has investigated CECs in the environment, please provide a brief discussion of the investigation conducted. (short answer)

2. How likely is it that your State will sample sites for PFAS in the next
 - a. 1 year? (Very Unlikely, Unlikely, Likely, Very Likely, Unsure)
 - b. 5 years? (Very Unlikely, Unlikely, Likely, Very Likely, Unsure)
 - c. 10 years? (Very Unlikely, Unlikely, Likely, Very Likely, Unsure)
 - d. Some years? (Very Unlikely, Unlikely, Likely, Very Likely, Unsure)

3. What actions has your State taken after identifying CEC contamination at a site? (short answer)

4. What facilities or industries has your State identified to be associated with PFAS in the environment? Please select all that apply. (multiple choice)
 - a. Areas where fluorine-containing firefighting foams are stored, used, or released such as
 - i. firefighting training areas,
 - ii. airport hangers, and
 - iii. aircraft and vehicle crash sites
 - b. Facilities that produce or use PFAS or PFAS-containing products in manufacturing such as
 - i. metal and textile plating and coating facilities,
 - ii. Semi-conductor facilities
 - c. Waste management and disposal areas including
 - i. landfills,
 - ii. incinerators,
 - iii. recycling facilities,
 - iv. composting facilities,
 - v. land applied biosolids, and
 - vi. open burn/open detonation (OB/OD) facilities, and
 - d. Water and sewage treatment systems
 - i. And downstream water bodies.
 - e. Dry cleaning facilities
 - f. Other (short answer)

5. Has your State sampled for CECs under a federal memorandum or cooperative agreement? (Y/N)? If yes, which one? (multiple choice)
 - a. Pre-Remedial Cooperative Agreement
 - b. Support Agency Cooperative Agreement
 - c. Brownfields/EPA Memorandum of Agreement
 - d. Department of Defense and State Memorandum of Agreement
 - e. Other? If other, please describe: _____ (short answer)
 - f. Please also list if you are using other funding (i.e. State program) to sample for CECs. (short answer)

6. Has your State experienced issues with assessing and moving forward with NPL listings, removal actions, or the CERCLA five-year review process at sites with CECs? (Y/N)
 - a. If yes, please describe the main problem. (short answer)

7. Does your State have approved lab methods for analyzing soil and groundwater samples for CECs? (Y/N)
 - a. If yes, please include CEC and approved methods (short answer)
 - b. If no, is this an obstacle for your State's programs (Site Assessment or others)? (short answer)

8. Is your State environmental or health agency in the process of developing or adopting guidance, requirements (i.e. ARARs), standards, and/or statutes/regulations regarding PFAS? (Y/N)
 - a. If yes, please provide brief discussion and adopted guidance/statutes, as well as a link to primary sources/approved methods. (short answer)

9. For each of the following, please respond if your State has a mechanism to create or establish a regulatory standard for CECs (soil, groundwater, surface water, wastewater, etc.):
 - a. Listing as a hazardous substance? (Y/N)
 - b. Maximum contaminant levels (MCLs)? (Y/N)
 - c. Cleanup concentration? (Y/N)
 - d. Risk-based concentration or screening value (Y/N)
 - e. Other State standard? (Y/N)
 - f. If you answered yes for any of the above, please describe the mechanism used, for which CECs, and provide a link to the applicable regulation or website with more information. Also, please also explain any issues using such mechanisms. (short answer)

10. In your opinion, what are the greatest risks and/or benefits (opportunity costs) for your State Site Assessment Program delaying PFAS investigations prior to EPA's potential designation as a hazardous substance? (short answer)