

U.S. EPA Biosolids Program Update

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BIOSOLIDS PROGRAM

HEALTH AND ECOLOGICAL CRITERIA DIVISION

OFFICE OF SCIENCE AND TECHNOLOGY | OFFICE OF WATER

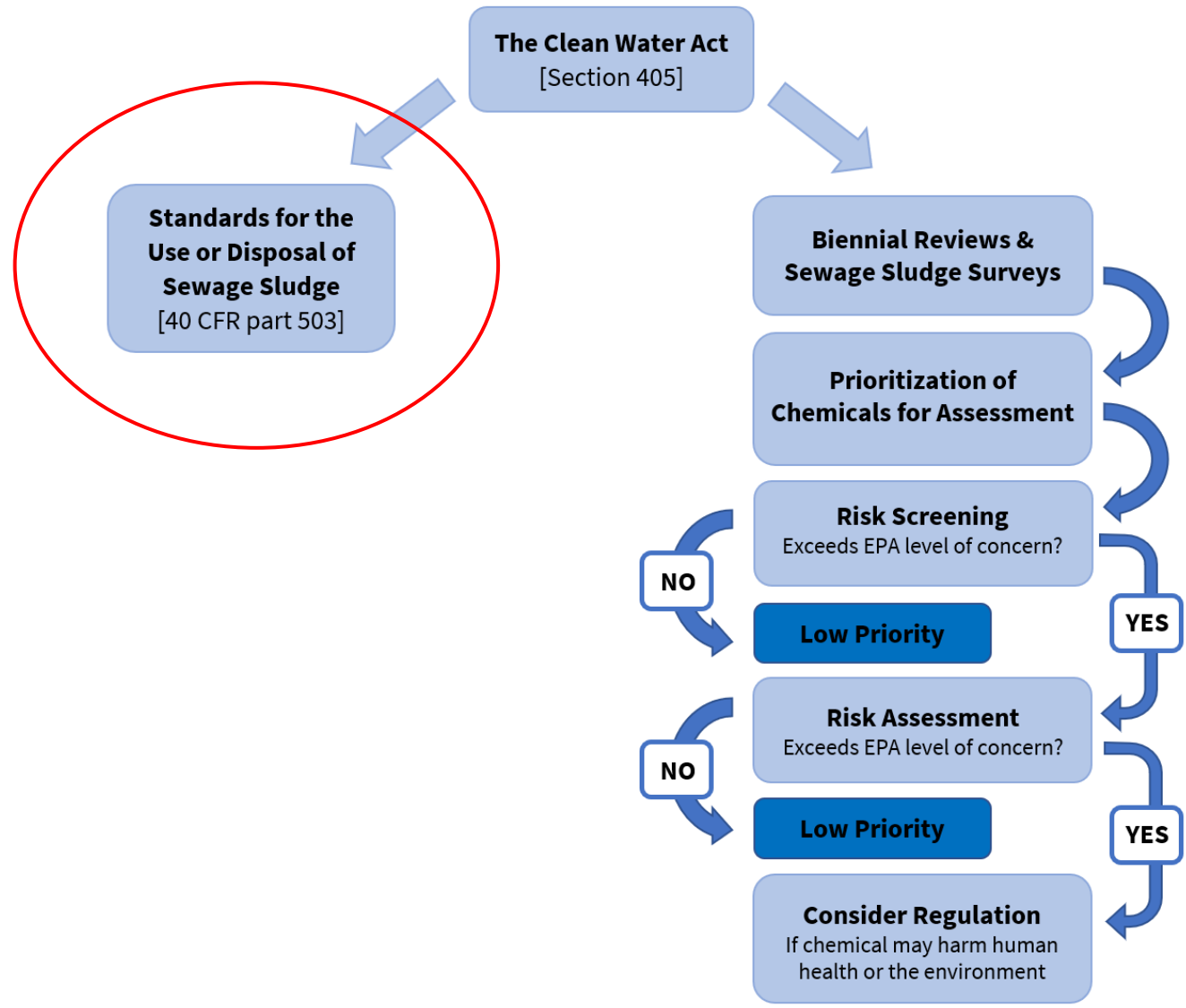
Chesapeake Bay Program Toxic Contaminant Workgroup

August 9, 2023

Disclaimer

The views expressed in this presentation are those of the author and do not necessarily represent the views or policies of the U.S. Environmental Protection Agency.

40 CFR Part 503 – Standards for the Use or Disposal of Sewage Sludge



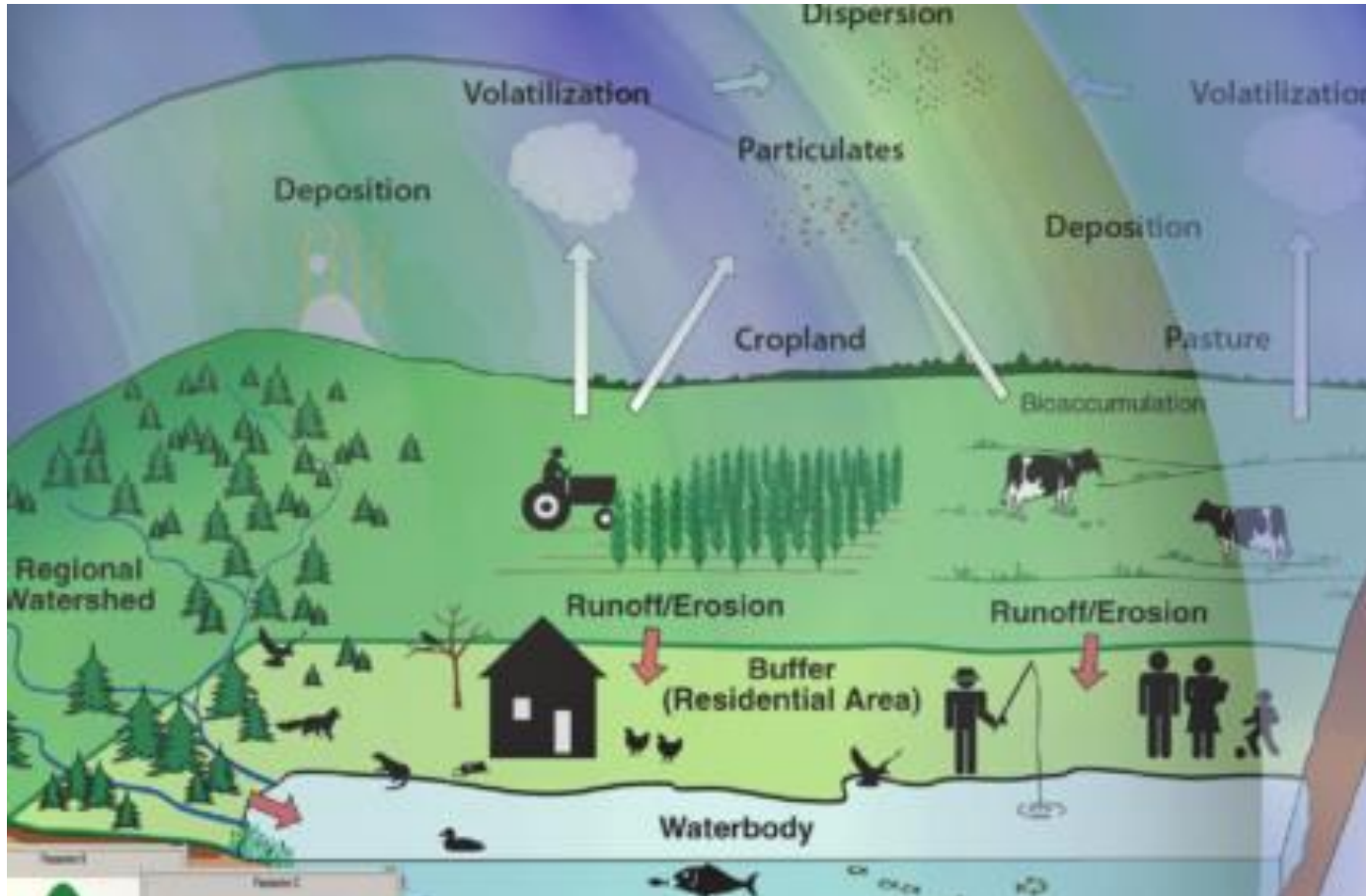
Assessing Risk from Pollutants Found in Biosolids

What is Risk Assessment?

Risk assessment is a scientific process. In general terms, risk depends on the following three factors:

- 1) How much of a stressor is present** in an environmental medium (e.g., soil, water, air) over what geographic area,
- 2) How much contact (exposure)** a person or ecological receptor has with the contaminated environmental medium, and
- 3) How it affects** the health of humans or ecological receptors (i.e. toxicity).

Biosolids – Conceptual Model



Human Health risk

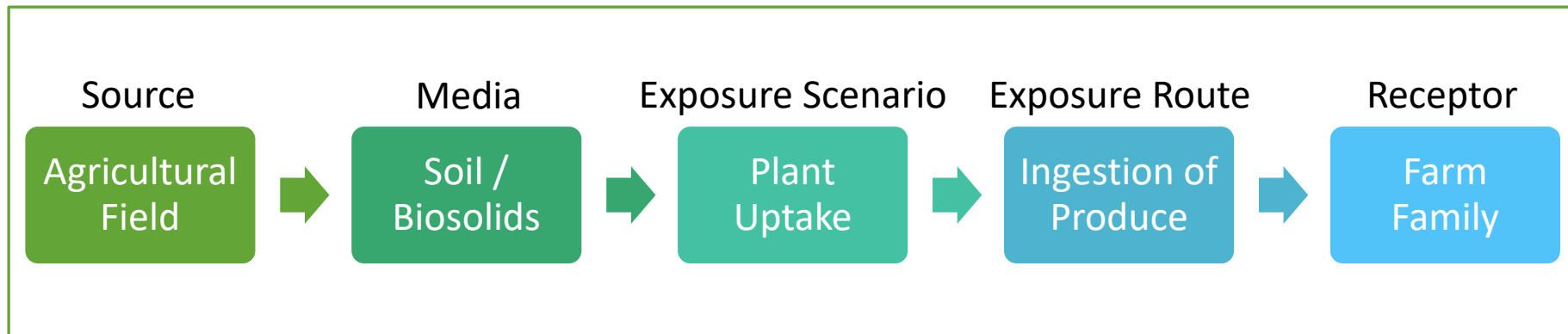
- Inhalation
- Drinking water
- Diet
- Soil ingestion

Ecological risk

- Water
- Soil
- Terrestrial

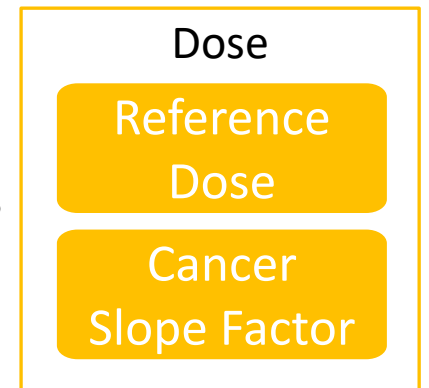
Example Exposure Pathway - Dietary

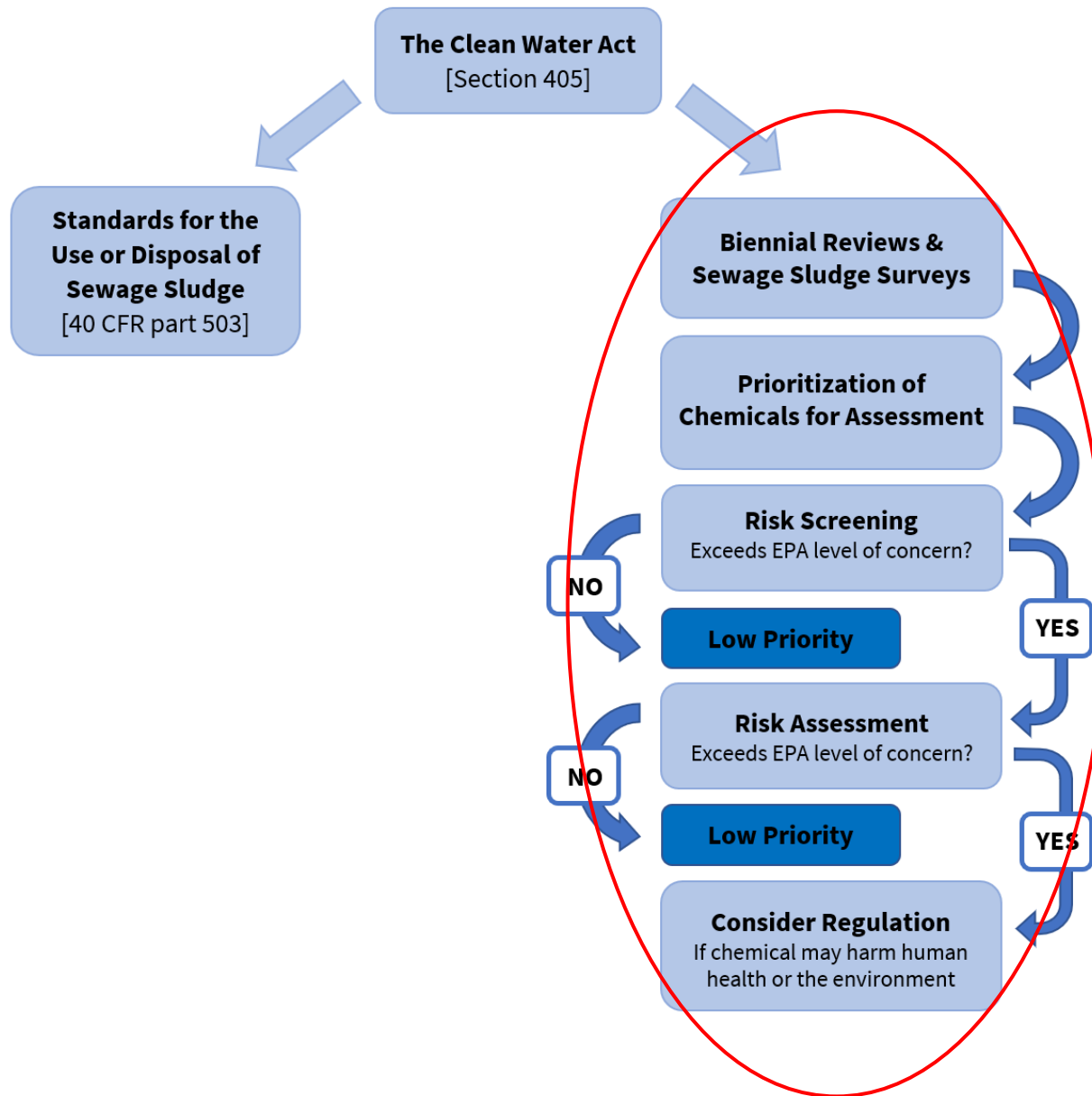
EXPOSURE

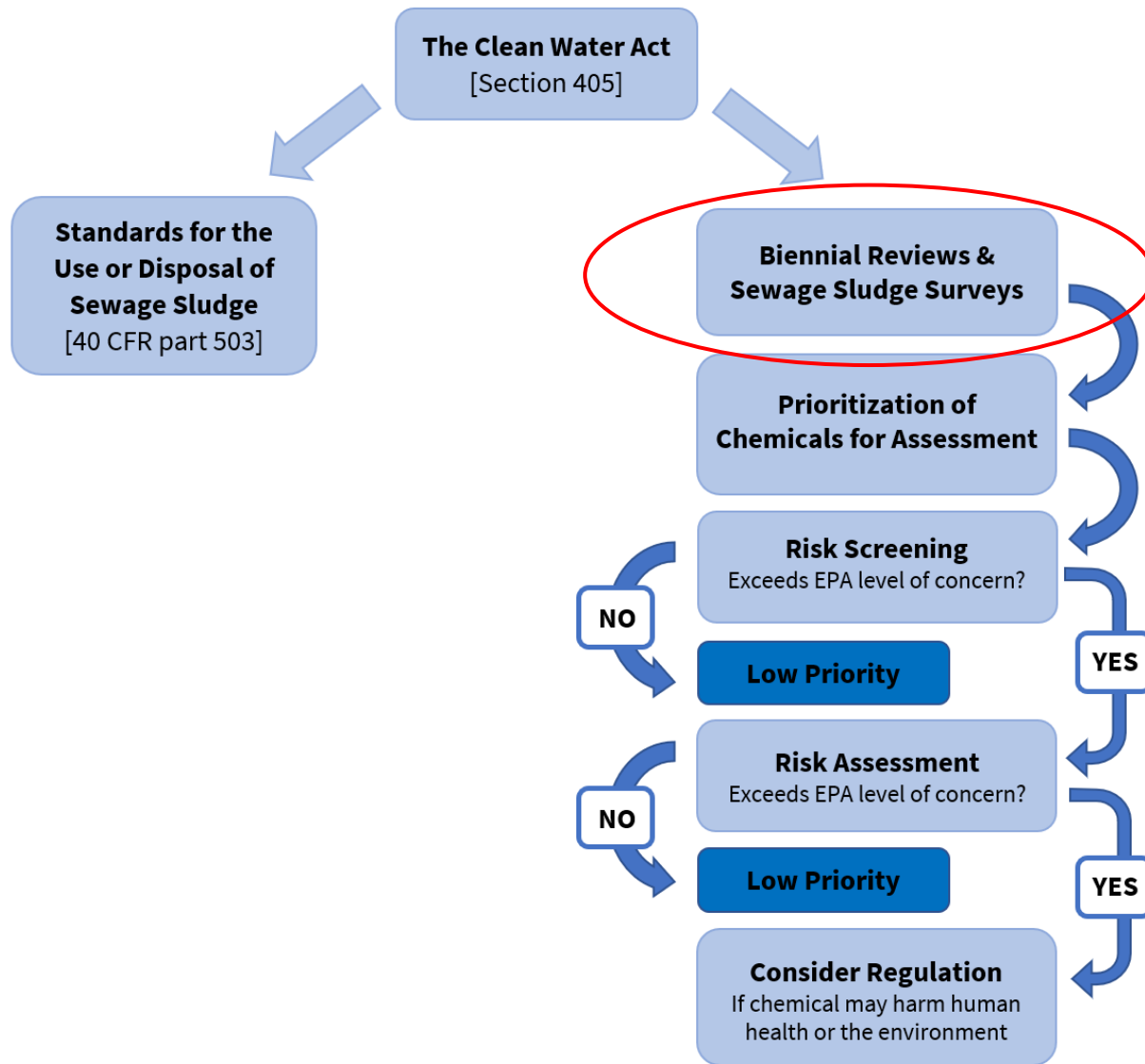


vs

HAZARD







Biennial Reviews & Sewage Sludge Surveys

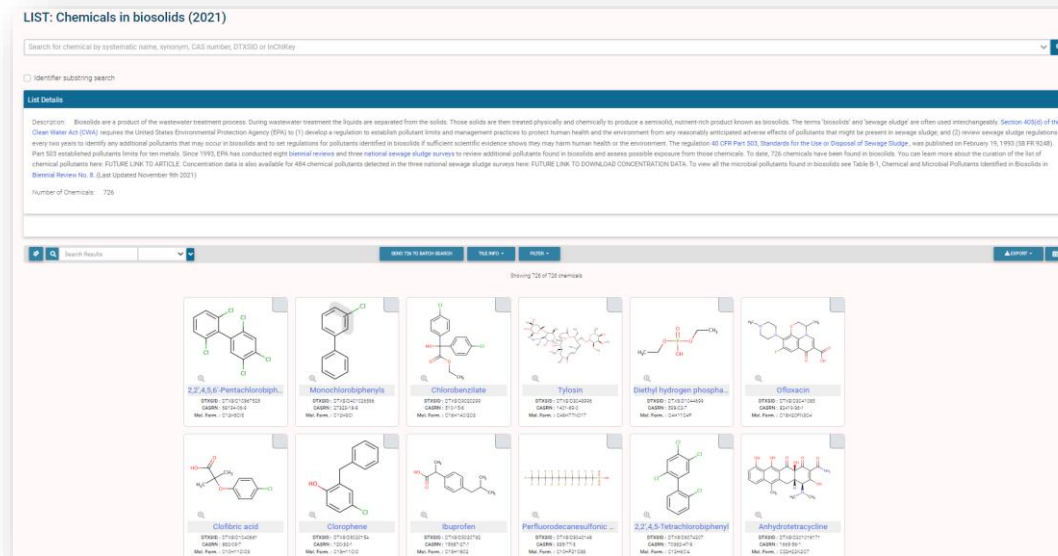
Biennial Reports
BR No.1 (2004-2005)
BR No.2 (2006-2007)
BR No.3 (2008-2009)
BR No.4 (2010-2011)
BR No.5 (2012-2013)
BR No.6 (2014-2015)
BR No.7 (2016-2017)
BR No.8 (2018-2019)
BR No.9 (2020-2021)

Sewage Sludge Surveys
1988 National Sewage Sludge Survey
2001 National Sewage Sludge Survey
2006 Targeted National Sewage Sludge Survey

- Initiated planning for the next national sewage sludge survey

Biosolids List on EPA's CompTox Chemicals Dashboard

- Link: <https://comptox.epa.gov/dashboard/chemical-lists/BIOSOLIDS>



LIST: Chemicals in biosolids (2021)

Search for chemical by systematic name, synonym, CAS number, RTECSID or InChIKey

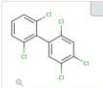
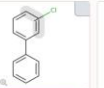


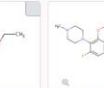


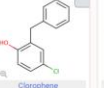
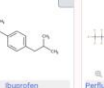



Identify substance search

List Details

Description: Biosolids are a product of the wastewater treatment process. During wastewater treatment the liquids are separated from the solids. These solids are then treated physically and chemically to produce a semi-solid, nutrient-rich product known as biosolids. The terms "biosolids" and "sewage sludge" are often used interchangeably. Section 402(g) of the Clean Water Act (CWA) requires the United States Environmental Protection Agency (EPA) to (1) develop a regulation to establish pollutant limits and management practices to protect human health and the environment from any reasonably anticipated adverse effects of pollutants that might be present in sewage sludge, and (2) revise sewage sludge regulations every two years to identify any additional pollutants that may occur in biosolids and to set regulations for pollutants identified in biosolids if sufficient scientific evidence shows they may harm human health or the environment. The regulation 40 CFR Part 503, Standards for the Use or Disposal of Sewage Sludge, was published on February 18, 1993 (58 FR 9348). Part 503 established pollutant limits for ten metals. Since 1993, EPA has conducted eight biennial reviews and three national sewage sludge surveys to review additional pollutants found in biosolids and assess possible exposure from these chemicals. To date, 726 chemicals have been found in biosolids. You can learn more about the curation of the list of chemical pollutants here: [EPA USE LINK TO ARTICLE](#). Concentration data is also available for 464 chemical pollutants detected in the three national sewage sludge surveys here: [EPA USE LINK TO DOWNLOAD CONCENTRATION DATA](#). To view all the individual pollutants found in biosolids see Table B-1, Chemical and Microbial Pollutants Identified in Biosolids in Biennial Review No. 8. (Last Updated November 9th 2021)

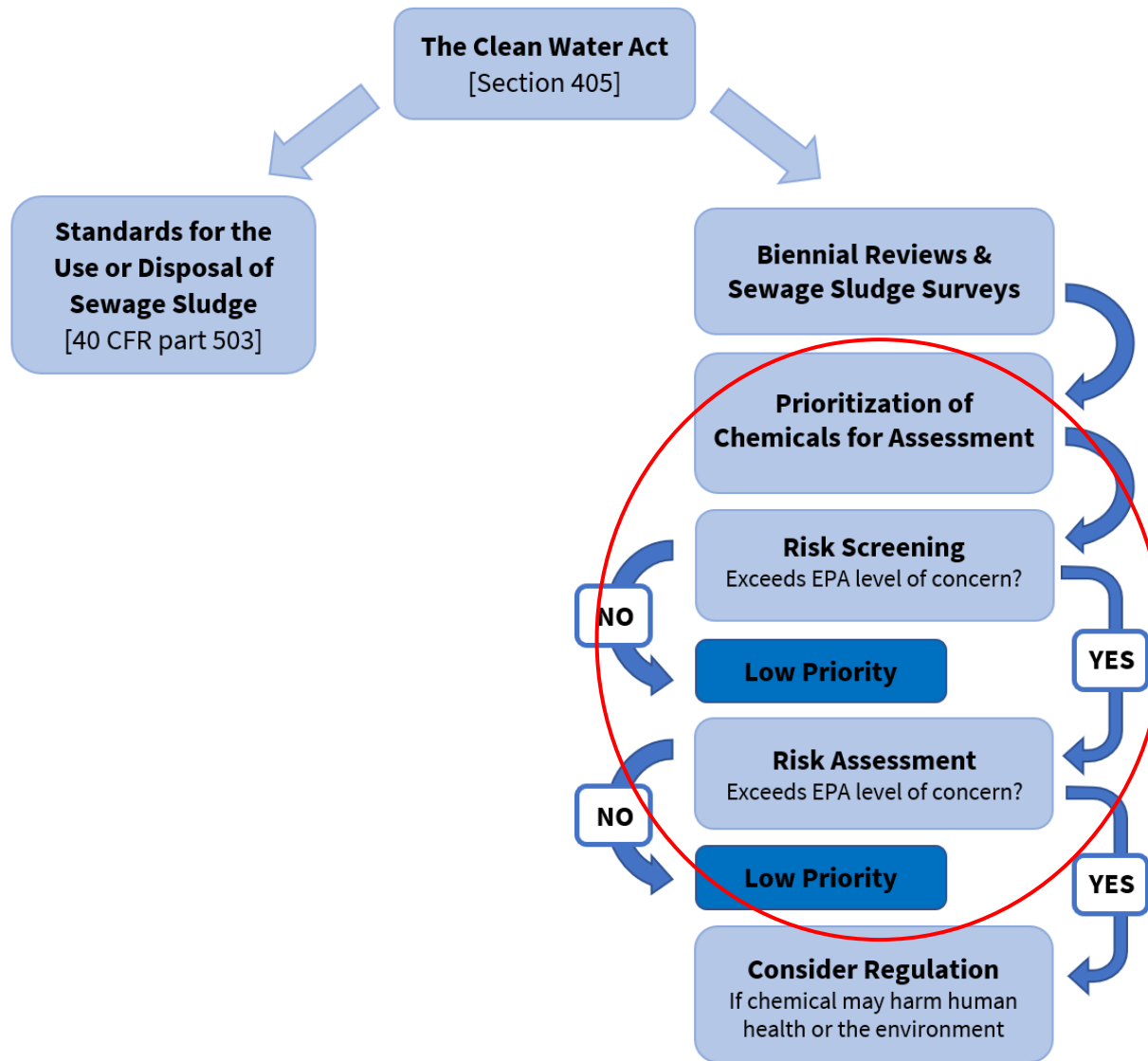
Number of Chemicals: 726

Showing 12 of 726 chemicals

 2,2',4,5,6'-Pentachlorobiphenyl EPA ID: C1740138702 CAS#: 2104-48-8 Mol. Wt.: 370.953	 Monochlorobiphenyls EPA ID: C1740133355 CAS#: 2103-16-8 Mol. Wt.: 174.047	 Chlorobenzotetra EPA ID: C174022225 CAS#: 2117-6 Mol. Wt.: 176.04222	 Tylosin EPA ID: C174022495 CAS#: 141-81-3 Mol. Wt.: 546.70217	 Diethyl hydrogen phospho EPA ID: C1740124493 CAS#: 284-72-7 Mol. Wt.: 164.1248	 Ofloxacin EPA ID: C1740224188 CAS#: 184758-8 Mol. Wt.: 319.07824
 Clofibric acid EPA ID: C1740124089 CAS#: 4852-87-9 Mol. Wt.: 254.27128	 Cloprophene EPA ID: C1740222716 CAS#: 122331 Mol. Wt.: 178.07183	 Ibuprofen EPA ID: C1740222716 CAS#: 15687-27-1 Mol. Wt.: 206.273	 Perfluorodecansulfonic EPA ID: C1740222716 CAS#: 335-77-8 Mol. Wt.: 328.07128	 2,2',4,5-Tetrachlorobiphenyl EPA ID: C1740222716 CAS#: 71352-7-1 Mol. Wt.: 318.042	 Anhydrotetracycline EPA ID: C1740222716 CAS#: 148-81-1 Mol. Wt.: 326.32127

- Richman, T., Arnold, E. & Williams, A.J. Curation of a list of chemicals in biosolids from EPA National Sewage Sludge Surveys & Biennial Review Reports. *Sci Data* 9, 180 (2022). <https://doi.org/10.1038/s41597-022-01267-9>

Science Advisory Board



Risk Assessment Framework

EPA is proposing a three-step approach to biosolids risk assessment:

- Step 1: Prioritization using the Public Information Curation and Synthesis (PICS) Approach
- Step 2: Screening-level Model
- Step 3: Framework for Refined Risk Assessment including Probabilistic Modeling

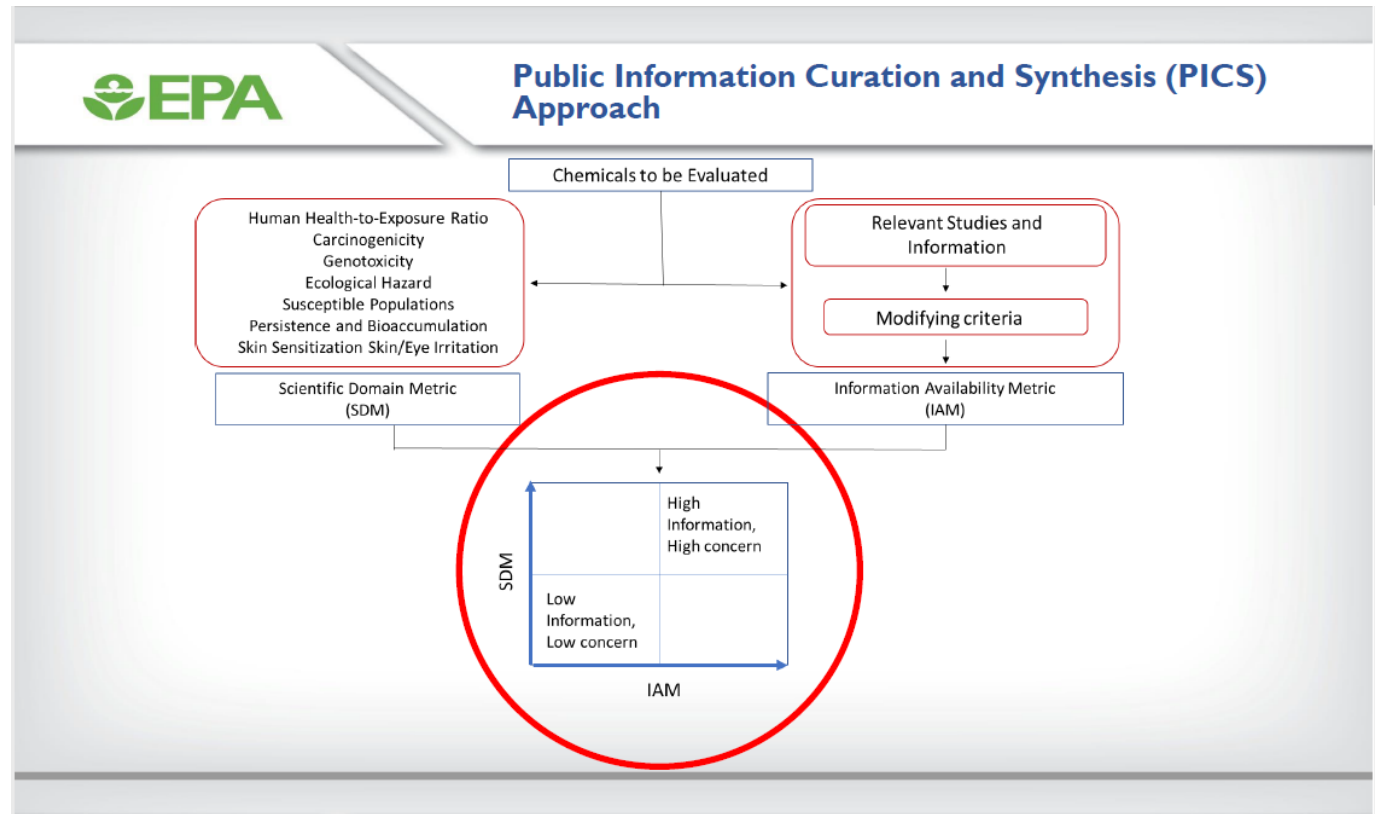
Science Advisory Board - “Approach to Biosolids Chemical Risk Assessment and Biosolids Screening Tool” (Began April 5, 2023)

- Link: https://sab.epa.gov/ords/sab/f?p=100:18:7435319323204:::RP,18:P18_ID:2610

Risk Assessment Framework: Prioritization

Link: [EPA National Biosolids Meeting Summary 2021 \(pdf\)](#)

Link: [EPA National Biosolids Meeting 2021 \(Session 3\): EPA's Preliminary Biosolids Risk Assessment Approach – Biosolids Pollutant Prioritization](#)



Source: [EPA National Biosolids Meeting 2021 \(Session 3\): EPA's Preliminary Biosolids Risk Assessment Approach – Biosolids Pollutant Prioritization, Dr. Richard Judson. November 2, 2022.](#)

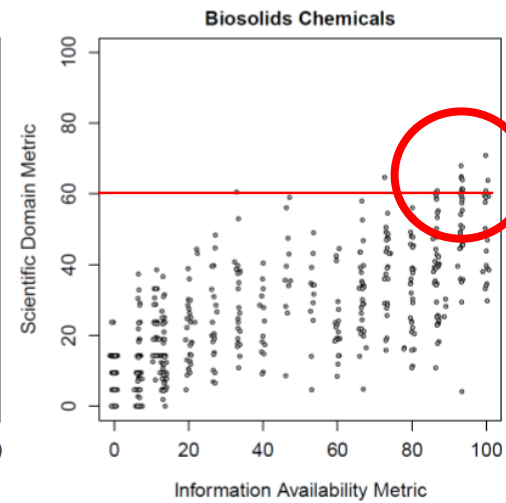
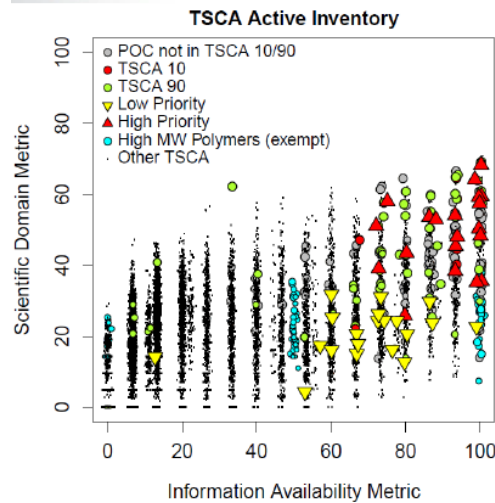
Risk Assessment Framework: Prioritization (cont.)

Link: [EPA National Biosolids Meeting Summary 2021 \(pdf\)](#)

Link: [EPA National Biosolids Meeting 2021 \(Session 3\): EPA's Preliminary Biosolids Risk Assessment Approach – Biosolids Pollutant Prioritization](#)



Biosolids Results

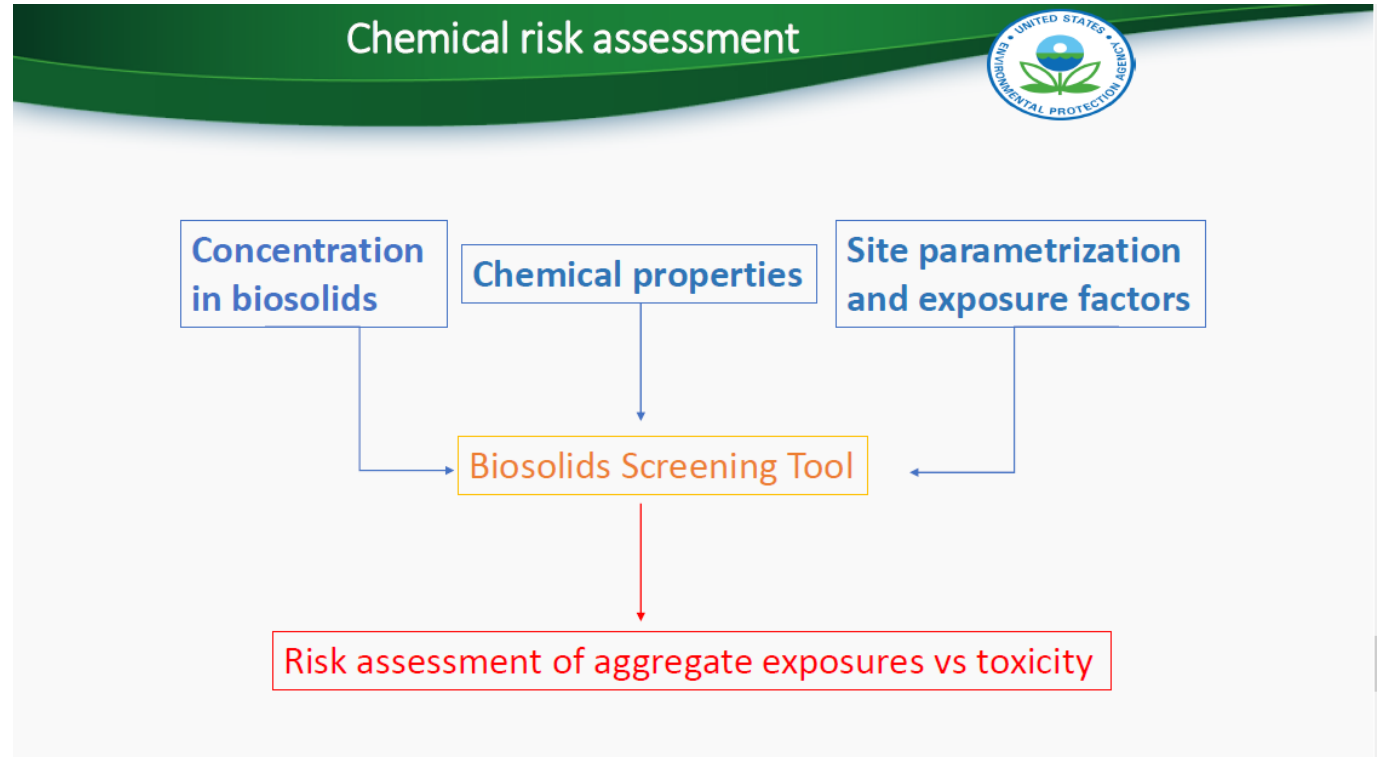


Source: [EPA National Biosolids Meeting 2021 \(Session 3\): EPA's Preliminary Biosolids Risk Assessment Approach – Biosolids Pollutant Prioritization, Dr. Richard Judson. November 2, 2022.](#)

Risk Assessment Framework: Screening-level Model

Link: [EPA National Biosolids Meeting Summary 2021 \(pdf\)](#)

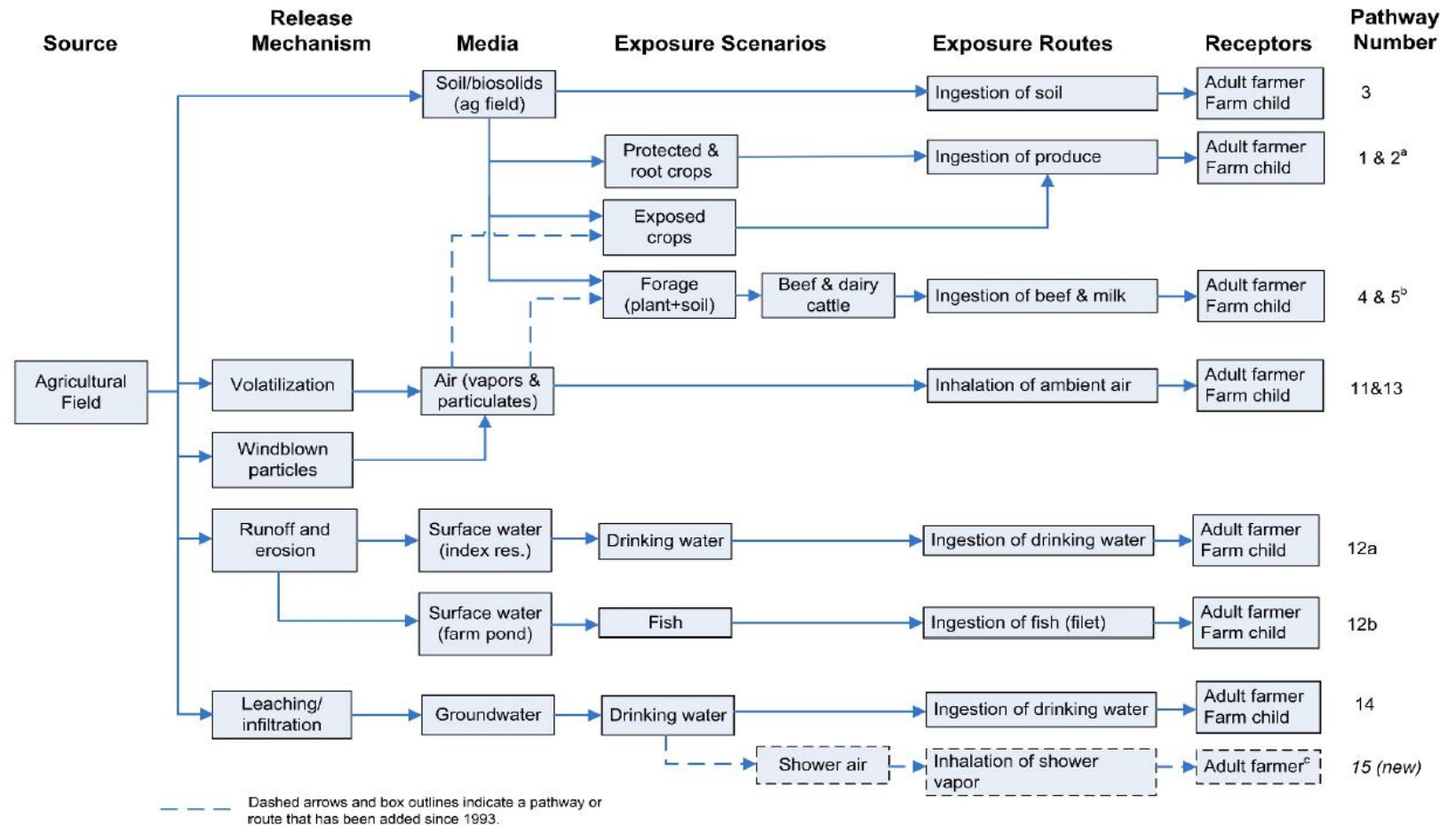
Link: [EPA National Biosolids Meeting 2021 \(Session 5\): EPA's Preliminary Biosolids Risk Assessment](#)



Source: [EPA National Biosolids Meeting 2021 \(Session 5\): EPA's Preliminary Biosolids Risk Assessment, Dr. David Tobias. November 2, 2022.](#)

Risk Assessment Framework: Framework for Screening and Refined Risk Assessment including Probabilistic Modeling

Link: [SAB - Approach to Biosolids Chemical Risk Assessment and Biosolids Screening Tool](#)



^a Originally, Pathways 1 and 2 differed only in that they were modeled for two different scenarios (1, general population and 2, home gardener). In the Biosolids Screening Tool, this pathway is modeled for only one scenario, a farm family (adult farmer and farm child).

^b Originally, Pathways 4 (cattle eat contaminated plants) and 5 (cattle eat contaminated soil) were modeled separately. In the Biosolids Screening Tool, these pathways are combined to reflect that when cattle eat forage, they ingest soil as well. The overall cattle diet is assumed to be 95% forage and 5% soil.

^c The farm child is omitted because inhalation risks for children are always equal to or lower than those for adults, and young children are less likely to shower.

Figure A-1. Conceptual model for human exposures.

Source: [EPA National Biosolids Meeting 2021 \(Session 5\): EPA's Preliminary Biosolids Risk Assessment, Dr. David Tobias. November 2, 2022.](#)

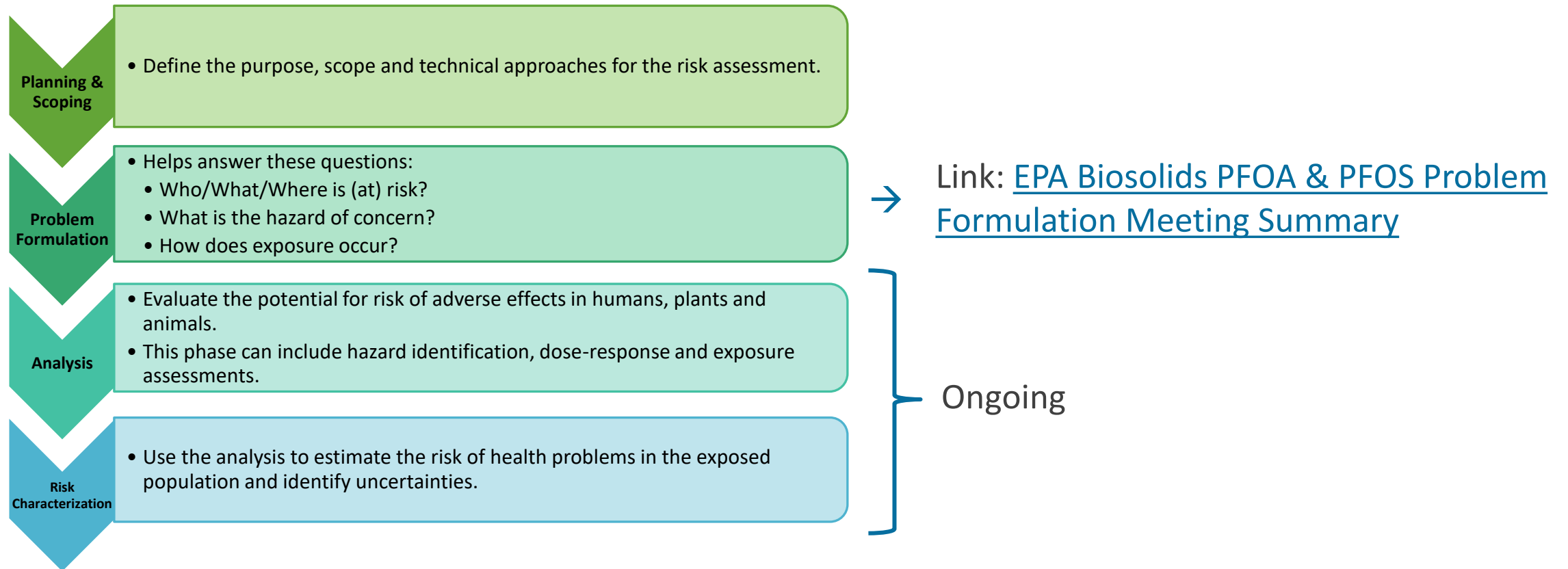
PFOA and PFOS Risk Assessment in Biosolids

PFOA and PFOS Risk Assessment

- EPA PFAS Strategic Roadmap: EPA's Commitments to Action 2021-2024 – “Finalize risk assessment for PFOA and PFOS in biosolids that will serve as the basis for determining whether regulation of PFOA and PFOS in biosolids is appropriate.”
 - Link: <https://www.epa.gov/pfas/pfas-strategic-roadmap-epas-commitments-action-2021-2024>

PFOA and PFOS Risk Assessment (cont.)

Generalized Risk Assessment Framework

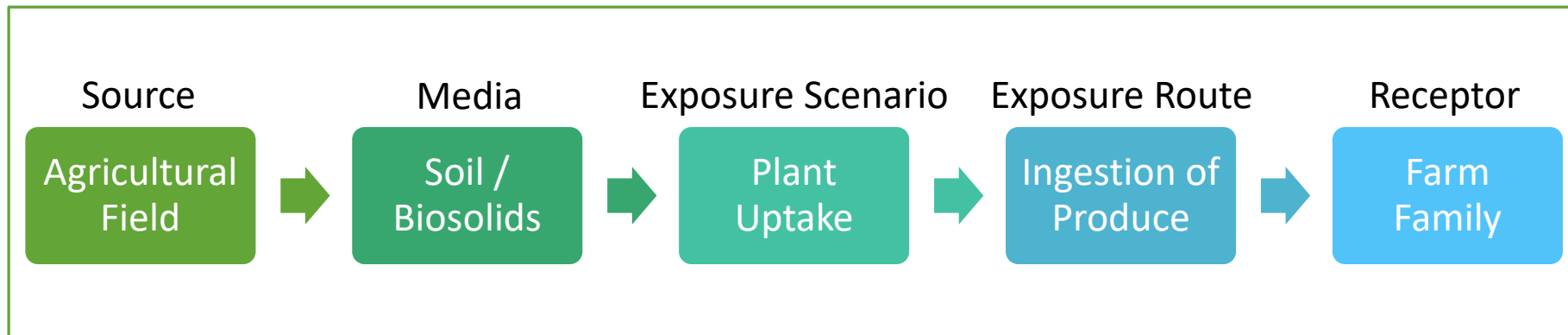


PFOA and PFOS Hazard Assessment

- Proposed PFAS National Primary Drinking Water Regulation (March, 2023)
- Link: <https://www.epa.gov/sdwa/and-polyfluoroalkyl-substances-pfas>

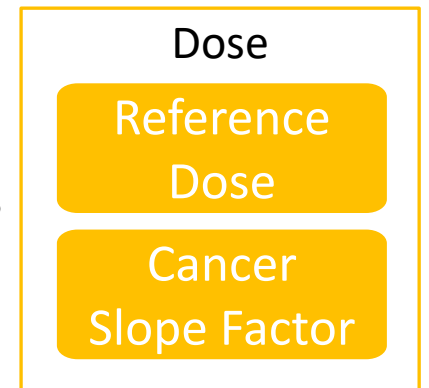
Ongoing Work for PFOA and PFOS RA

EXPOSURE



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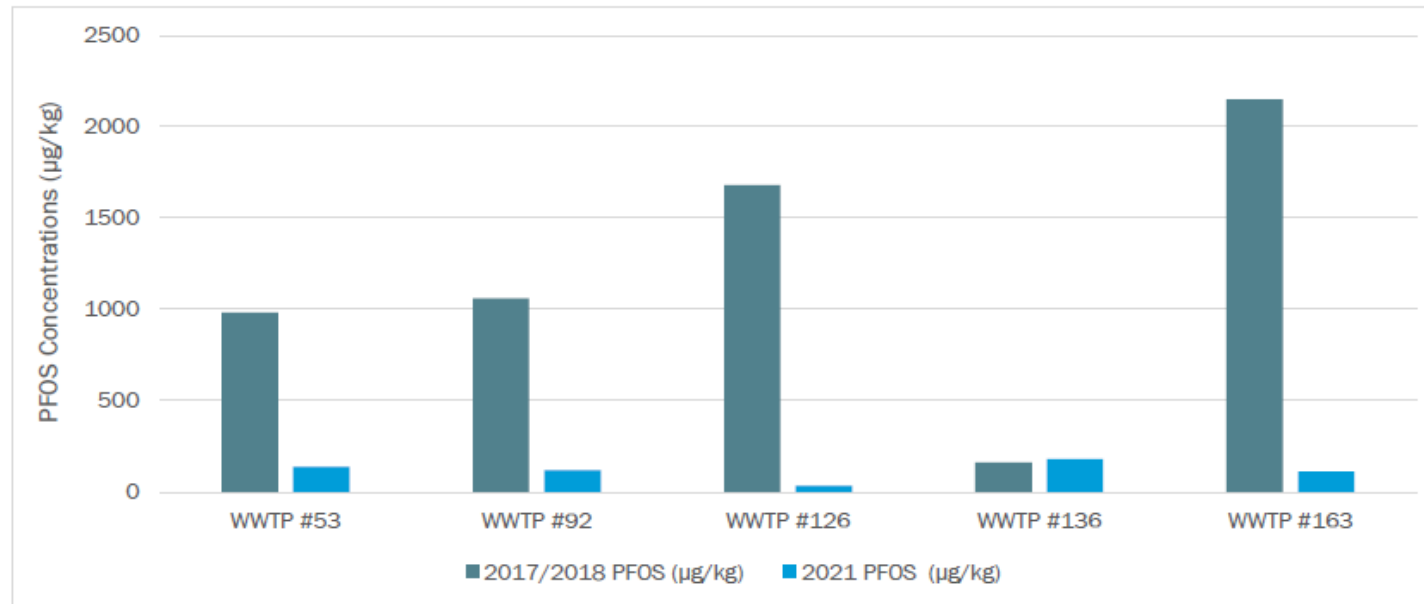
HAZARD



“WWTPs do not generate PFAS, they just receive them. What are we supposed to do?”

MICHIGAN STRATEGY FOR LAND APPLICATION OF BIOSOLIDS CONTAINING PFAS (UPDATED 2022)

Figure 1. PFOS Concentration Reductions in Industrially Impacted Biosolids: 2017 to 2021



Source: [Land Application of Biosolids Containing PFAS: Interim Strategy, Updated April 2022](#). Michigan Department of Environment, Great Lakes, and Energy.

“What happens after the PFOA/PFOS risk assessment is complete in 2024?”

Risk Management

Risk Management is a distinctly different process from risk assessment. Risk assessment establishes whether a risk is present and, if so, the range or magnitude of that risk. In the risk management process, the results of the risk assessment are integrated with other considerations, such as economic or legal concerns, to reach decisions regarding the need for and practicability of implementing various risk reduction activities. Risk managers also use risk assessment results as a basis for communicating risks to interested parties and the general public.

Source: [EPA Website – Risk Management](#)

“What should I do in the meanwhile?”

MEMORANDUM

SUBJECT: Addressing PFAS Discharges in NPDES Permits and Through the Pretreatment Program and Monitoring Programs

C. Recommended Biosolids Assessment

- 1. Where appropriate, states may work with their POTWs to reduce the amount of PFAS chemicals in biosolids, in addition to the NPDES recommendations in Section B above, following these general steps:⁷**
 - a. EPA recommends using draft method 1633 to analyze biosolids at POTWs for the presence of 40 PFAS chemicals.⁸
 - b. Where monitoring and IU inventory per section B.2 and B.3.a above indicate the presence of PFAS in biosolids from industrial sources, EPA recommends actions in B.3.b to reduce PFAS discharges from IUs.
 - c. EPA recommends validating PFAS reductions with regular monitoring of biosolids. States may also use their available authorities to conduct quarterly monitoring of the POTWs (*see* 40 CFR 403.10(f)(2)).

Biosolids Team

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Questions?