Committing to Land Application Amid PFAS Regulations:

Case Study of Two Michigan Utilities Implementing Class A Biosolids Treatment Technologies

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NWWC 2024 | Winnipeg, MB

Presentation Overview:

PFAS INTRODUCTION

MI EGLE REGULATORY OVERVIEW

LYSTEK THP

MI CASE STUDIES

PFAS and Biosolids

- Per- and polyfluoroakly substances (PFAS)
- “Forever chemicals”
- PFAS are not *intentionally* added or used in the treatment of municipal wastewater or sewage
- WWTPs are “Passive Receivers”: PFAS concentrations are dependent on the local circumstances
- Source control is considered the most effective means of controlling the concentration of PFAS in biosolids
- Demonstrated effectiveness of regulatory action and industrial phase out

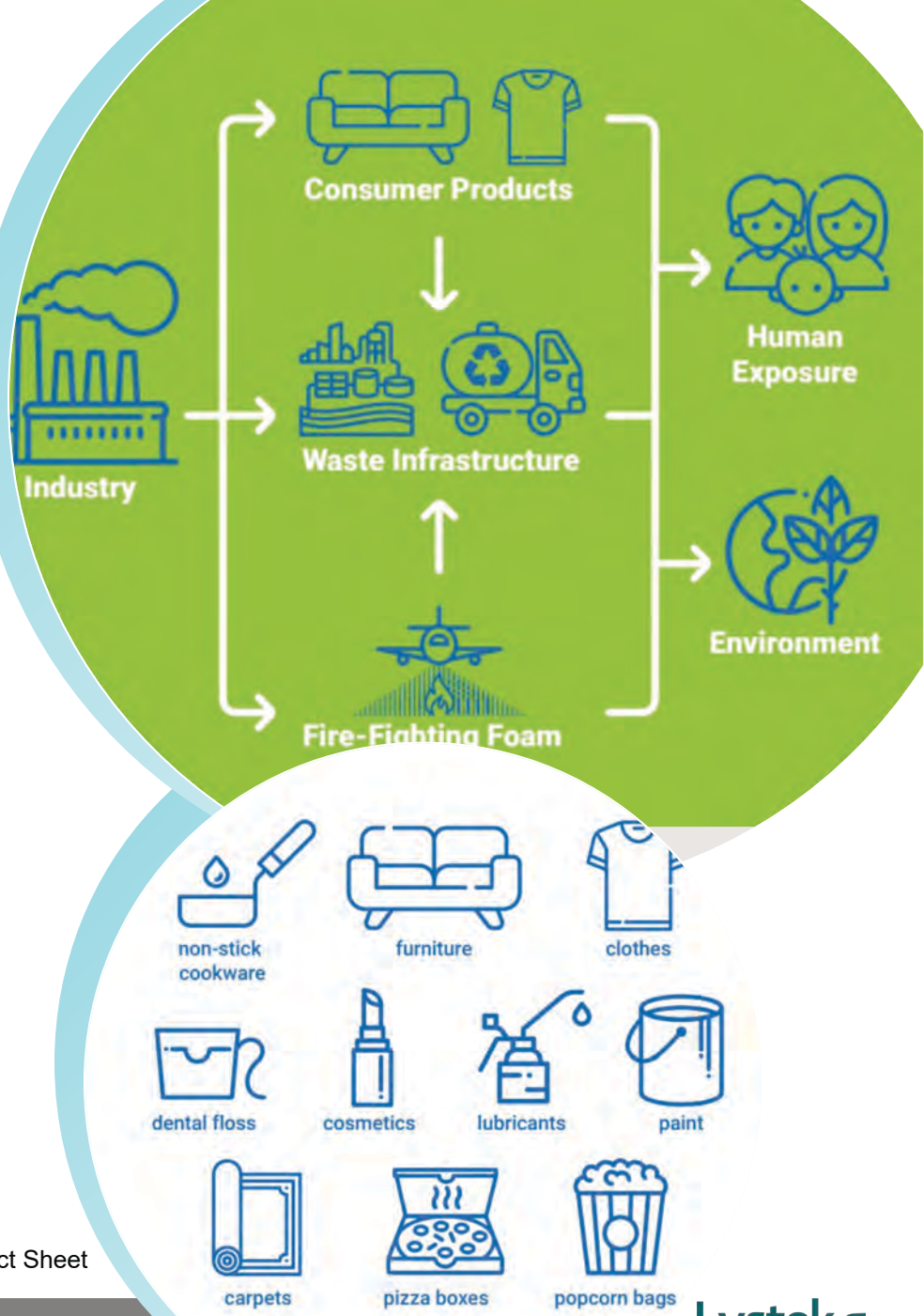


Image Source: CASA PFAS Fact Sheet

PFAS REGULATIONS IN CANADIAN BIOSOLIDS

CFIA PFOS Interim Standard

- CFIA announced (May 2023) the intent to adopt an interim standard of **< 50 ppb of PFOS** (used as an indicator) for domestic and imported biosolids represented as fertilizers

- Product importers and domestic manufacturers will be required to test products

- Compliance verification will be based on a Certificate of Analysis (CoA) and attestation as to its validity provided by the proponent

- *Enforcement began Oct 18, 2024*

MICHIGAN'S INTERIM STRATEGY: BIOSOLIDS & PFAS

Michigan EGLE

- **EGLE:** Department of Environment, Great Lakes, and Energy
- EGLE began proactive statewide testing for PFAS in 2018
  - 99 Municipal WWTPs were required to screen for PFAS

Michigan recognized as early North American jurisdiction in both surveillance and regulatory efforts to mitigate PFAS exposures from wastewater effluent and land applied biosolids.

EGLE

MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

Examples of Michigan's Early Years of PFAS Exposure and Awareness

- **Wurtsmith Air Force Base**
  - 1923 – 1993
  - Aqueous film forming foam used
  - 1994: listed as superfund site
  - 2010: PFOS contamination discovered with soil and groundwater contamination as high as 1.2 million ng/L
- **Nearby Clarks Marsh**
  - 2012: Do not eat fish advisory.
    - Fish contained 5,100,000 ng/L average PFOS across all species in Clark Marsh
  - 2016: Do not drink tap water advisory
  - 2018: Do not eat deer advisory
- Michigan's first activated carbon system was implemented at the base in 2015

2021: EGLE Interim Strategy

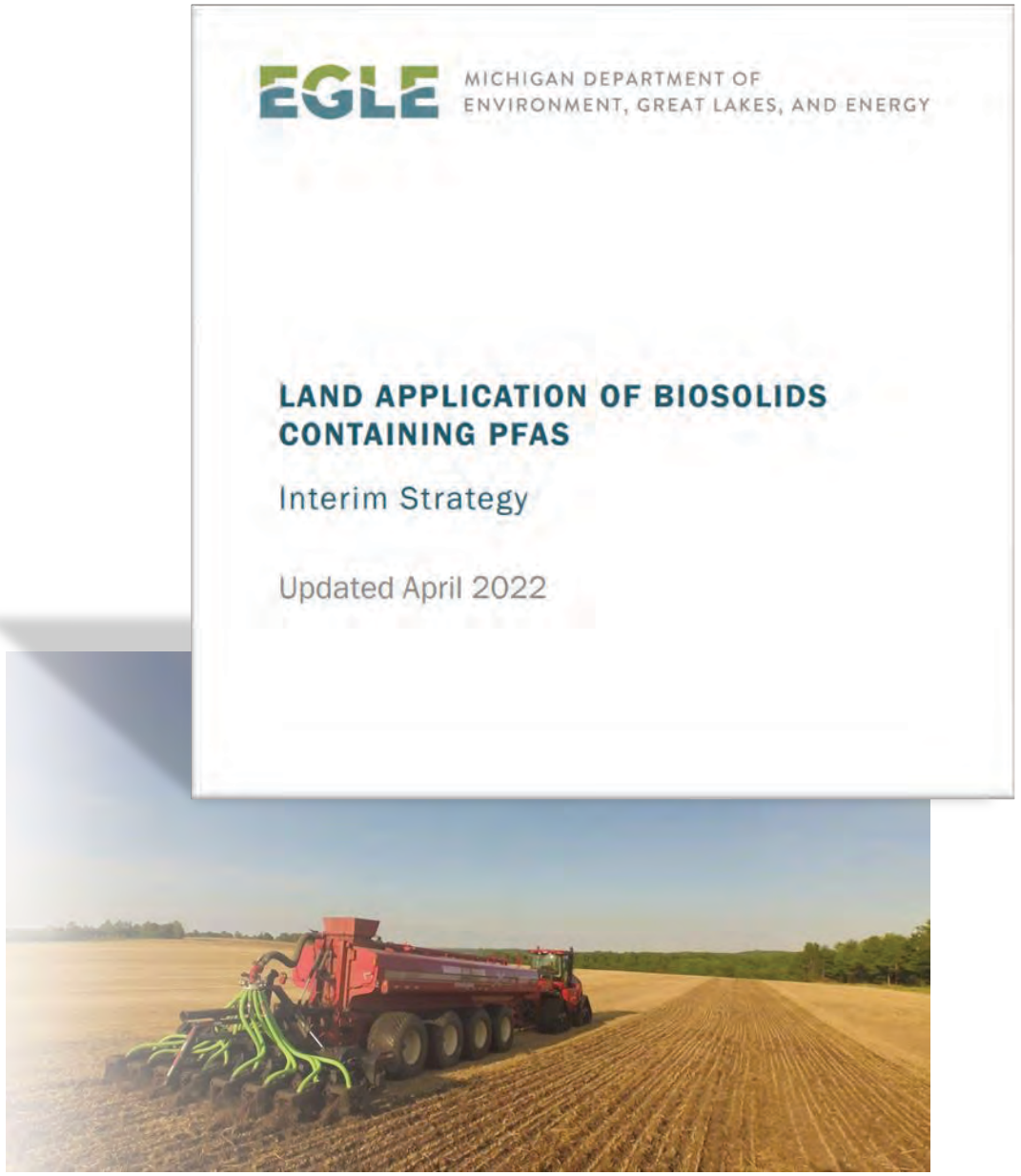
- EGLE implemented first Interim Strategy for the Land Application of Biosolids Containing PFAS July 1, 2021

- **GOALS of EGLE's Biosolids Interim Strategy**

    1. **REDUCE** PFAS concentrations in biosolids with continued source identification and reduction efforts

    2. **PREVENT** land application of industrially impacted biosolids

    3. **MITIGATE** risks moving forward



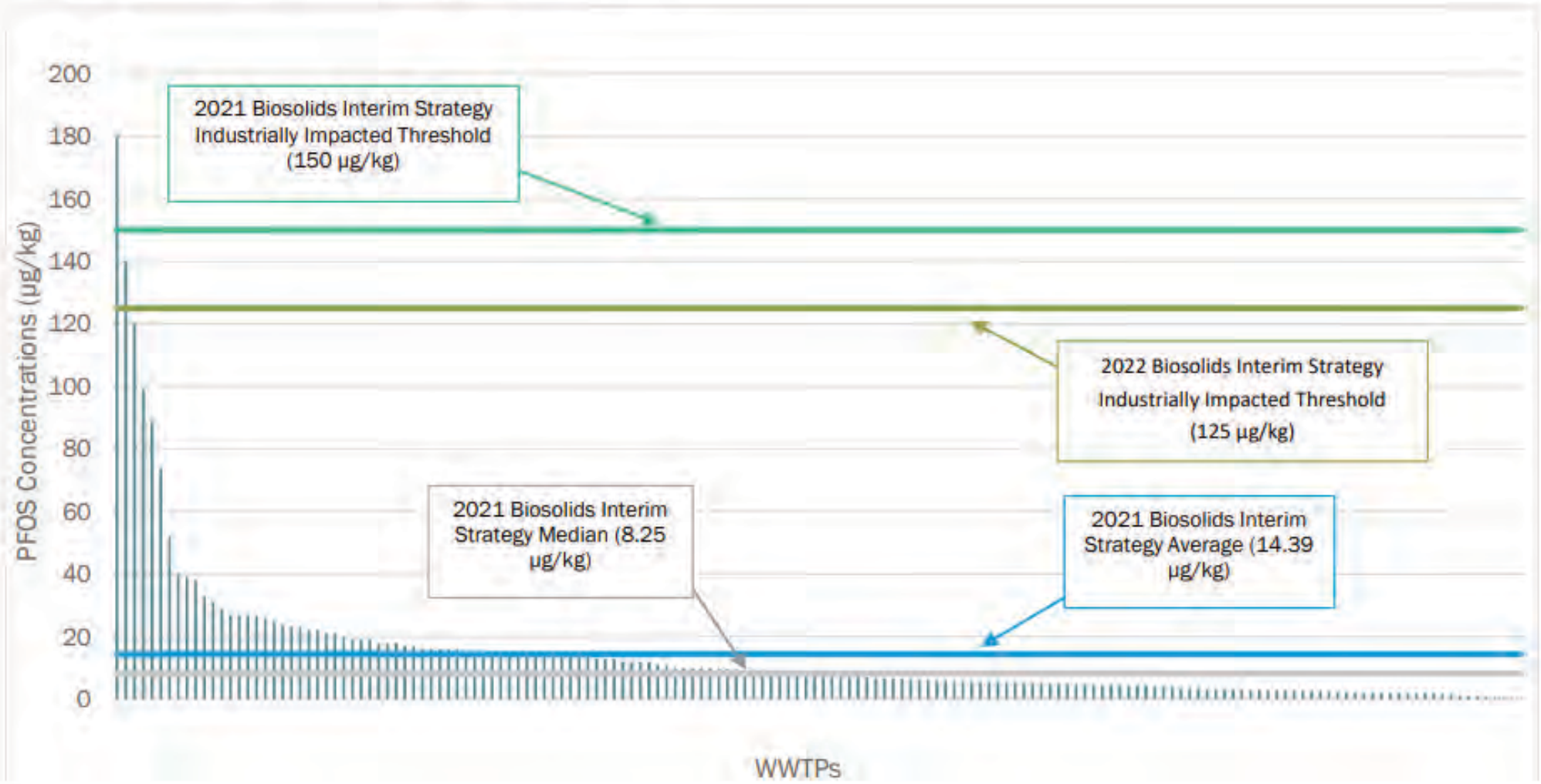
Primary Components of Interim Standard:

- **PFAS Biosolids Sampling -** PFAS analysis of biosolids is required prior to land application as of July 1, 2022
  - Sample frequency is determined by the size of the WWTP, whether an IPP is required, the type of groundwater permit, and previous Interim Strategy PFAS sample results.
- **PFAS Source Identification and Reduction -** PFAS analytical results of biosolids (and in many cases WWTP effluent) will dictate the level of source identification and reduction efforts.
- **Landowner and Farmer Communication** - EGLE requires analytical results and additional resources specific to PFAS in biosolids be available.

EGLE PFOS Thresholds

- **PFOS at or below 20 µg/kg.**
  - No additional requirements to comply with the Interim Strategy.
- **PFOS above 20 µg/kg, but below 50 µg/kg.**
  - EGLE recommends investigating sources and sampling the WWTP effluent for PFAS
- **PFOS at or above 50 µg/kg but below 125 µg/kg.**
  - Immediately notify EGLE
  - Sample effluent and investigate potential sources to develop a source reduction program, if they have not already done so under the IPP PFAS Initiative.
  - To reduce overall loading to the site, reduce land application rates to no more than 1.5 dry tons per acre (or submit an Alternative Risk Mitigation Strategy).
- **PFOS at or above 125 µg/kg.**
  - Biosolids exceeding 125 µg/kg PFOS are deemed to be industrially impacted and cannot be land applied.

Figure 5. 2022 Industrially Impacted Threshold



EGLE Land Application of Biosolids Containing PFAS Interim Strategy. Updated April 2022.

Biosolids/Sludge Concentrations Since 2018

Pollutant	2018 Statewide Study** Mean	2018 Statewide Study** Median	2021 Interim Strategy Mean	2021 Interim Strategy Median	2022 Interim Strategy Mean	2022 Interim Strategy Median	2023 Interim Strategy Mean	2023 Interim Strategy Median
PFOS (ppb)	184*	13*	21	9	16	10	11	7
PFOA (ppb)	25	7	8	4	7	3	6	3

S. Kammer, EGLE, 2023

Updates to EGLE Interim Strategy in 2024

PFOA added as analyte to review

- Based on the PFOS and/or PFOA results:
  - **Equal to or Below 20 ppb** (same as 2022)
    - ***No restrictions***
  - **Above 20 ppb – Less than 100 ppb** (updated)
    - ***Required*** to sample effluent and identify sources
    - ***Required*** to mitigate during land application rate
      - Reduce land application rate to 1.5 dry tons per acre or submit alternative strategy
  - **Equal to or Above 100 ppb** (updated)
    - Deemed Industrially Impacted and ***land application prohibited***
    - ***Required*** to sample effluent and identify sources

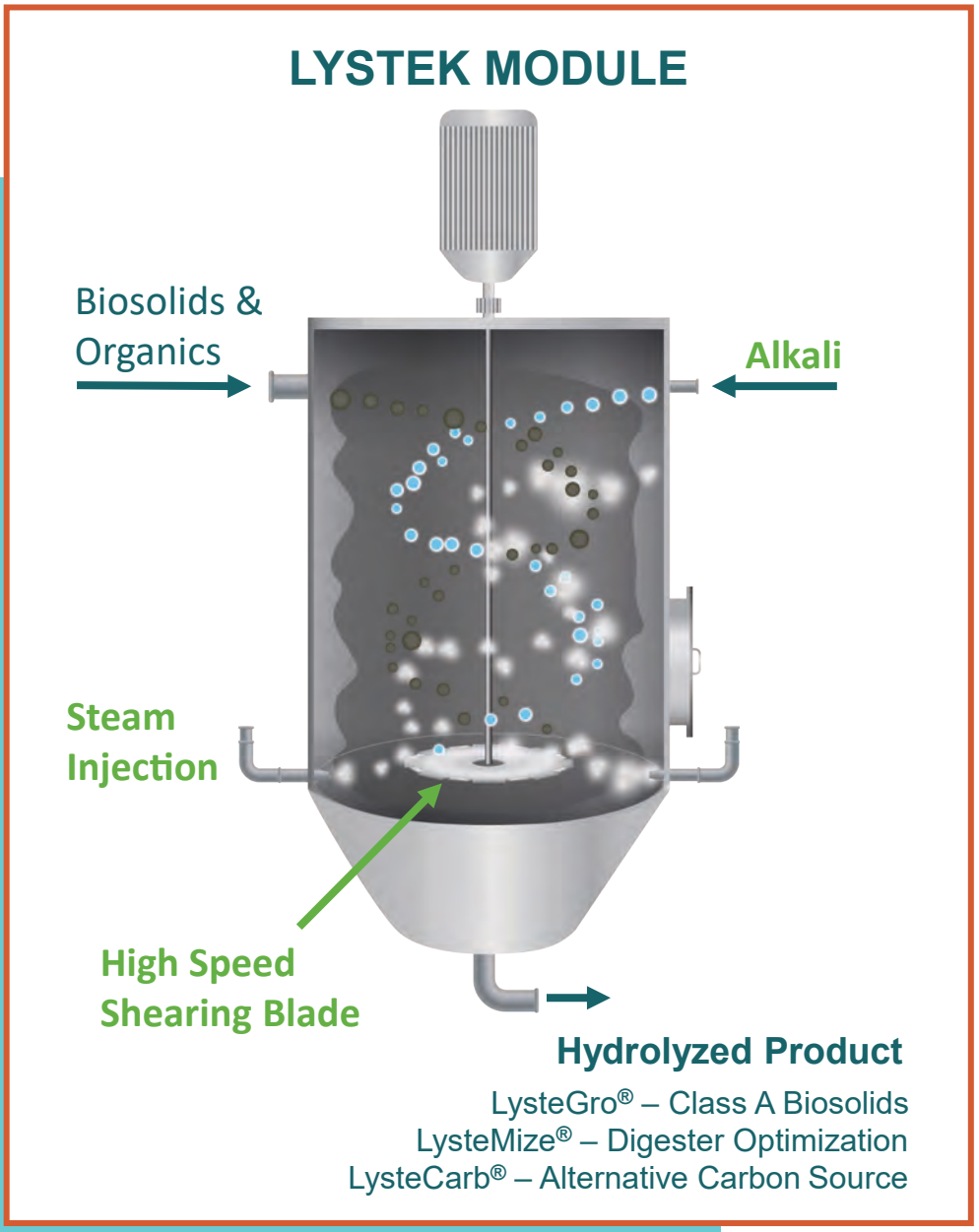
LYSTEK THP: CLASS A BIOSOLIDS OPERATIONS IN MICHIGAN

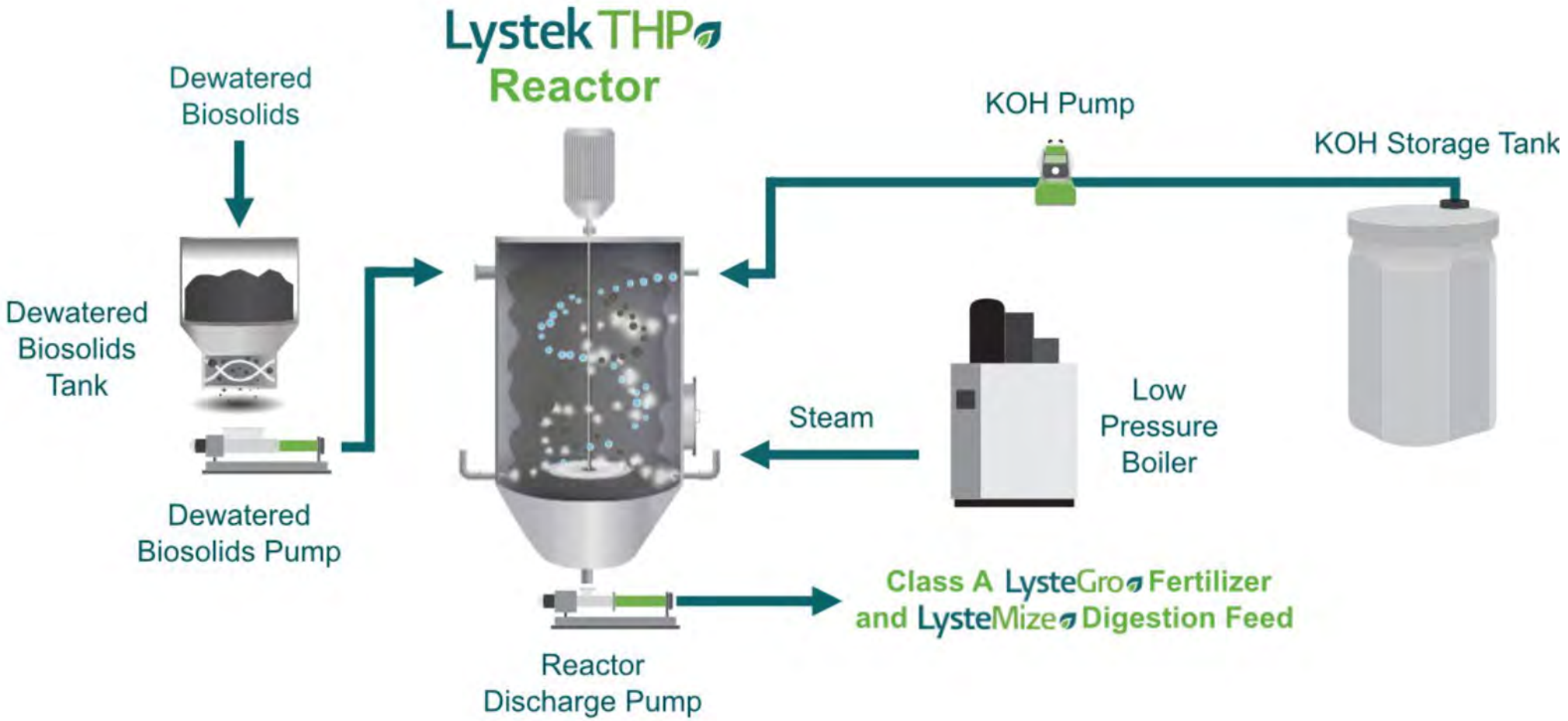
Who We Are

- Founded in 2000 at the University of Waterloo
- Canadian owned and operated
- Core Mission: Optimize resource recovery from sustainable and renewable feedstocks
- Leading thermal hydrolysis process provider in North America with 13 operating facilities
- Patented Thermal-alkaline Hydrolysis Process (**Lystek THP®**)

How Does Lystek THP Work?

- Processing time = 30 – 40 minutes per batch
- Processes organics in a non-pressurized vessel with combination of:
  - **Heat** - low pressure steam injection, low temperature – 167 °F
  - **High speed shearing**
  - **Alkali** - pH adjustment
- Low energy requirement
- Pathogens eliminated, product homogenized, nutrients added (optional) → Multipurpose end products: **LysteGro®, LysteMize®, LysteCarb®**

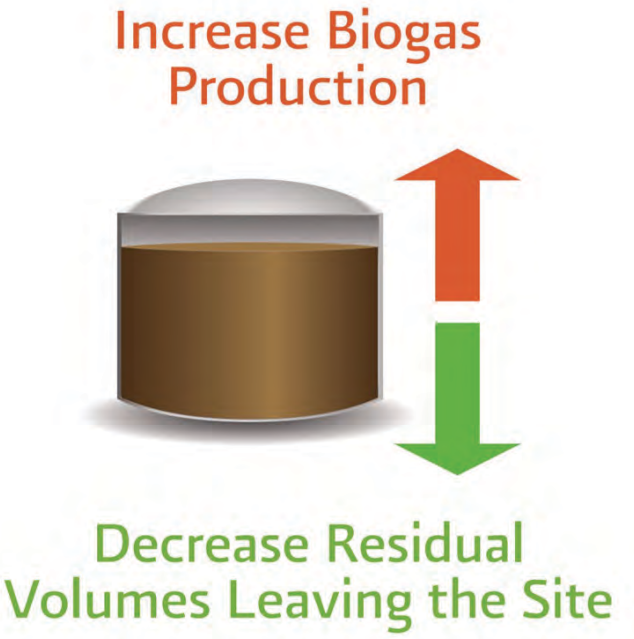




How Does Lystek THP Work?

LysteMize Digestion

- Lystek THP solubilizes recalcitrant organic compounds → further biodegradation
- Hydrolyzed material contains high quantities of soluble COD
- **Affordable alternative to produce biogas and reduce solids**
- **Energy positive process**
- **Increases:**
  - Digestion kinetics
  - Volatile solids destruction, and
  - Biogas generation
- **Customizable configurations**



LysteGro
Fertilizer Overview

- Enhanced treatment: CFIA Fertilizer / Class A (EQ) quality
- Homogeneous liquid / high solid (13-16%) product
- Up to 90% volume reduction
- Fully pumpable using conventional land application equipment
- Nutrient rich (NPK 4:3:2)
- No separation / settling issues
- No pathogen regrowth

MICHIGAN WWTP CASE STUDIES

South Huron Valley Utility Authority (SHVUA), Michigan

Project Driver: Insufficient Liquid Storage

- 50 MLD WWTP
- Servicing 90,000 people across 7 communities
- Produced a **Class B low solids lime stabilized liquid** biosolid for land application
- Evaluated Lystek THP in 2019

CHALLENGES

- Insufficient **storage capacity**
- Land application constraints
- Excess biosolids dewatered using temporary equipment and land filled leading to an **unsustainable reliance on contingency disposal**

Lystek

South Huron Valley Utility Authority (SHVUA), Michigan

- Design-Build Agreement executed in 2020
- Commissioned April 2022
- Implementation of 1 LY10 Module, dewatering centrifuge and permanent biosolids truck loading infrastructure
- Over **3x biosolids volume reduction**
- Optimized use of existing site infrastructure:
  - Installation in the **existing building**
  - Use of **existing biosolids storage tanks**
- **Elimination of:**
  - Alkali stabilization, storage cleanouts, contingency dewatering

South Huron Valley Utility Authority
Serving Downriver Communities Since 1988

Commerce Township, MI

Project Driver: Landfill Viability in Question

- Treats up to 32 MLD, average flow 8 MLD
- Services ~45,000 people
- Class B dewatered biosolid for landfill disposal
- Began evaluating Lystek THP in 2019

Challenges

- Vulnerability to substantial increases in disposal prices
  - Average **annual increase of over 30%**
- **Limited disposal options**
- **Insufficient storage** to return to liquid land application program

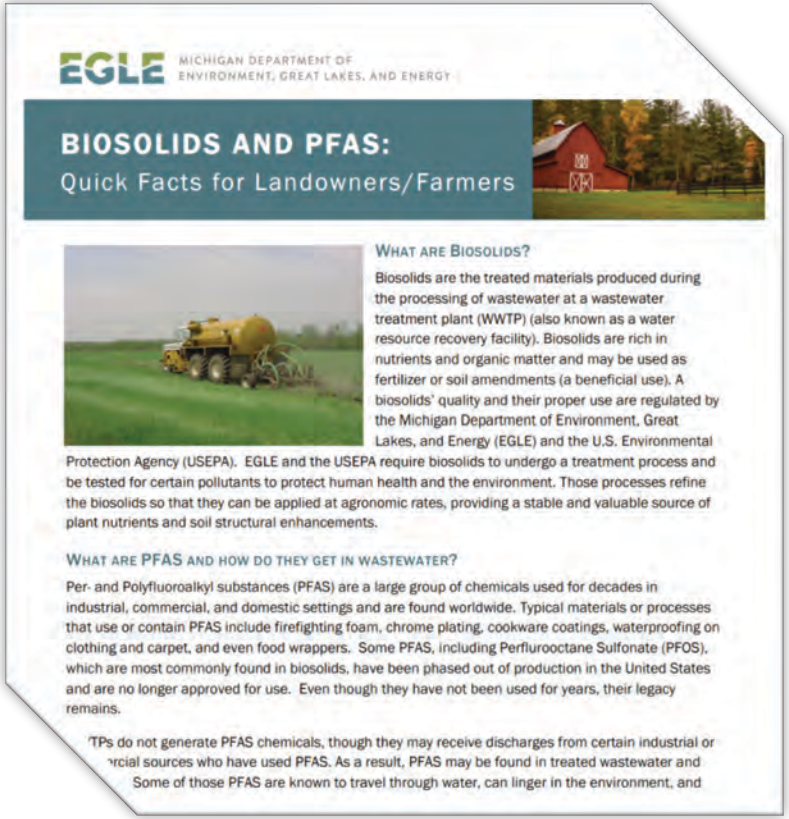
Commerce Township, MI

- Progressive-Design Build
  - Design: July 2021 to December 2021
  - Design-Build: July 2022 – March 2024
- One LY10 Module installed in an **existing building** on-site, alongside odor biofiltration unit, and permanent truck loading infrastructure
- No major infrastructure being decommissioned
- **Use of existing equipment** including belt filter presses, dewatering building, and liquid biosolids storage tanks
- Providing the Township with **long-term cost-certainty**
- Reduction in carbon footprint
- Project awarded State and Federal Funds

MICHIGAN LYSTEGRO LAND APPLICATION

Land Application of Biosolids Containing PFAS Interim Strategy

- Regulatory Requirements:
  - One representative sample required per calendar year prior to land application
  - Results must be submitted to EGLE and provided to landowners/farmers prior to land application
  - 2021 Interim Strategy:
    - < 50 ppb PFOS
  - 2024 Interim Strategy
    - < 20 ppb PFOS & PFOA



EGLE MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

BIOSOLIDS AND PFAS:
Quick Facts for Landowners/Farmers

What are Biosolids?

Biosolids are the treated materials produced during the processing of wastewater at a wastewater treatment plant (WWTP) (also known as a water resource recovery facility). Biosolids are rich in nutrients and organic matter and may be used as fertilizer or soil amendments (a beneficial use). A biosolids' quality and their proper use are regulated by the Michigan Department of Environment, Great Lakes, and Energy (EGLE) and the U.S. Environmental Protection Agency (USEPA). EGLE and the USEPA require biosolids to undergo a treatment process and be tested for certain pollutants to protect human health and the environment. Those processes refine the biosolids so that they can be applied at agronomic rates, providing a stable and valuable source of plant nutrients and soil structural enhancements.

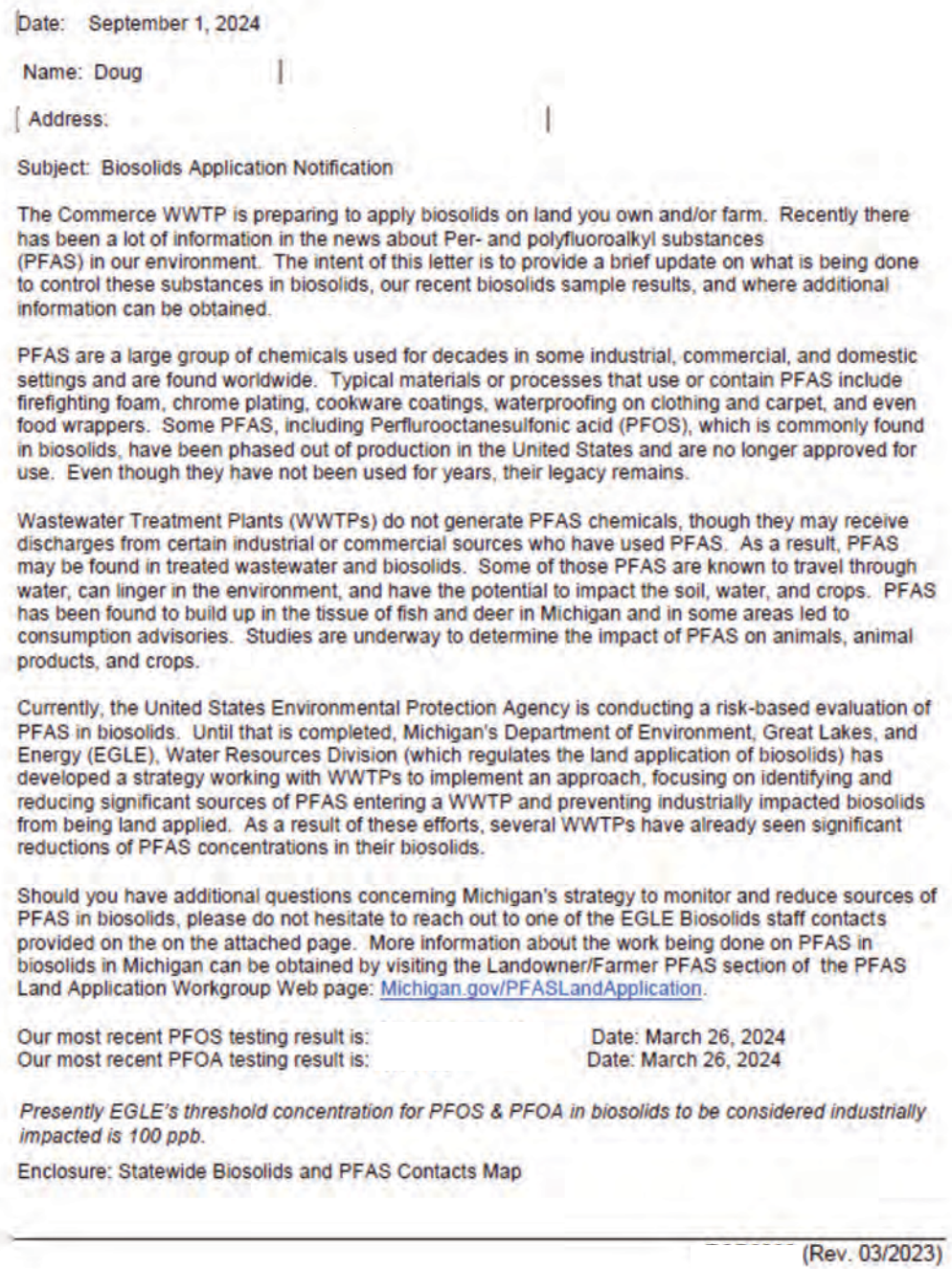
What are PFAS and how do they get in wastewater?

Per- and Polyfluoroalkyl substances (PFAS) are a large group of chemicals used for decades in industrial, commercial, and domestic settings and are found worldwide. Typical materials or processes that use or contain PFAS include firefighting foam, chrome plating, cookware coatings, waterproofing on clothing and carpet, and even food wrappers. Some PFAS, including Perfluorooctane Sulfonate (PFOS), which are most commonly found in biosolids, have been phased out of production in the United States and are no longer approved for use. Even though they have not been used for years, their legacy remains.

TPs do not generate PFAS chemicals, though they may receive discharges from certain industrial or rcial sources who have used PFAS. As a result, PFAS may be found in treated wastewater and Some of those PFAS are known to travel through water, can linger in the environment, and

Notification to Farmers

- Prior to land application at a site, the following must be provided to the landowner and farmer (if different):
  1. The most recent WWTP PFOS analytical results
  2. Regulatory contact information
  3. Any additional resources related to PFAS such as: The PFAS Landowners/Farmers link available on the MPART Land Application Workgroup webpage.



Date: September 1, 2024

Name: Doug

Address:

Subject: Biosolids Application Notification

The Commerce WWTP is preparing to apply biosolids on land you own and/or farm. Recently there has been a lot of information in the news about Per- and polyfluoroalkyl substances (PFAS) in our environment. The intent of this letter is to provide a brief update on what is being done to control these substances in biosolids, our recent biosolids sample results, and where additional information can be obtained.

PFAS are a large group of chemicals used for decades in some industrial, commercial, and domestic settings and are found worldwide. Typical materials or processes that use or contain PFAS include firefighting foam, chrome plating, cookware coatings, waterproofing on clothing and carpet, and even food wrappers. Some PFAS, including Perfluorooctanesulfonic acid (PFOS), which is commonly found in biosolids, have been phased out of production in the United States and are no longer approved for use. Even though they have not been used for years, their legacy remains.

Wastewater Treatment Plants (WWTPs) do not generate PFAS chemicals, though they may receive discharges from certain industrial or commercial sources who have used PFAS. As a result, PFAS may be found in treated wastewater and biosolids. Some of those PFAS are known to travel through water, can linger in the environment, and have the potential to impact the soil, water, and crops. PFAS has been found to build up in the tissue of fish and deer in Michigan and in some areas led to consumption advisories. Studies are underway to determine the impact of PFAS on animals, animal products, and crops.

Currently, the United States Environmental Protection Agency is conducting a risk-based evaluation of PFAS in biosolids. Until that is completed, Michigan's Department of Environment, Great Lakes, and Energy (EGLE), Water Resources Division (which regulates the land application of biosolids) has developed a strategy working with WWTPs to implement an approach, focusing on identifying and reducing significant sources of PFAS entering a WWTP and preventing industrially impacted biosolids from being land applied. As a result of these efforts, several WWTPs have already seen significant reductions of PFAS concentrations in their biosolids.

Should you have additional questions concerning Michigan's strategy to monitor and reduce sources of PFAS in biosolids, please do not hesitate to reach out to one of the EGLE Biosolids staff contacts provided on the on the attached page. More information about the work being done on PFAS in biosolids in Michigan can be obtained by visiting the Landowner/Farmer PFAS section of the PFAS Land Application Workgroup Web page: Michigan.gov/PFASLandApplication.

Our most recent PFOS testing result is: Date: March 26, 2024
Our most recent PFOA testing result is: Date: March 26, 2024

Presently EGLE's threshold concentration for PFOS & PFOA in biosolids to be considered industrially impacted is 100 ppb.

Enclosure: Statewide Biosolids and PFAS Contacts Map

(Rev. 03/2023)

SHVUA Historical PFAS Surveillance

- November 2018
  - EGLE required PFAS testing of significant industrial users (SIUs) and SHVUA WWTP
  - 11 SHVUA SIUs included:
    - One active and two closed hazardous waste landfills
    - Two automotive plants
    - One metal finisher
    - Several automotive suppliers
    - One rail yard
  - Of the 11 SIUs, 3 had PFAS results greater than the drinking water quality limit of 12 ppb and were required to install PFAS remediation systems
  - Through their Industrial Pretreatment Program they are able to regulate industries that may produce contaminants that are discharged to the treatment process
  - Discharge limits enable WWTPs to manage loading limits at their plants

South Huron Valley Utility Authority

- SHVUA voluntarily samples biosolids quarterly for PFAS
- Historically all samples have been below EGLE standards
- SHVUA maintains that
  - “Landfills have been found to be an unreliable disposal option and contaminants, including PFAS, circulate back to the WWTP via the leachate
  - Beneficial use of biosolids is key
  - Carbon is critical for soil health
  - Point source control is the most important issue facing our industry
  - Farmers are not nervous”

Nathan Callison, Jacobs, SHVUA Operations Manager

South Huron Valley Utility Authority

- Enhanced quality of LysteGro Class A biosolids drove decision to proceed
- PFOS levels as high as 16 ppb and as low as non-detect since surveillance began
- Point source control works but continued work is needed
- Six LysteGro land application events since the program began in 2022
- LysteGro demand continues to outpace product supply
- Farmers have always and continue to pay for the product
- SHVUA Jacobs Operations Team is satisfied with decision to continue land application

GRETCHEN WHITMER
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

EGLE
PHILLIP D. ROOS
DIRECTOR

April 23, 2024

VIA EMAIL

Mark Houle
Project Manager
South Huron Valley Utility Authority Wastewater Treatment Plant
34001 West Jefferson Road
Brownstown, MI 48173

Dear Mark Houle:

SUBJECT: Biosolids and PFAS Monitoring Results
National Pollutant Discharge Elimination System (NPDES)
Permit No.
Designated Name: S Huron Valley UA WWTP

On March 29, 2024, the S Huron Valley UA Wastewater Treatment Plant (WWTP) submitted results to the Department of Environment, Great Lakes, and Energy (EGLE), Water Resources Division (WRD), of a biosolids sample collected from the S Huron Valley UA WWTP on January 5, 2024, for Per- and Polyfluoroalkyl substances (PFAS). The submittal was in accordance with the requirements set forth in the WRD's *Interim Strategy for Land Application of Biosolids Containing PFAS (Interim Strategy)* and the Residuals Management Program (RMP) Modification letter dated December 27, 2023, which became effective January 1, 2024, and part of the WWTP's approved RMP.

The laboratory results indicate that the PFAS analytes, Perfluorooctane Sulfonate (PFOS) and Perfluorooctanoic Acid (PFOA), concentrations in biosolids were microgram per kilogram (µg/kg) (parts per billion [ppb]) for PFOS and µg/kg for PFOA. Based on the analytical results for PFOS and PFOA in biosolids being 20 µg/kg or below, no additional actions are required at this time and land application is approved to proceed as normal in accordance with the conditions of the Interim Strategy.

Commerce WWTP

- Was not initially required to surveil PFAS in 2018
- Voluntary early surveillance suggested PFAS contaminant levels were well below interim standards
- Surveillance mitigated WWTP's concerns
- PFAS concerns further impacting viability of landfill disposal as well
- Transition to land application program to reduce costs, improve sustainability, reduce the facility's GHG footprint, and provide long-term certainty
- First LysteGro land application event fall 2024
  - PFOS: 6.5 ppb
  - PFOA: non-detect

Commerce WWTP

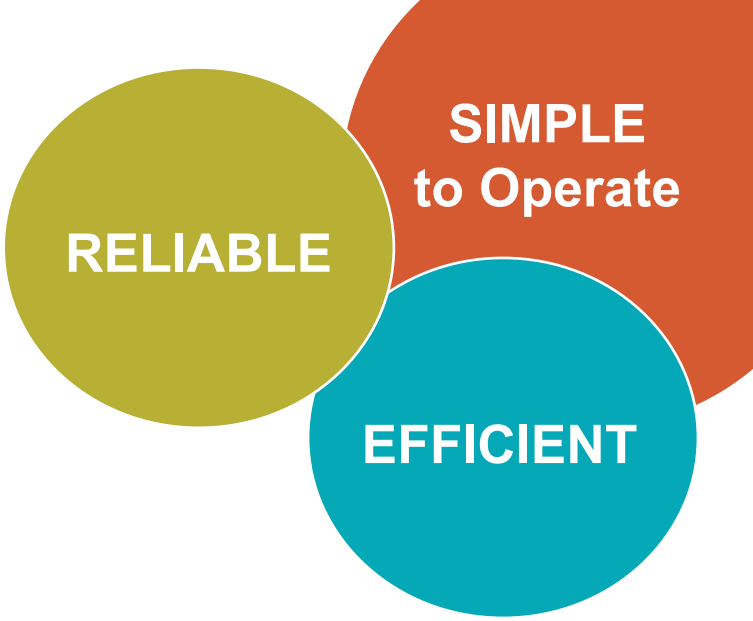
- Local farmer perceptions impacted by actions of neighbouring Genesee County. Concerns were mitigated with more recent PFAS analysis
- **LysteGro demand still outpaced supply** and drove product value up significantly in first year of operations
- Overall enhanced product quality drives demand

"We're looking forward to our first haul and we're looking forward to never going to landfill again,"

Mary Koeger, Oakland County Water Resources Assistant Chief Engineer, Commerce Wastewater Treatment Plant.

LESSONS LEARNED

Lessons Learned



- PFAS surveillance comes first
- Point source control is effective
- Proactive and transparent communication is important
- Recognition of broader benefits of land application of enhanced Class A biosolids fertilizers and relative risk of PFAS
- Best Management Practices are critical
- Resource recovery is important aspect of sustainability and climate resiliency

When managed properly, Class A biosolids fertilizer programs continue to be a demonstrated success in the age of PFAS concerns and regulations



Thank You!

Sarah Mason-Renton, PhD

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Lystek