Phase I Assessment
Material:
Fats, Oils, and Grease (FOG)

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Project No. 02226001.00 | April 27, 2026

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1.0 MATERIAL ASSESSMENT – FATS, OILS, AND GREASE

Disclaimer: This material assessment is provided as a standalone discussion packet for stakeholders supporting development of Ohio's broader Organic Materials Management Plan. Individual material assessments may be shared separately (with their own cover pages and tables of contents) to facilitate focused review and feedback. Content is subject to revision based on stakeholder input and agency review, and is expected to be integrated into a consolidated, cohesive plan following the stakeholder engagement process.

1.1 EXECUTIVE SUMMARY

This material assessment summarizes how fats, oils, and grease (FOG) are generated, collected, transported, processed, and ultimately managed in Ohio, as a standalone discussion packet to support stakeholder engagement for Ohio's broader Organic Materials Management Plan. FOG originates primarily from commercial food service establishments and food manufacturing/processing, and is commonly managed as two distinct streams: source-separated "yellow" grease (used cooking oil) and grease interceptor/trap pump-outs ("brown" grease).

Overall, available information indicates that a substantial portion of yellow grease is collected and routed to established commodity markets (e.g., rendering and biodiesel/renewable fuels). In contrast, brown grease is generally more variable in recoverability and routability because it contains higher water content, solids, and contaminants, and may be delivered to wastewater treatment plants (WWTPs) for receiving/co-treatment (including co-digestion where available), specialized processors, or other permitted outlets. Unmanaged disposal to the sewer system remains an important pathway to address due to its contribution to blockages and sanitary sewer overflows (SSOs) and increased operational burdens at WWTPs.

- Planning-level magnitude only: Direct statewide measurements of FOG generation and diversion are limited; screening-level estimates and secondary data are used to bound order-of-magnitude quantities and highlight priority data gaps.

- Different streams, different constraints: Yellow grease is typically higher-value and more consistently captured; brown grease management is constrained by quality/acceptance criteria, receiving capacity, and logistics (especially in lower-density areas).

- Capacity is more than infrastructure: Effective processing capacity depends on acceptance criteria, receiving hours/appointments, pricing/tipping structures, and market conditions—not only nominal facility throughput.

- Key risks and opportunities: Mismanagement to sewer, variable generator compliance with interceptor maintenance, and market volatility are recurring

challenges; opportunities include improved tracking/reporting, targeted generator education/BMPs, and expanded WWTP receiving/co-digestion where feasible.

- Near-term focus: Stakeholder input should prioritize Ohio-specific data sources (haulers, processors, WWTPs, local pretreatment programs), validate pathway assumptions, and identify practical interventions by region and generator type.

1.2 STAKEHOLDER INPUT QUESTIONS

The questions below compile all stakeholder input requests included throughout this material assessment, organized by topic/section for convenience. (Original questions are also retained in their original locations.)

FOG sources, definitions, and priority generator types (Section 2.0)

- Are the described FOG sources and generator types complete for Ohio, or are key sources missing?
- Do stakeholders prefer different terminology/definitions for "yellow" vs. "brown" grease for consistency with Ohio programs?
- Are there priority sub-sectors (e.g., institutions, grocery/retail, processors) that should be called out explicitly?

Generation estimates and data sources (Section 2.1)

- Are the screening-level generation brackets and assumptions reasonable for Ohio?
- What Ohio-specific data sources (haulers, processors, WWTPs, local pretreatment programs) could materially improve the estimate?
- Which limitations are most important to address first for planning and goal-setting?

Current disposal pathways and sewer mismanagement indicators (Section 2.2)

- Which disposal pathways (managed vs. unmanaged) are most prevalent by region, based on stakeholder experience?
- What indicators or datasets can best approximate sewer-disposal/mismanagement in Ohio (e.g., SSO/blockage tracking, enforcement data)?
- Are there notable local programs or ordinances that significantly change disposal behavior?

Contaminants, acceptance criteria, and preprocessing (Section 2.3)

- What contaminants most commonly drive rejection or added costs in Ohio (yellow vs. brown grease)?
- Are there Ohio-specific acceptance criteria or common preprocessing practices we should document?
- What level of contamination information would be feasible to collect (and by whom) for planning purposes?

Collection practices and service gaps (Section 2.4)

- Where are the biggest collection gaps today (geographies, generator types, or stream types)?
- What pickup/pump-out frequencies are typical (and what drives outliers)?
- What practical constraints should be emphasized (space, access, odor, theft/spills, contract terms)?

Transportation practices and constraints (Section 2.5)

- Are the described transportation constraints accurate for Ohio (haul distance, receiving hours/appointments, minimum loads)?
- Where is out-of-state transport most common, and why (capacity, acceptance criteria, economics)?
- Are transfer/aggregation sites used in Ohio today, and should they be characterized further?

Markets, end uses, and volatility (Section 2.7)

- What are the most important current end markets for Ohio material (in-state and out-of-state) by stream?
- How volatile are pricing and outlet availability in practice, and what risks should the plan highlight?
- Are there emerging/anticipated market changes (e.g., renewable diesel demand) that should be reflected?

Key challenges and barriers (Section 2.9)

- Are there additional barriers (regulatory, contractual, infrastructure, or behavioral) that should be elevated as “top” challenges?

- Which barriers are most solvable in the near term versus longer-term structural issues?

- Any Ohio examples (successful/unsuccessful) that would strengthen this section?

Opportunities, roles, and implementation priorities (Section 2.10)

- Which opportunities are highest priority for Ohio in the next 12–24 months?

- Who should lead/own each opportunity (state, locals, WWTPs, haulers, industry groups), and what support is needed?

- Are there existing initiatives we should align with or avoid duplicating?

2.0 MATERIAL DESCRIPTION, SOURCES, AND MANAGEMENT

Fats, oils, and grease (FOG) include animal fats, vegetable oils, and grease generated primarily from food preparation and food processing activities. FOG is produced by commercial food service establishments (restaurants, cafeterias, grocery stores, institutional kitchens), food manufacturing and processing facilities, and, to a lesser extent, residential sources. Food service establishments (FSEs) typically produce two types of FOG (US EPA 2023a):

- "Brown" grease is floatable FOG, settled solids, and associated wastewater captured by grease interceptors and traps.
- "Yellow" grease is source-separated used cooking oil that is collected from food service operations and typically has higher value for recycling or reuse (e.g., rendering or biodiesel production).

Commercially generated FOG is typically captured through grease interceptors or collected as source-separated "yellow" grease. Key feedstock generators include restaurants, grocery stores, institutional kitchens, food processors, and rendering facilities.

Stakeholder input requested:

- Are the described FOG sources and generator types complete for Ohio, or are key sources missing?
- Do stakeholders prefer different terminology/definitions for "yellow" vs. "brown" grease for consistency with Ohio programs?
- Are there priority sub-sectors (e.g., institutions, grocery/retail, processors) that should be called out explicitly?

2.1 GENERATION ESTIMATES

Direct statewide measurements of FOG generation are limited. Generation estimates can be derived through reported collection volumes from service providers and haulers or by using industry generation factors. Using waste hauler and FSE records to determine generation estimates is more accurate but requires extensive data collection and processing. These records may not be available to the public. Projected generation is supposed to track with population and commercial activity growth.

2.1.1 Data Sources and Assumptions

2.1.1.1 Reported Collection Volume

The primary sources for FOG generation data include available hauler and food processor reports. Additional information used to track FOG in FSEs includes:

- State business registry data

- Inspection information and history
- Grease control equipment
- Permit issuance, summary reports
- Sanitary Sewer Overflows (SSO) or blockage tracking (commercial and residential) (US EPA 2023b)

2.1.1.2 Industry Generation Factors – Screening-Level Approach

Screening-level generation estimates were developed by (1) selecting a published per-restaurant generation factor, (2) compiling Ohio food-service establishment counts from a single, consistent data source year, and (3) applying the factor range to those counts to produce a transparent planning-level bracket. The intent was to bound the likely magnitude of FOG generation in the absence of statewide direct measurements and to provide a repeatable method that can be updated as improved data become available.

As the primary national reference, the range cited in EPA's National Pretreatment Program materials for controlling FOG discharges from food service establishments was used. EPA reports that annual production of collected grease trap waste plus uncollected grease entering wastewater treatment plants can range from approximately 800 to 17,000 pounds per year per restaurant (US EPA, 2007). This published range was treated as a screening-level proxy for total restaurant-related FOG that is either captured as brown grease or enters the sewer system.

To apply the factor, the Ohio NAICS 7225 (Restaurants and Other Eating Places) establishment count from County Business Patterns (CBP 2023) was used as the base restaurant universe. Using 20,682 establishments and applying the EPA range (800–17,000 lb/restaurant/year) produced an order-of-magnitude estimate of approximately 8,000–176,000 tons per year of grease trap waste plus uncollected grease entering wastewater treatment plants. For discussion purposes in this profile, the resulting statewide magnitude was summarized as on the order of ~100,000 tons per year, recognizing that Ohio-specific pump-out practices, compliance, and routing pathways will determine where actual conditions fall within the screening range.

A sensitivity case was also prepared by expanding the establishment universe beyond NAICS 7225 to include adjacent food-service categories (e.g., NAICS 7223 Special Food Services and NAICS 7224 Drinking Places) as a broader "food service and drinking places" proxy. Applying the same EPA range to this broader proxy yielded a slightly higher bracket (previously estimated at approximately 10,000–205,000 tons/year). This sensitivity case was retained as a check on how results shift when the generator universe is defined more broadly than "restaurants" as used in the underlying EPA factor.

Additional reasonableness checks were completed using alternative establishment metrics and subsets. For example, applying the same EPA range to the limited-service subset (NAICS 722513) produced a lower partial estimate (previously 4,000–82,000 tons/year), consistent with the expectation that this subset represents only part of the overall restaurant universe. We also reviewed Annual Business Survey (ABS) employer-firm counts

for NAICS 7225 as a supplementary benchmark, with the caveat that firm counts are not directly comparable to establishment counts and therefore were not used as the primary driver of the estimate.

In parallel, market-based reporting to provide context for the source-separated "yellow grease" portion of the FOG stream were reviewed. Clean Fuels Alliance America summarized findings from an LMC International/GlobalData outlook indicating that U.S. used cooking oil collection reached approximately 850 million gallons in 2022, with potential growth to about 1.1 billion gallons by 2030 (Clean Fuels Alliance America, 2023). These figures were treated as indicative of collected used cooking oil volumes (not total FOG generation) and were used only as a qualitative bound on the magnitude of the yellow grease market, recognizing that they do not capture brown grease, settled solids, or mismanaged grease disposed to sewer.

Finally, where Ohio-specific information was available at a summary level, SCS identified opportunities to compare it against the establishment-based screening estimate to confirm the order of magnitude and inform future refinement. Candidate cross-checks include aggregated collection totals reported by haulers and processors, wastewater treatment plant receiving records (e.g., grease interceptor pump-outs accepted for processing), and local pretreatment program pump-out data. These sources—if compiled in an aggregated, non-proprietary format—can help narrow the screening range by informing likely pump-out frequency, capture rates (collected versus disposed to sewer), and disposition pathways.

2.1.2 Data Limitations

These results rely on secondary data and should be interpreted as planning-level estimates rather than precise measurements. Public business datasets (e.g., County Business Patterns) improve transparency and repeatability for estimating the size of the commercial generator universe (establishment counts). However, establishment counts do not directly provide FOG quantities generated, grease control equipment prevalence, pump-out frequency and volumes, contamination rates, capture rates (collected versus disposed to sewer), or final disposition pathways. In addition, some datasets reflect employer establishments only and may not capture nonemployer businesses.

For purposes of stakeholder background and discussion, this profile is intended to describe key trends, uncertainties, and decision points rather than establish definitive statewide totals. Where Ohio-specific measurements are not available, the analysis uses transparent proxy indicators and screening scenarios to bound potential outcomes, with assumptions stated explicitly. Data improvement options discussed by stakeholders may include voluntary, aggregated reporting and targeted pilots (e.g., limited sets of haulers, processors, or WWTPs) designed to protect proprietary information while improving consistency and comparability over time.

Stakeholder input requested:

- Are the screening-level generation brackets and assumptions reasonable for Ohio?
- What Ohio-specific data sources (haulers, processors, WWTPs, local pretreatment programs) could materially improve the estimate?
- Which limitations are most important to address first for planning and goal-setting?

2.2 CURRENT DISPOSAL

FOG is managed through a combination of (1) controlled collection and beneficial use pathways and (2) unmanaged disposal to the wastewater system. Unmanaged disposal occurs when oils and grease are poured into sinks or floor drains and enter sanitary sewers. This pathway contributes to blockages and sanitary sewer overflows (SSOs) and can increase operating and maintenance burdens at wastewater treatment plants (US EPA, 2023b). Statewide quantitative estimates of FOG disposed to sewer are not currently available.

Managed pathways vary by stream. Source-separated yellow grease (used cooking oil) is typically collected in dedicated containers and is more consistently routed to rendering or fuel markets (e.g., biodiesel) due to its higher commodity value. Brown grease (grease interceptor/trap pump-outs) contains more water, solids, and contaminants, and may be routed to a wastewater treatment plant for receiving/co-treatment (including co-digestion where available), to specialized processors, or to other permitted disposal outlets depending on local acceptance criteria and hauling distances. Residual solids removed during pumping or preprocessing (e.g., settled solids, screenings) may be managed with other wastes and can be disposed in landfills; where FOG is anaerobically digested, residual digestate management may include land application consistent with applicable permits and management plans.

In the absence of statewide reporting, the following indicators can help stakeholders characterize current disposal pathways:

- WWTP receiving practices: which facilities accept grease interceptor pump-outs, acceptance criteria (e.g., water/solids limits), volumes tracked, and whether material is co-digested.

- Hauler routing: typical destinations for yellow grease versus brown grease (in-state versus out-of-state processors) and whether transfer/aggregation occurs.

- Residuals management: how interceptor solids/screenings are handled (e.g., landfill disposal) and how digestate is managed where digestion occurs.

- Sewer system indicators: blockage/SSO tracking and any documented linkages to commercial corridors or specific generator types.

Stakeholder input requested:

- Which disposal pathways (managed vs. unmanaged) are most prevalent by region, based on stakeholder experience?
- What indicators or datasets can best approximate sewer-disposal/mismanagement in Ohio (e.g., SSO/blockage tracking, enforcement data)?
- Are there notable local programs or ordinances that significantly change disposal behavior?

2.3 CONTAMINANTS

FOG streams can contain a range of contaminants that affect collection, processing, and end-market suitability. Common contaminants include water and wastewater (especially for grease interceptor pump-outs), food solids and sediment/grit, and non-organic debris (e.g., plastics or packaging fragments). In addition, soaps, detergents, and other cleaning chemicals can emulsify oils and increase processing difficulty. Typical preprocessing steps used by recyclers and end users are intended to remove free water and solids and improve feedstock consistency and may include screening/straining, settling or dewatering, heating to reduce viscosity and promote phase separation, and filtration (US EPA, 2023b; Deaver and Popat, 2022; Mata et al., 2024).

Quantitative contamination rates are not available at the state level. Contamination primarily affects the usability of FOG for biodiesel or rendering markets.

Stakeholder input requested:

- What contaminants most commonly drive rejection or added costs in Ohio (yellow vs. brown grease)?
- Are there Ohio-specific acceptance criteria or common preprocessing practices we should document?
- What level of contamination information would be feasible to collect (and by whom) for planning purposes?

2.4 CURRENT COLLECTION PRACTICES AND CAPACITY

Food service establishments and food manufacturing and processing facilities typically capture FOG in purpose-designed systems to prevent discharge to wastewater. Collection practices differ by stream: source-separated yellow grease (used cooking oil) is typically stored in dedicated containers for periodic pickup, while brown grease is generated through scheduled pump-outs of grease interceptors or traps and includes wastewater and settled solids.

- Source-separated containers for used cooking oil (“yellow” grease)
- Grease interceptor pump-outs (“brown” grease)

Figures 1 and 2 provide simplified flow diagrams illustrating common collection and managed versus unmanaged pathways for FOG. As shown in Figure 1, FOG generated at food service establishments and other sources can follow managed pathways (collection and beneficial use) or unmanaged pathways (disposal to sewer). Figure 2 highlights an unmanaged pathway in which FOG enters the wastewater system, contributing to blockages and SSOs.

Figure 1. FOG Flow (Simplified)

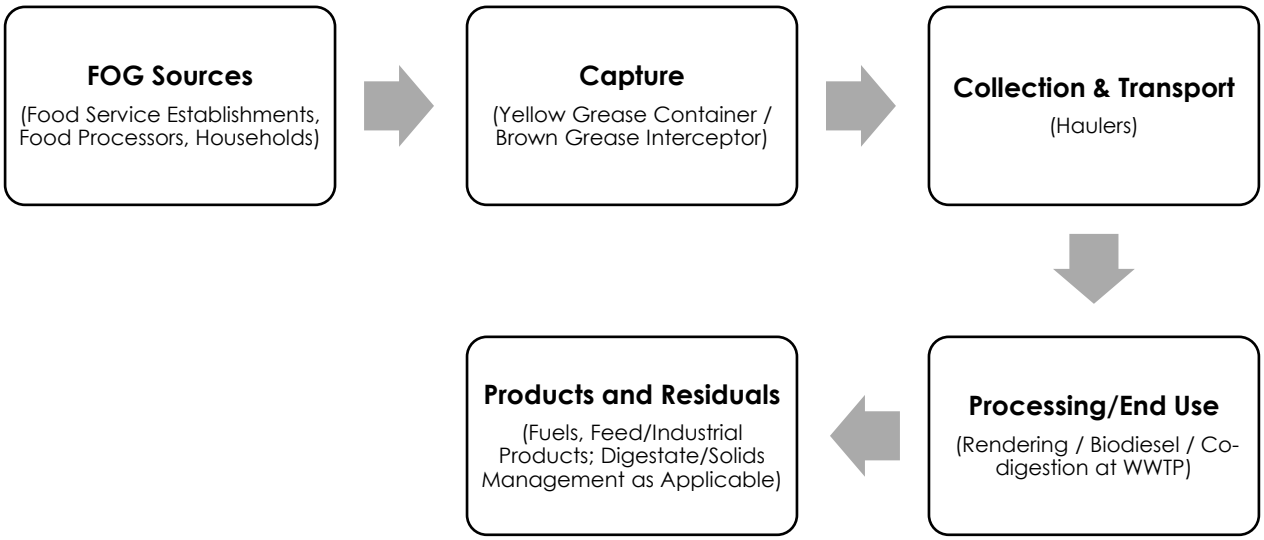
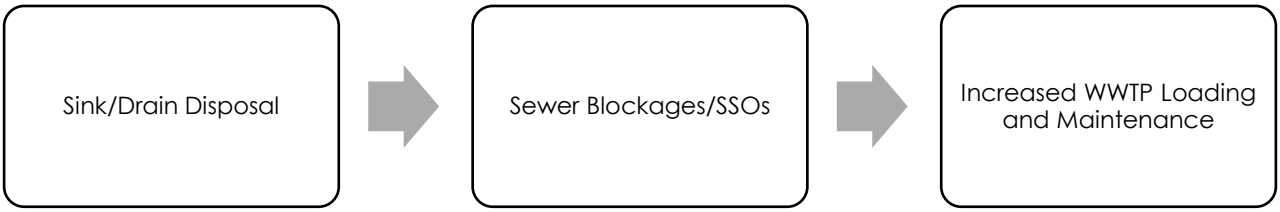


Figure 2. Unmanaged Pathway (to be Minimized)



The collection practices described below determine how consistently material is captured and routed through the managed pathways shown in Figure 1.

Collection is typically provided by private haulers, rendering companies, or specialized service providers under service agreements with generators. Yellow grease service is commonly structured as scheduled pickup based on container size and generation rates, while brown grease management is driven by interceptor sizing, local maintenance requirements, and pump-out frequency (scheduled or on-call). For purposes of this profile,

collection "capacity" includes the availability of service providers, the ability to provide reliable pickup/pump-out frequency, and the presence of adequate on-site storage (e.g., container sizing and secondary containment) without creating operational or odor issues. Qualitatively, collection services appear widely available in urban and suburban areas, with more limited provider coverage and higher per-stop costs in rural regions.

Key factors that drive variation in collection practices (examples) include:

- Generator density and route efficiency (urban versus rural service areas).
- Container/interceptor sizing and storage constraints (including space, secondary containment, and access for trucks).
- Pump-out frequency drivers for brown grease (local requirements, observed grease accumulation, and enforcement/inspection practices).
- Feedstock quality considerations (water content, solids, and contamination) that can affect acceptance and pricing.
- Contract terms and pricing structures (minimum service charges, commodity value offsets for yellow grease, and tipping fees for brown grease).

Indicators to confirm collection coverage and constraints (examples) include:

- Service availability by geography: areas where providers will not service, charge premiums, or require minimum volumes.
- Typical pickup/pump-out intervals and whether service is primarily scheduled or on-call.
- Common failure modes: overflow events, missed pump-outs, container theft/spills, or illegal dumping.
- Generator participation: the extent to which small businesses and institutions are under contract versus self-managing disposal.

2.4.1 Solid Waste District Programs

Solid Waste District (SWD) plans were reviewed to identify FOG collection and management programs operating within each district. Based on a review of the district solid waste management plans, there is no explicit evidence of active, district-run programs for managing fats, oils, and grease (FOG) (e.g., cooking oil recycling, grease-trap collection, or FOG diversion initiatives). Across the plans, FOG is not treated as a distinct waste stream; when "oil" is mentioned, it most often refers to used motor oil addressed through HHW programs, retail take-back, or private recyclers. While some plans discuss food waste diversion (composting, donation) and anaerobic digestion feasibility for organics, FOG is not

explicitly identified, targeted, tracked, or listed as a feedstock. Overall, responsibility for FOG management appears to be implicitly deferred to private haulers, wastewater utilities, and individual generators, with districts primarily serving an educational or referral role rather than establishing goals, infrastructure, or performance tracking specific to FOG.

Stakeholder input requested:

- Where are the biggest collection gaps today (geographies, generator types, or stream types)?
- What pickup/pump-out frequencies are typical (and what drives outliers)?
- What practical constraints should be emphasized (space, access, odor, theft/spills, contract terms)?

2.5 CURRENT TRANSPORTATION PRACTICES AND CAPACITY

FOG is transported by vacuum trucks or sealed containers from generators to receiving outlets such as rendering facilities, biodiesel processors, wastewater treatment plants (WWTPs), and transfer or aggregation locations. Transportation practices differ by stream: yellow grease is typically collected in sealed containers and hauled as a higher-value commodity to rendering or fuel markets, while brown grease (interceptor/trap pump-outs) is commonly hauled by vacuum truck and may be delivered to WWTP receiving stations, specialized processors, or other permitted outlets depending on local acceptance criteria and proximity.

Transportation capacity is generally provided through private-sector fleets and is influenced by route density, equipment availability, and receiving outlet constraints. Even where fleet capacity exists, effective transportation capacity can be limited by long haul distances to accepting facilities, limited receiving hours or appointment requirements, minimum load thresholds, and feedstock quality issues (e.g., high water content or contamination that narrows the set of available outlets). These constraints are typically more pronounced in rural or low-density areas, where fewer stops per route increase per-stop costs and may reduce service frequency.

Transportation indicators to confirm (examples) include:

- Typical haul distances and routing patterns by region (including out-of-state deliveries where applicable).
- Use of transfer/aggregation locations versus direct haul to end users or WWTP receiving stations.
- Common operational constraints (receiving hours/appointments, seasonal impacts, minimum volume requirements, or equipment availability).
- Differences in transport logistics for yellow grease versus brown grease (container pickups versus vacuum truck pump-outs).

Stakeholder input requested:

- Are the described transportation constraints accurate for Ohio (haul distance, receiving hours/appointments, minimum loads)?
- Where is out-of-state transport most common, and why (capacity, acceptance criteria, economics)?
- Are transfer/aggregation sites used in Ohio today, and should they be characterized further?

2.6 PROCESSING CAPACITY (SUMMARY)

2.6.1 Rendering into Products

Recycled FOG can be rendered into several products including animal feed, industrial lubricants and soaps, and fatty acids/glycerol. FOG can serve as a concentrated source of energy and nutrients in livestock feed formulations where permitted. Fatty acids and glycerol can be used to help make surfactants, plastics, resins, textiles, and cosmetics. A more detailed breakdown of products rendered from recycled FOG can be found in section 1.8.

Rendering processing capacity and acceptance conditions are controlled by private-sector companies and are not typically publicly reported. However, the Ohio Department of Agriculture maintains records of licensed rendering plants and transporters, which provide insight into the geographic distribution of rendering infrastructure in the state. From a planning perspective, constraints can include limited receiving hours, equipment downtime, seasonal spikes (temperature-driven odor control needs and peak production periods), and rejection risks associated with contamination (e.g., packaging, debris, or excessive solids) and feedstock condition. These constraints can result in longer on-site storage times, increased transportation distances, or temporary reliance on alternative permitted management options.

Rendering infrastructure in Ohio is concentrated in the northern and central portions of the state, particularly in the Northeast region. As a result, generators in southern and southeastern Ohio may face longer transport distances and greater dependence on collection services, reinforcing the importance of alternative management pathways (e.g., on-site storage, permitted disposal, or other regional options) in areas with limited access to rendering facilities.

Table 1. Regional Distribution of Licensed Rendering Plants in Ohio

Region	Counties Represented	Number of Rendering Plants	Example Facilities
Northeast	Cuyahoga, Ashtabula, Holmes, Stark	6	Otto By-Products; Darling Ingredients; Holmes By-Products
Northwest	Wyandot	1	Davis Grease and Tallow

Region	Counties Represented	Number of Rendering Plants	Example Facilities
West/Central	Auglaize, Darke	2	G.A. Wintzer & Son Co.; Shur Green Farms
Central	Franklin	1	AEC Logistics
Southeast	—	0	—
Total	—	~10–11 facilities	—

Table 2. Regional Distribution of Licensed Rendering Transporters in Ohio

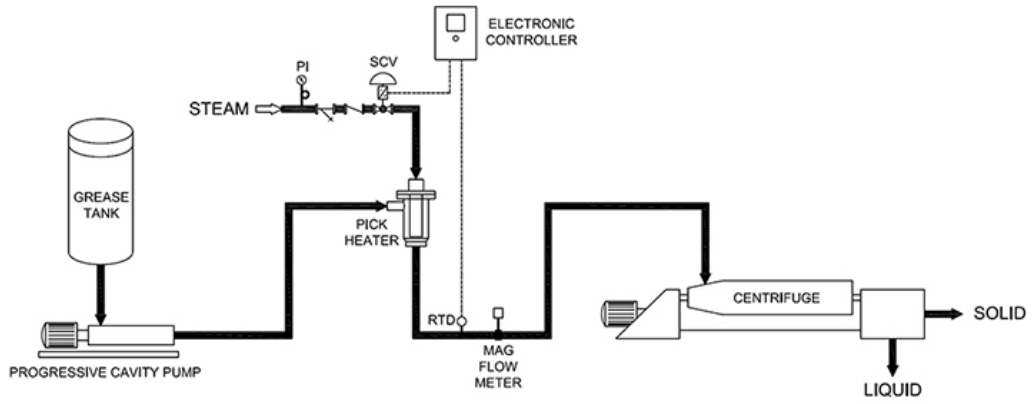
Region	Number of Licensed Transporters
Northeast	42
Northwest	4
Central	14
Southwest	9
Southeast	6
Total	75

Licensed rendering transporters are distributed across all regions of Ohio, with concentrations generally aligned with population centers and livestock production areas. This distribution supports statewide collection coverage, although transport distances may still vary depending on proximity to processing facilities.

2.6.2 Biodiesel Production

FOG (particularly source-separated yellow grease/used cooking oil) can be processed into biodiesel, a renewable alternative to petroleum diesel. In general, feedstock is pretreated to remove free water and solids (e.g., screening/straining, settling or dewatering, heating to reduce viscosity and promote phase separation, and filtration). The treated oil is then converted to fatty acid methyl esters (biodiesel) through transesterification with an alcohol (typically methanol) in the presence of a catalyst, producing glycerin as a coproduct. Feedstock quality (e.g., water content and free fatty acids) influences pretreatment needs and process performance. Figure 3 provides an example process schematic for biodiesel production from FOG (US DOE, AFDC, 2026).

Figure 3. Example Process Schematic for Biodiesel Production From FOG



2.6.3 Anaerobic Digestion (limited)

Anaerobic digestion is a biological process that breaks down organic materials in an oxygen-free environment. This process produces biogas (mostly methane and carbon dioxide) and a nutrient-rich residual material called digestate. FOG can be used as a feedstock in an anaerobic digester in lieu of or in tandem with other organic materials like food waste and manure. Typically, FOG feedstocks are used in a process called low-solids anaerobic digestion. Low-solids anaerobic digesters can usually be found at wastewater treatment plants (WWTPs) as a way to treat sewage sludge. These types of digesters have increased production of biogas and a high solids-destruction potential, resulting in little digestate. The methane in the biogas produced from the digester can be processed to create energy. This decreases fossil fuel reliance and greenhouse gas emissions.

The Ohio EPA has developed a list of anaerobic digesters that are known to accept FOG (Table 3).

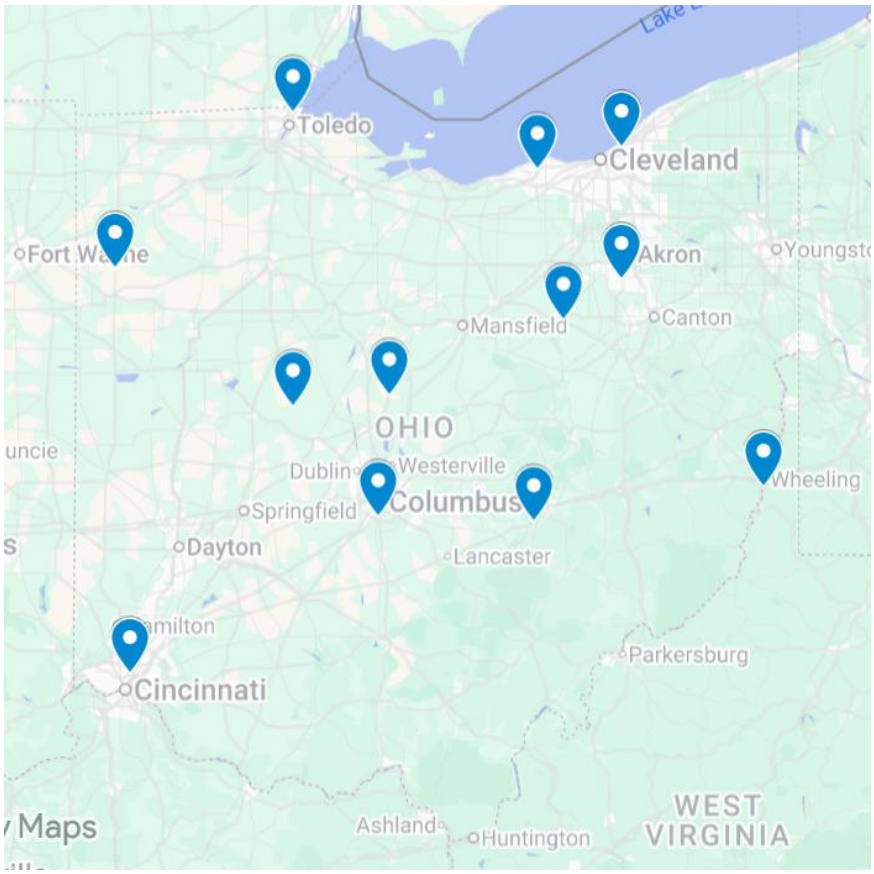
Table 3. Ohio Anaerobic Digesters that Accept FOG

Facility/Farm Name	County	Permitted Waste Input	Biogas End Use (Renewable Energy Generation)	Notes
REnergy - Dovetail Energy, LLC	Greene	Swine Manure, Pumpable and high solids, organic biomass, food waste, energy crops, FOG	Electricity	Digester closed since 2024

Facility/Farm Name	County	Permitted Waste Input	Biogas End Use (Renewable Energy Generation)	Notes
REnergy - Emerald BioEnergy Digester	Morrow	Food waste, FOG, manure, biosolids, energy crops and approved industrial waste	Boiler/Furnace Fuel, CNG	
Buckeye Biogas LLC / OARDC	Wayne	Pumpable and high solids, organic biomass, food waste, energy crops, FOG, Manure	Electricity; CNG; electricity utilized for heating and power generation	
Three Creek Bioenergy, LLC / French Creek WWTP	Lorain	biosolids, FOG, manure food waste, agriculture energy crops	Electricity; CNG	
Lucas County WRRF / Northwest BioEnergy LLC	Lucas	Biosolids, FOG, manure food waste, agriculture energy crops	biogas utilized for electricity and heat	
Central Ohio BioEnergy, LLC / Suburban RNG	Franklin	food waste, FOG, biosolids, manure	Gas/biosolid for beneficial use	
Schmack BioEnergy LLC - Anaerobic Digestion System (Zanesville) IAD Facility Addition Not Operating	Muskingum	biosolids, septage and grey water, FOG, food waste, energy crops, manure, glycerin and stillage byproducts	Electricity; CNG	
Collinwood BioEnergy, LLC	Cuyahoga	FOG, food waste, manure and energy crops	Electricity	
Haviland Energy LLC	Paulding	Biosolids, FOG, food waste, energy crops, mixed plastic recycling water	Electricity; CNG	Same as Top Acres?
Lime Lakes Energy, LLC	Summit	food waste, FOG, manure, biosolids, and energy crops	Electricity	Not currently operating. Planning to restart.

Facility/Farm Name	County	Permitted Waste Input	Biogas End Use (Renewable Energy Generation)	Notes
Eastern Ohio Regional Wastewater Authority (EORWA)	Belmont	co-digest regional organic wastes (food scraps, expired beverages, etc.) along with wastewater sludge	Electricity / heat	
Vanguard Renewables Mansfield AD1, LLC	Union	Packaged food waste, Liquid food waste, Source-separated organics (SSO), Manure, Fats, oils, grease (FOG), glycerin	RNG	Not yet constructed.
Synthica Energy, LLC	Hamilton	Food waste, Food & beverage processing byproducts, Glycerine byproducts, Biodiesel byproducts, Spent yeast / bad beer, Depackaged food/beverage waste, High-strength wastewater, Sludges, filter cakes	RNG	

Figure 4. Operating Anaerobic Digesters that Accept FOG



Available information indicates that a substantial portion of source-separated yellow grease is diverted to established processing markets (e.g., rendering and biodiesel), while brown grease is more variable in recoverability and routability due to higher water content, solids, and contaminants. As a result, "processing capacity" for FOG should be understood not only as physical throughput at facilities, but also as the availability of outlets that will accept material under site-specific quality specifications, pricing/tipping structures, and logistics constraints.

Processing outlets exist both in-state and regionally; however, the adequacy of in-state capacity is not fully documented in a single public inventory, and effective capacity can be constrained by acceptance criteria and operating conditions. Common constraints reported in other jurisdictions and expected to be relevant for Ohio include variability in feedstock quality (water, solids, and non-organic debris), limited receiving hours or appointment requirements, storage and odor management limitations, pretreatment needs prior to co-digestion, and changes in end-market demand (e.g., biodiesel/feedstock pricing). These factors can affect where and when material can be delivered even when nominal processing infrastructure exists.

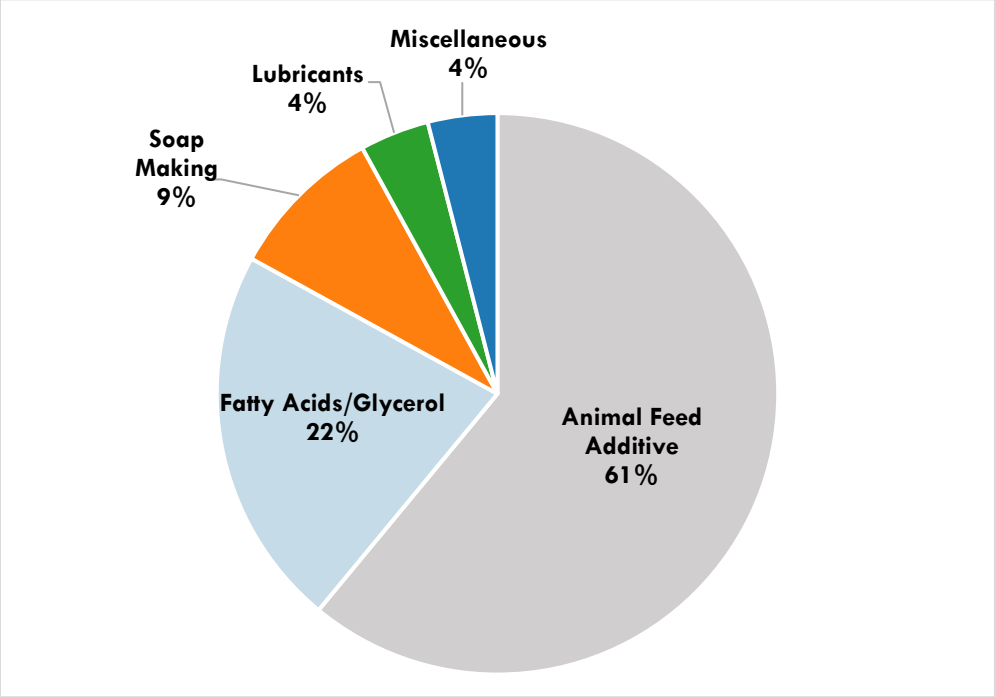
Capacity and acceptance indicators to confirm (examples) include:

- Which in-state facilities and WWTPs accept yellow grease and/or brown grease, and what are the key acceptance criteria (e.g., maximum water/solids, screening requirements, prohibited materials)?
- What operational limits affect effective capacity (receiving hours, seasonal constraints, storage volume, appointment systems, or pump-out volume caps)?
- What are typical pricing structures (commodity value, tipping fees, or blended arrangements), and how do they shift with market conditions?
- How often is material routed out of state due to capacity, acceptance, or economics, and are there regions where haul distance is a binding constraint?

2.7 CURRENT USES, PRODUCTS, AND MARKETS

The top end-uses for yellow grease in 2023 are shown in Figure 5 below (EPA 2023a).

Figure 5. End-uses for Recycled Yellow Grease in 2023



"Miscellaneous" uses can include use as biodiesel feedstock and other industrial applications, and category definitions may vary by reporting source. In general, yellow grease markets are regional and national, with material moving across state lines to reach end users with consistent demand and processing capability.

Pricing for yellow grease fluctuates with broader commodity markets and fuel policy incentives, including demand for bio-based diesel fuels. As market conditions shift, the relative attractiveness of outlets (e.g., rendering versus fuel markets) can change, which in turn can affect collection economics, contract terms, and where material is ultimately processed. These dynamics are relevant for planning because they influence the stability of diversion pathways and the likelihood that material will be routed to in-state versus out-of-state facilities.

Brown grease (grease interceptor/trap pump-outs) is generally less marketable than yellow grease due to higher water content, solids, and contaminants. As a result, viable outlets may be limited to facilities with appropriate receiving and pretreatment capability (e.g., certain WWTP receiving stations/co-digestion programs or specialized processors), and economics may involve tipping fees rather than commodity revenue. Market and acceptance constraints for brown grease can therefore be a binding factor in rural areas or where hauling distances to accepting outlets are long.

Market indicators to confirm (examples) include:

- Recent trends in yellow grease pricing and contract structures (e.g., revenue share, service fees, theft prevention measures).
- Common destinations for Ohio material (in-state versus out-of-state) and whether routing changes seasonally or with market conditions.
- Acceptance and pricing/tipping structures for brown grease at WWTPs and other outlets, including key rejection reasons (water/solids/contamination).
- Any observed shifts in outlets driven by fuel policy incentives or renewable diesel demand that may affect long-term pathway resilience.

Stakeholder input requested:

- What are the most important current end markets for Ohio material (in-state and out-of-state) by stream?
- How volatile are pricing and outlet availability in practice, and what risks should the plan highlight?
- Are there emerging/anticipated market changes (e.g., renewable diesel demand) that should be reflected?

2.8 ENVIRONMENTAL AND ECONOMIC IMPACT (WARM-BASED)

This section describes the planned EPA Waste Reduction Model (WARM) analysis that will be completed as part of this work. WARM will be used to develop planning-level comparisons of greenhouse gas (GHG) emissions and energy impacts for alternative FOG management pathways in Ohio. Results will be scenario-based and intended to support stakeholder discussion (not to provide facility-specific LCA results).

2.8.1 Planned analysis inputs

The WARM run will require a set of transparent, stakeholder-reviewed inputs. Anticipated inputs include:

- Estimated annual FOG quantities by stream (yellow grease and brown grease), including water/solids assumptions where needed.
- Baseline management split (planning-level shares routed to rendering, biodiesel, co-digestion/WWTP, sewer disposal/mismanagement, landfill/other, and out-of-state destinations where applicable).
- Scenario definitions (diversion shares and destination pathways to be compared against the baseline).
- Transport assumptions (typical hauling distances to processing facilities or WWTPs; regional vs. in-state routing as applicable).
- Processing assumptions needed to interpret WARM factors (e.g., which pathway is treated as producing a displaced product or fuel, and the type of displacement credit assumed).

2.8.2 Illustrative scenarios (to be finalized)

The WARM analysis can be structured around three clear, bounded scenarios that bracket likely outcomes and highlight key decision levers.

- **Scenario A – Reference (current management split).** Planning-level baseline reflecting the current split of yellow grease and brown grease across managed pathways (e.g., rendering/commodity markets, biodiesel/renewable fuels, WWTP receiving/co-treatment where available) and unmanaged sewer disposal. Baseline transport distances reflect typical in-state and out-of-state routing.
- **Scenario B – Constraint case (lower diversion / longer haul).** Represents conditions where access, acceptance criteria, or market factors reduce the share of material reaching higher-benefit outlets. Modeled as (1) longer average hauling distances (especially in rural areas) and/or (2) a shift of collected brown grease away from WWTP receiving/co-digestion toward the limited set of available permitted outlets, with unmanaged sewer disposal held constant or increased as a stress test.
- **Scenario C – Program improvement case (higher diversion / reduced sewer disposal).** Represents improved capture and routing through a combination of better interceptor maintenance and compliance (reduced sewer disposal), improved feedstock quality/acceptance, and expanded use of available in-state outlets (e.g., increased WWTP receiving/co-digestion where feasible). Modeled as a defined reduction in the sewer-disposal share with corresponding increases in managed collection and delivery to beneficial-use pathways.

2.8.3 Planned outputs

The WARM results will be summarized in a consistent format across scenarios, including:

- Estimated net GHG impacts and net energy impacts for each scenario relative to the baseline.
- A clear description of key drivers and sensitivities (baseline split, diversion quantity, hauling distance, and displacement assumptions).
- A qualitative discussion of co-benefits and tradeoffs not captured well by WARM (e.g., sewer maintenance/SSO reductions, operational constraints at WWTPs, contamination impacts, and market resilience).

All inputs and assumptions will be documented alongside results so stakeholders can understand how conclusions change under different conditions. Where Ohio-specific data are not available, the analysis will use transparent proxies and will identify the data elements that most influence results (to help prioritize future data collection).

2.9 KEY CHALLENGES AND BARRIERS

This section summarizes the primary factors that limit consistent, high-quality diversion of FOG from the wastewater system and other disposal pathways. The challenges below reflect common gaps in data, generator practices, enforcement, and market/logistics conditions that can affect collection reliability and end-market viability.

- Limited statewide reporting
- Variable generator compliance with interceptor maintenance
- Illegal dumping
- Market price variability
- Long haul distances in rural areas

Stakeholder input requested:

- Are there additional barriers (regulatory, contractual, infrastructure, or behavioral) that should be elevated as “top” challenges?
- Which barriers are most solvable in the near term versus longer-term structural issues?
- Any Ohio examples (successful/unsuccessful) that would strengthen this section?

2.10 OPPORTUNITIES AND PLANNING IMPLICATIONS

This section highlights practical opportunities to improve FOG management and identifies planning considerations that can support higher diversion rates and more resilient recycling pathways. The items below are intended to inform program design, stakeholder coordination, and near-term implementation priorities.

- Improve reporting or tracking of commercial FOG collection
- Promote best management practices for grease interceptor maintenance
- Educate food service establishments and residents
- Encourage co-digestion of brown grease at wastewater treatment facilities
- Explore regional aggregation hubs in underserved areas

Stakeholder input requested:

- Which opportunities are highest priority for Ohio in the next 12–24 months?
- Who should lead/own each opportunity (state, locals, WWTPs, haulers, industry groups), and what support is needed?
- Are there existing initiatives we should align with or avoid duplicating?

2.11 REMAINING NEEDS AND NEXT STEPS (FOR STAKEHOLDER DISCUSSION)

This section outlines the key information gaps and decision points that stakeholders can help address as Ohio develops an organics management plan. The discussion items are intended to support alignment on goals, roles, and near-term actions for improving FOG prevention, collection, and beneficial use across the state. This section builds on the challenges and barriers identified in Section 1.10 and the opportunities and planning implications summarized in Section 1.11 by translating them into specific policy, program, and implementation needs.

Discussion note: The items below are intended to support stakeholder dialogue and identify candidate policy and program elements that could be incorporated into Ohio's broader Organics Management Plan. They are not final recommendations and should be refined through stakeholder input, agency review, and alignment with applicable authorities and emergency response frameworks.

Priority data gaps and options to address them: The items in Table 4 below are presented as options for consideration; they are not recommendations and would require coordination with affected parties (e.g., generators, haulers, utilities, and state/local agencies).

Table 4. Data Gaps

Data gap	Why it matters for the plan	Neutral options to reduce the gap (examples)
Statewide generation and diversion quantities (yellow vs. brown grease)	Needed to set and evaluate quantitative targets and estimate environmental benefits.	Pilot voluntary aggregated reporting with willing haulers/facilities; use anonymized county-level totals; supplement with proxy estimates using establishment counts and

Data gap	Why it matters for the plan	Neutral options to reduce the gap (examples)
		national factors (clearly labeled as planning-level).
Disposition pathways (rendering, biodiesel, co-digestion/WWTP, other/out-of-state)	Affects feasibility, resilience, and whether diversion aligns with plan priorities.	Standardize a small set of pathway categories for optional reporting; conduct structured stakeholder interviews; compile an infrastructure inventory and validate with operators.
Service coverage and access constraints (especially rural)	Identifies where costs/haul distances may limit proper management and where pilots may be most helpful.	Map processors/accepting WWTPs and estimate drive-time/haul distance; ask haulers to identify "no-service" or high-cost areas qualitatively; use regional aggregation concepts for discussion.
Compliance indicators (interceptor maintenance frequency, enforcement/inspection variability)	Helps connect program options to sewer protection outcomes and operational burden.	Compile example local ordinances/programs; request a small sample of anonymized inspection stats from willing jurisdictions; use WWTP blockage/SSO narratives as qualitative context where available.
Residential FOG generation and disposal behaviors	Informs education/outreach design and realistic expectations for household diversion.	Use surveys as an optional input; incorporate program participation metrics (e.g., number of households reached); focus on "do no harm" messaging and sewer-protection benefits.

2.11.1 Discussion Topics

- Planning goals: What outcomes should the plan prioritize for FOG (e.g., sewer blockage prevention, diversion/beneficial use, GHG reductions, compliance)?

- Baseline and measurement: What existing data sources (haulers, local pretreatment programs, WWTPs, business registries) can be leveraged to estimate generation and diversion more reliably?

- Geographic service gaps: Where do collection/processing access constraints exist (especially rural areas), and what are the underlying drivers (haul distance, contract structure, generator density)?

- Roles and governance: Which entities should lead or coordinate FOG initiatives (state agencies, local health departments, sewer districts/WWTPs, MPOs/councils of governments, private haulers)?

- Policy and program levers: What approaches are feasible in Ohio (e.g., voluntary BMP programs, local ordinances, enhanced pretreatment requirements, state guidance, reporting frameworks)?

- End markets and resilience: How sensitive are Ohio generators/haulers to commodity price swings and outlet changes (rendering, biodiesel, AD), and what would improve market stability?

- Equity and burden: Are there small businesses or rural/underserved communities disproportionately affected by compliance costs or limited service options?

2.11.2 Potential next steps (for discussion)

- Confirm planning assumptions and targets for FOG (baseline year, planning horizon, and how diversion will be defined and tracked).

- Develop a data collection approach: identify a manageable set of reporting fields and pilot voluntary (or required) reporting with a small set of haulers, WWTPs, and local pretreatment programs.

- Map existing infrastructure: compile and validate a statewide inventory of FOG-related collection, transfer/aggregation, rendering, biodiesel, and permitted co-digestion capacity (including operating status and constraints).

- Identify priority geographies: use stakeholder input to select areas for focused interventions (e.g., rural aggregation hubs, regional contract models, shared containers).

- Draft and distribute BMP materials: standardize guidance for food service establishments and interceptor maintenance; coordinate messaging for residents (e.g., “cool, collect, and recycle” practices).

- Evaluate policy options: screen a short list of feasible approaches (local ordinance support, state guidance, incentive programs, enforcement/inspection alignment) and identify implementation partners.

- Develop a short list of near-term projects: define 2–4 pilot initiatives with scope, lead entity, partners, schedule, and expected outcomes for inclusion in the organics management plan.

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