

# US-EPA FOG ABATEMENT & EMERGING POLLUTANTS TRAINING:

## EFFECTIVE FOG & EMERGING POLLUTANTS ABATEMENT PROGRAM IMPLEMENTATION



POLLUTION PREVENTION  
resource center



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# **AFTERNOON**

# **PROGRAM**

# **IMPLEMENTATION**

- **FSE FOG MANAGEMENT PRACTICES**
- **PUBLIC OUTREACH**
- **FSE EFFECTIVE FOG PRETREATMENT**
- **FOG AND WATER SEPARATION**
- **GREASE REMOVAL DEVICES (GRD)**
  
- **FSE INSPECTIONS**
- **PREFERRED PUMPER PROGRAMS**
  
- **CONTAMINANTS OF EMERGING CONCERN AND PFAS**

# Best Management Practices



# “Effective Kitchen BMPs Keep FOG Out of Public Sewers”

## In A Perfect World ...

**BMPs such as scraping/wiping all utensils and plates into garbage keeps FOG out of drains.**



# Kitchen BMPs

## In The Real World ...

**What really happens:**

- Cleanup staff are in a hurry
- Fastest way to clean pots is with high pressure water
- Hose down the floor and squeegee to the nearest floor drain



# Kitchen BMPs ...

**... frequently not an effective tool for FOG abatement**

**FSE manager's responsibility is about getting good food onto the customer's table**



# Kitchen BMPs ...

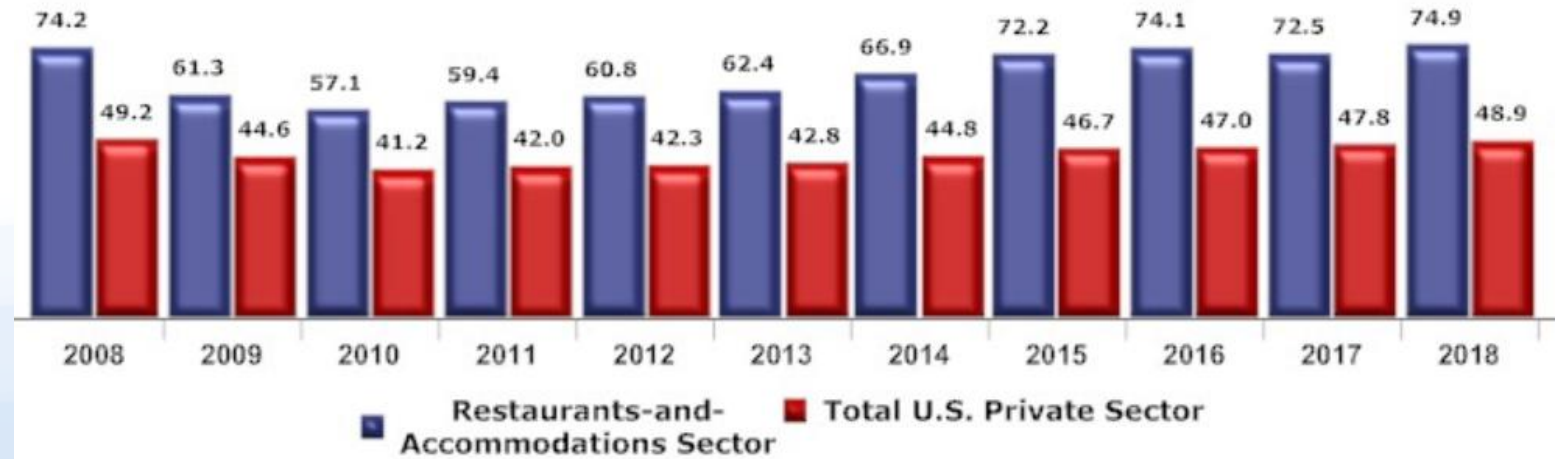
... frequently not the most effective tool for FOG abatement

Employee turnover rate is high (16-200%) and Kitchen BMP training becomes very time consuming.



## Annual Employee Turnover Rates (%)

Restaurants-and-Accommodations Sector vs. Total Private Sector




Source: Bureau of Labor Statistics

# Kitchen BMPs ...

- Scrape pots and pans prior to washing.
- Do not pour, scrape, or otherwise dispose of fats, oils, or grease into the sink or drains
- Collect fryer oil and store in barrels for recycling.
- Do not put food (including liquid food) including milk shake syrups, batters, and gravy down the drain
- Use strainers on sinks and floor drains to prevent solid material from entering the sewer.
- Post “NO GREASE” signs near sinks and drains.

## Let's Tackle the Grease in This Kitchen!



**Why should I help?**

- Prevent grease buildups from blocking sewer lines.
- Stop sewer overflows into streets and storm drains.
- Save money spent on costly cleanups of sewage spills.
- Reduce the number of times you have to clean your grease trap (food service).
- Protect the quality of our water.

**DO!**

- ✓ Put oil and grease in covered collection containers.
- ✓ Scrape food scraps from dishes into trash cans and garbage bags and dispose of properly. Avoid using your garbage disposal.
- ✓ Remove oil and grease from dishes, pans, fryers, and griddles. Cool first before you skim, scrape, or wipe off excess grease.
- ✓ Prewash dishes and pans with cold water before putting them in the dishwasher.
- ✓ Cover kitchen sink with catch basket and empty into garbage can as needed.
- ✓ Cover floor drain with fine screen and empty into garbage can as needed.


**DON'T!**

- ✗ Don't pour oil and grease down the drain.
- ✗ Don't put food scraps down the drain.
- ✗ Don't run water over dishes, pans, fryers, and griddles to wash oil and grease down the drain.
- ✗ Don't rinse off oil and grease with hot water.

**More Ways to Tackle Grease**

- ▶ Use environmentally safe cleaning products instead of harsh detergents or cleaners that can damage sewer lines.
- ▶ If you generate large amounts of used cooking oil, reuse or recycle it. To find a recycler, check the phone book under "recyclers" or "rendering companies."
- ▶ If you generate small amounts of used cooking oil, reuse it as often as possible and then pour it into a container you can throw away. Never pour it down the drain.
- ▶ Start a compost pile at your home with scraps that are not meat. Find out about composting in the TCEO publication, "A Green Gali

For more information, contact the  
Tri-County Council on Environmental Quality (TCEQ)



WSA  
a project of pprc.org

# Kitchen BMPs ...

- **Train all kitchen staff in best management practices for grease disposal and the impacts of grease accumulation in the sewer.**
- **Provide regular refresher training/discussion for proper disposal of fats, oils, and grease for all employees.**
- **Inspect grease abatement devices/interceptors after pumping to ensure adequate cleaning was performed.**
- **Dump mop water only to drains connected to your grease treatment system.**
- **Use absorbents to soak up spills containing fats, oils, and grease.**



**CASE STUDY: Despite inspections, and training on kitchen BMPs and interceptor maintenance . . . just 3 months after public line cleaning:**

**FOG buildup at FSE connections**

**Restrictions in the pipe**

**FOG on top of pipe indicates blockage**



# SO, GET OUT OF THE KITCHEN?

**Is There Nothing  
Good About BMP's?**



# What's GOOD ABOUT Kitchen BMPs ?

- Are One of the Tools in the Toolbox
- Are the First Line Of Defense Against FOG
- Will Not Solve FOG Problems But Can Still Help Control Costs
- Have the Most Available Resources to Download and Print – Especially Resources for FSE Employees
- Can Help Perpetuate a Cultural Consciousness About FOG Problems

## THE RIGHT WAY

**CORRECTO**  
올바른 방법

**Wipe dishes, pots, pans and cooking equipment before rinsing or washing.**

Limpie con papel los platos, ollas, sartenes y equipo de cocina antes de enjuagarlos o lavarlos.

접시, 냄비, 팬, 조리 도구를 물로 헹구거나 씻기 전에 먼저 찌꺼기를 닦아냅니다.



**Put food waste into food recycling container or trash.**

Coloque los restos de comida en contenedores para reciclar alimentos o en la basura.

음식물 찌꺼기는 음식물 재활용 용기나 쓰레기통에 넣습니다.



**Collect waste oil and store for recycling. Clean up spills immediately.**

Junte el aceite usado y guárdelo para reciclar. Limpie los derrames inmediatamente.

사용한 기름은 모아뒀다가 수거해 가도록 합니다. 기름이 흘렀을 때는 즉시 닦습니다.



## THE WRONG WAY

**INCORRECTO**  
잘못된 방법

**Do not pour cooking residue into the drain.**

No arroje por el desagüe los residuos de alimentos cocinados.

조리하고 남은 찌꺼기를 배수구에 붓지 마십시오.



**Do not put food waste down the drain.**

No arroje los desperdicios de alimentos por el desagüe.

음식물 찌꺼기를 배수구로 흘려보내지 마십시오.



**Do not pour cooking oil into the drain.**

No vierta aceite de cocina directamente en el desagüe.

요리용 기름을 배수구에 붓지 마십시오.





## Kitchen Best Management Practices (BMPs)

To Do	Why?	Benefits
Train employees	Employees help eliminate grease blockages and sewer spills	Avoid sewer blockage, fines and environmental issues
Display "No Grease" information in the workplace	Reminds employees to reduce FOG in the kitchen	Minimize grease discharge; reduce cleaning and disposal costs
Scrape or dry-wipe excess food and grease from cookware; dispose in trash	Keeps grease out of traps and interceptors	Less frequent cleaning, reduce maintenance costs
Install removable screens on all kitchen drains	Prevents food from clogging the sewer system	Reduce grease and food in traps and interceptors
Keep hot water to drains less than 140° F	Hot water dissolves grease and pushes it to the sewer pipe	Reduce costs to heat water; prevent FOG "pass through" in grease interceptors
Don't overfill FOG containers	Prevents slippery FOG spills	Employee safety
Pour cooking grease, liquid oil into covered grease container	Reduces amount of grease discharged to sewer	Reduce grease waste and garbage fees
Use Spill Kits	Absorb spilled grease and oil	Reduce material in grease traps and interceptors
Routinely clean kitchen exhaust system filters/hoods	Grease and oil in kitchen exhaust system can accumulate on the roof and may enter the stormdrain system when it rains	Protect local waterways. Avoid penalties or fines for polluting water

www.cleanwaterservices.org • (503) 681-3600



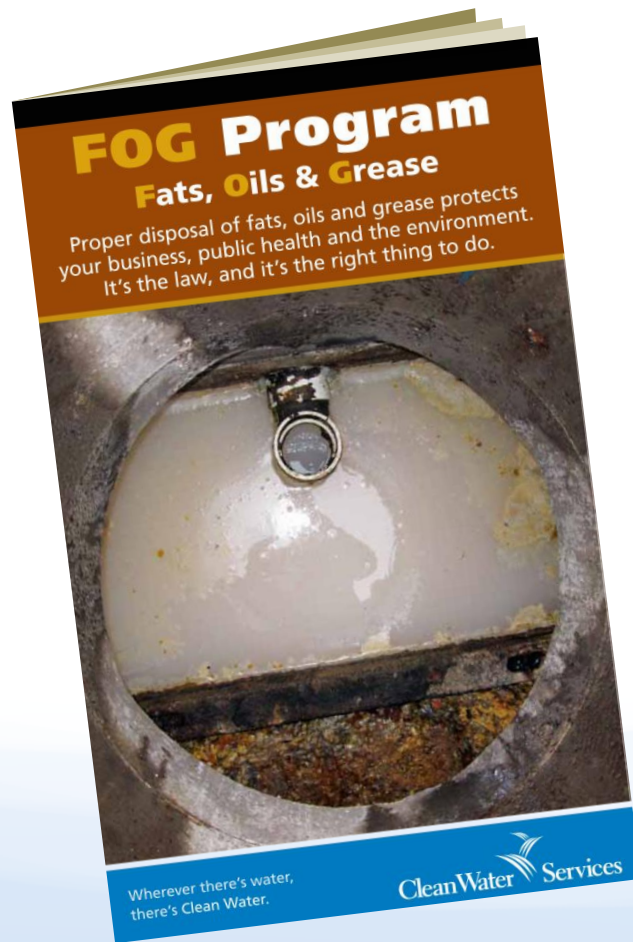
## Las mejores prácticas de administración para la cocina

Para hacer	¿Por qué?	Beneficios
Entrene a los empleados	Los empleados ayudan a eliminar los bloqueos causados por la grasa y los derrames en las alcantarillas	Los restaurantes se evitarán multas al no bloquear el alcantarillado y evitan problemas ambientales
Coloque la información de "No se permite grasa" en el lugar de trabajo	Les recuerda a los empleados a reducir la cantidad de manteca, aceite y grasa en la cocina	Reduce la descarga de grasa e los restaurantes; reduce el costo de limpieza y de desecho
Raspe o limpie en seco el exceso de comida y la grasa solidificada de los sartenes; tirela en la basura	Mantiene la grasa fuera de los colectores e interceptores	Menos grasa en los colectores significa tener que limpiar menos frecuente, lo cual reduce los costos de mantenimiento
Instale mallas removibles en todos los desagües de la cocina	Previene que las partículas de comida entren y bloqueen el sistema de alcantarillado	Reduce la cantidad de grasa y de material de comida en los colectores e interceptores
Use agua caliente en los desagües a menos de 140° F	El agua a una temperatura más caliente de 140° F disuelve la grasa, causando que se solidifique después en la tubería del alcantarillado	Reduce los costos de calentar agua; previene que la manteca, aceite y grasa "pase a través" de los interceptores para grasa
No rebalse los envases de FOG (manteca, aceite y grasa)	Previene derrames resbalosos de manteca, aceite y grasa	Seguridad de los empleados
Vierta la grasa para cocinar y el aceite líquido en un recipiente para grasa y cúbralo	Reduce la cantidad de grasa que es descargada al alcantarillado	Los restaurantes reducen el desperdicio de grasa y el costo potencial de transportar basura
Use los estuches para los derrames	Los materiales absorbentes la grasa y el aceite derramado	Reduce la cantidad de material en los colectores e interceptores de grasa
De manera rutinaria, limpie los filtros y campanas del sistema de ventilación de la cocina. (Vacíe el agua que usó para limpiar las campanas y los filtros en un desagüe conectado a un interceptor de grasa; o haga que le limpien las campanas a través de un servicio profesional.)	Si la grasa y el aceite se escapan a través del sistema de ventilación de la cocina, pueden acumularse en el techo y eventualmente entrar al sistema de alcantarillado de aguas pluviales	Se protege la calidad del agua en las vías fluviales locales. Evita multas o infracciones debido a las regulaciones sobre aguas pluviales

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# FOG Public Outreach, and Printed Material



## Outreach for residential FOG reduction

- “Freeze-the-Grease” kits
- Web information for homeowners
- Quarterly newsletter for customers
- Videos

## Outreach for commercial FOG generators

- Web information
- FOG booklet
- Kitchen poster
- Videos

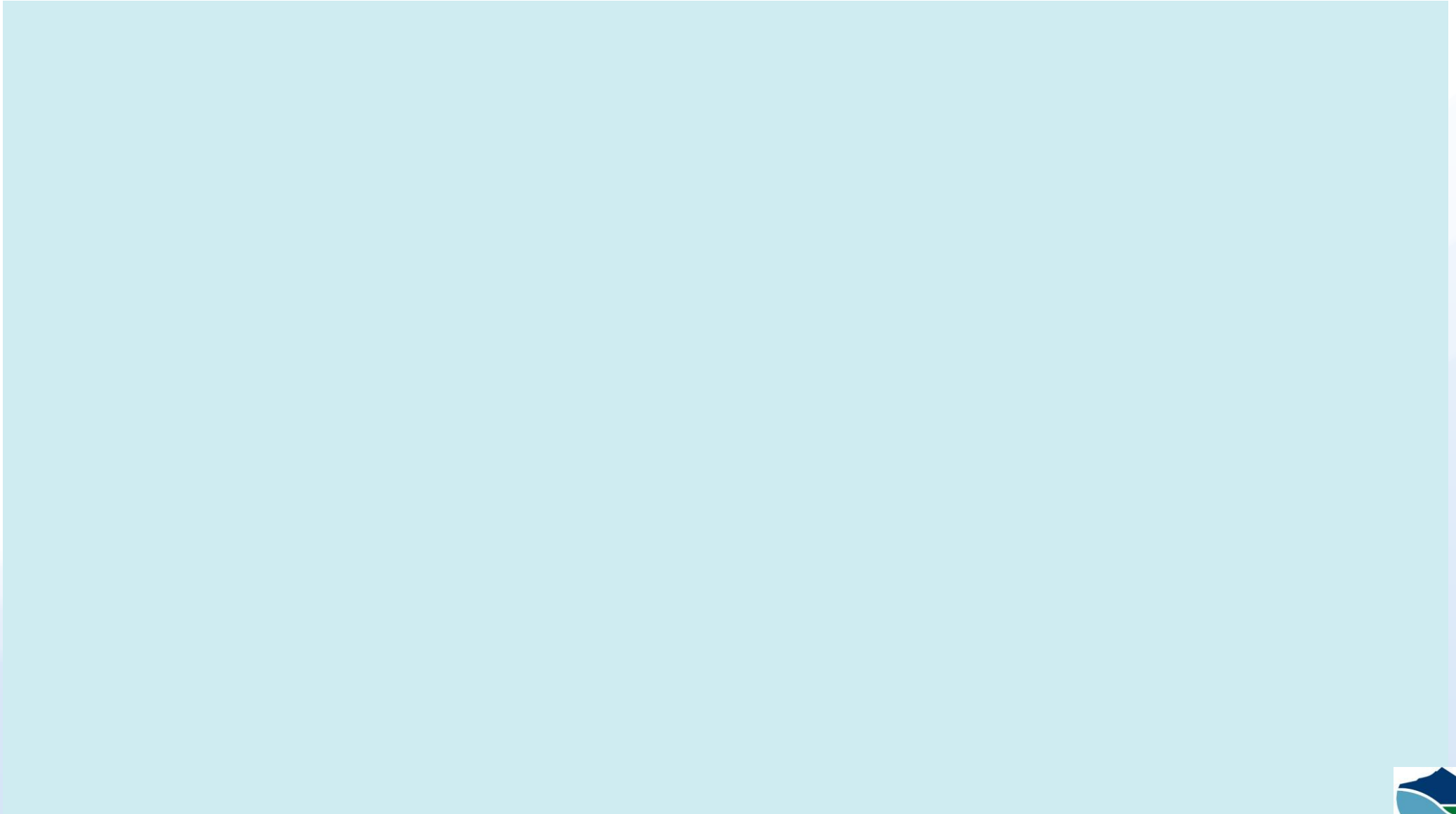


[WSA FOG for FSEs Page](#)

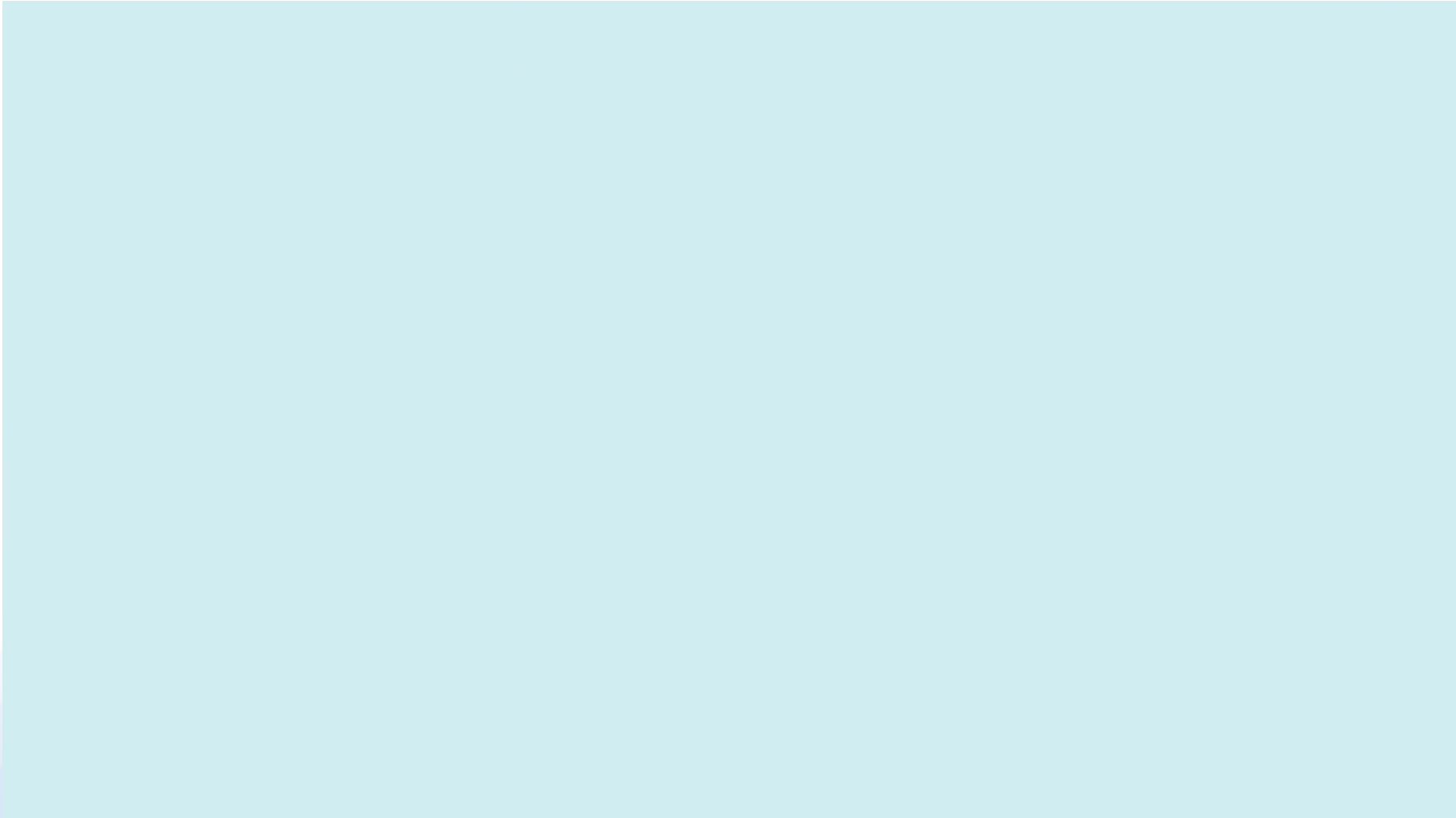
# Public myths and misconceptions

- Household pipes don't affect city pipes
- Using hot water or soap moves the FOG along
- Only cold grease gets stuck
- FOG in the wastewater means tap water is unsafe to drink
- Garbage disposal means it's okay to use them
- In a liquid state, oil and grease will flow into the sewer and WWTP, and that is desirable
- Vegan and vegetarian cooking doesn't generate FOG

# Pete the Plumber Shares FOG Tips for Restaurants



# Pete the Plumber's Tips on Dealing with Fats, Oils, and Grease





# FIGHT F.O.G.

HELP KEEP **FATS, OIL & GREASE** OUT OF YOUR DRAIN!

**COOL IT  
CAN IT  
TRASH IT!**

**PREVENT SEWER BACKUPS IN  
YOUR HOME, BUSINESS  
& NEIGHBORHOOD**

**THIS IS  
NOT A  
TRASH  
CAN.**

'Disposable' & 'Flushable'  
wipes clog sewer pipes.

**THINK BEFORE YOU FLUSH**



OREGON  
**E271994**  
RECYCLE OWEN

# FOG Public Outreach





**Cooking Oil and Grease Clog Pipes**  
No one wants their sewage back.



Where does it go?  
**STEP 1** Cool oil/grease    **STEP 2** Remove oil/grease from pots and pans

Small amount of grease	Large amount oil	Large amount of grease
		
Wipe with paper towels or newspaper	Pour cooled oil into container, close lid	Scrape into container, close lid
 <b>FOOD &amp; COMPOST</b>	 Place <b>NEXT</b> to <b>RECYCLE</b> cart	 <b>GARBAGE</b>

Also available in the following languages:

- [Spanish \(Español\)](#) 
- [Chinese \(Simplified\)](#) 
- [Chinese \(Traditional\)](#) 
- [Vietnamese](#) 
- [Korean](#) 

**DON'T FLUSH TROUBLE!**

**THESE ITEMS BELONG IN THE TRASH CAN!**



Cleaning wipes



Disposable diapers,  
nursing pads & baby wipes



Hair



**USE THE TRASH CAN,  
NOT THE TOILET!**



Grease



Condoms



Facial wipes



Tampons and pads

The label might say "flushable," but disposable wipes and other products are clogging our sewer lines and damaging pumps and other equipment. Not only are these problems expensive to fix, they can also cause raw sewage overflows into homes, businesses and local waterways. So, think trash, not toilets!

To learn more, including how to get rid of things you no longer want or need, visit us on the Web at <http://www.kingcounty.gov/wtd> or call the Wastewater Treatment Division at 206-477-5371 or 711 TTY.



**King County**  
Department of Natural Resources and Parks  
Wastewater Treatment Division

正體字

русский

Somali

Español

Tiếng Việt

# FOG Public Outreach

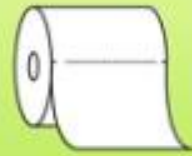
正體字

русский

Somali

Español

Tiếng Việt



**TOILET  
PAPER ONLY**



**EVERYTHING ELSE**  
(even if labeled flushable)



**SOLO PAPEL  
HIGIÉNICO**



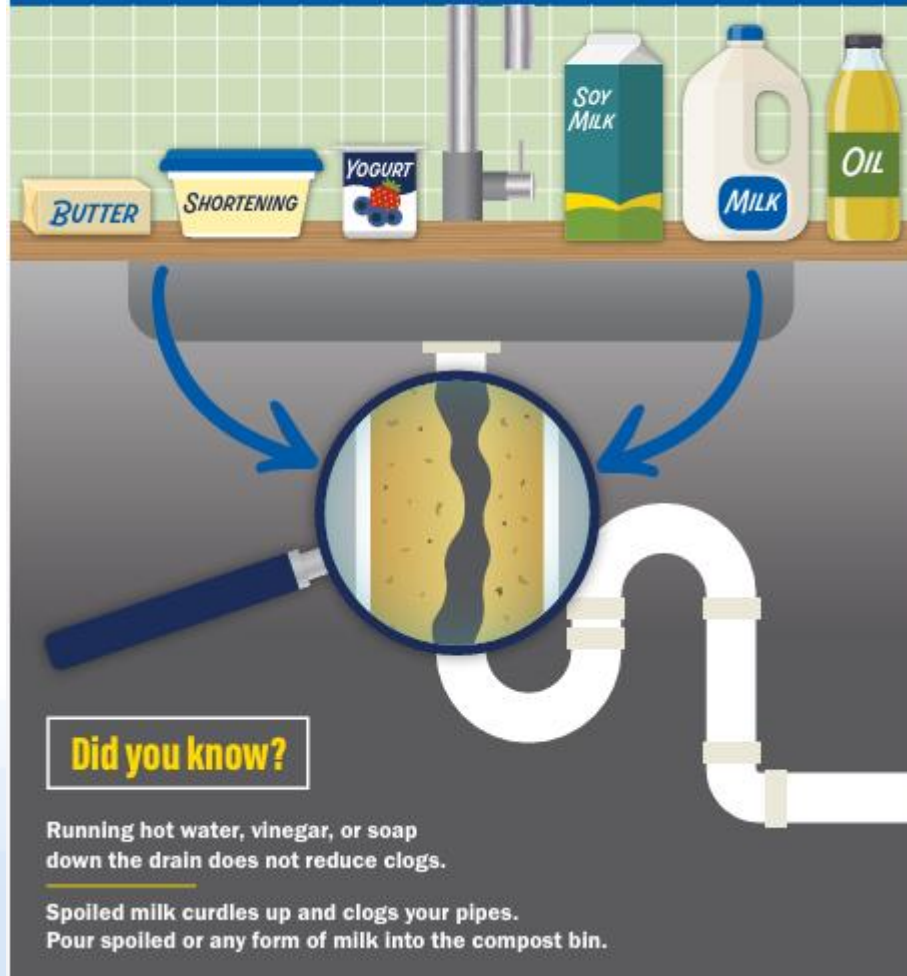
**TUDO LO DEMÁS**  
(incluso si está etiquetado como  
"desechable")



# No one wants their sewage back.



KEEP COOKING OIL, FATS, AND GREASE FROM CLOGGING YOUR PIPES!



## Did you know?

Running hot water, vinegar, or soap down the drain does not reduce clogs.

Spoiled milk curdles up and clogs your pipes. Pour spoiled or any form of milk into the compost bin.

## If in doubt, scrape it out!

Cooking oil and grease build up in your pipes and cause clogs. Instead of using your drain, follow the steps below to safely discard of them.



### Step 1. Let the oil or grease cool

Before discarding, let oil or grease cool down.



### Step 2. Scrape or wipe off grease from dishware

Oils and greases will form into solids or liquids. Small amounts can be scraped or wiped down with paper towels and discarded into your compost.



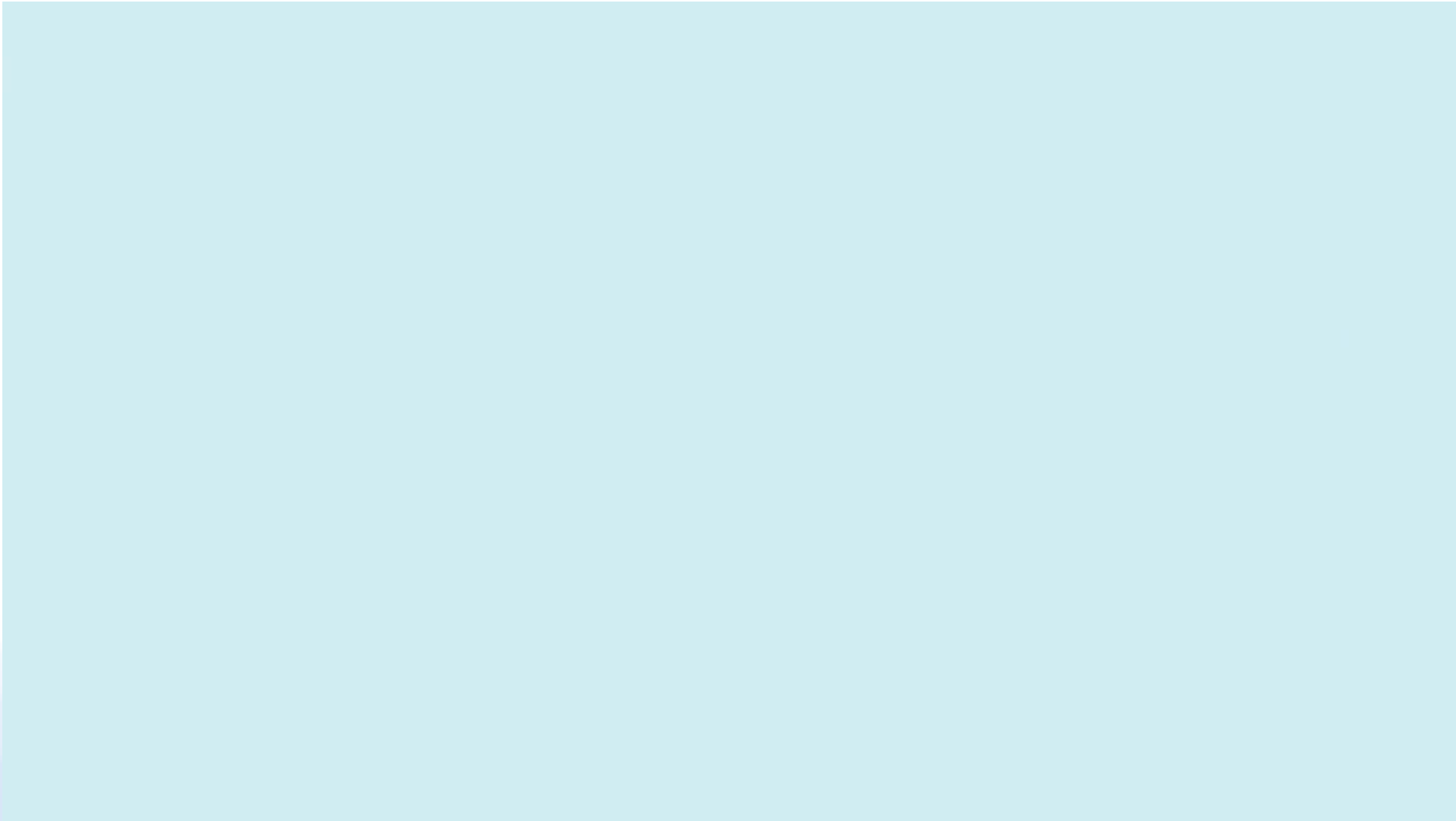
For large amounts, pour the oil into a sealable container (like a milk carton or jar) and place it in the garbage.



Thank you for keeping waterways clean!

Oct 2024 - Multi-family

# Pete the Plumber on Flushable Wipes



# So, What Takes the Place of BMPs?

**Connect all fixtures and drains in the food/beverage service areas to FOG pretreatment system**

**Size FOG pretreatment system to the FOG generator's food/beverage operation (FOG production values)**

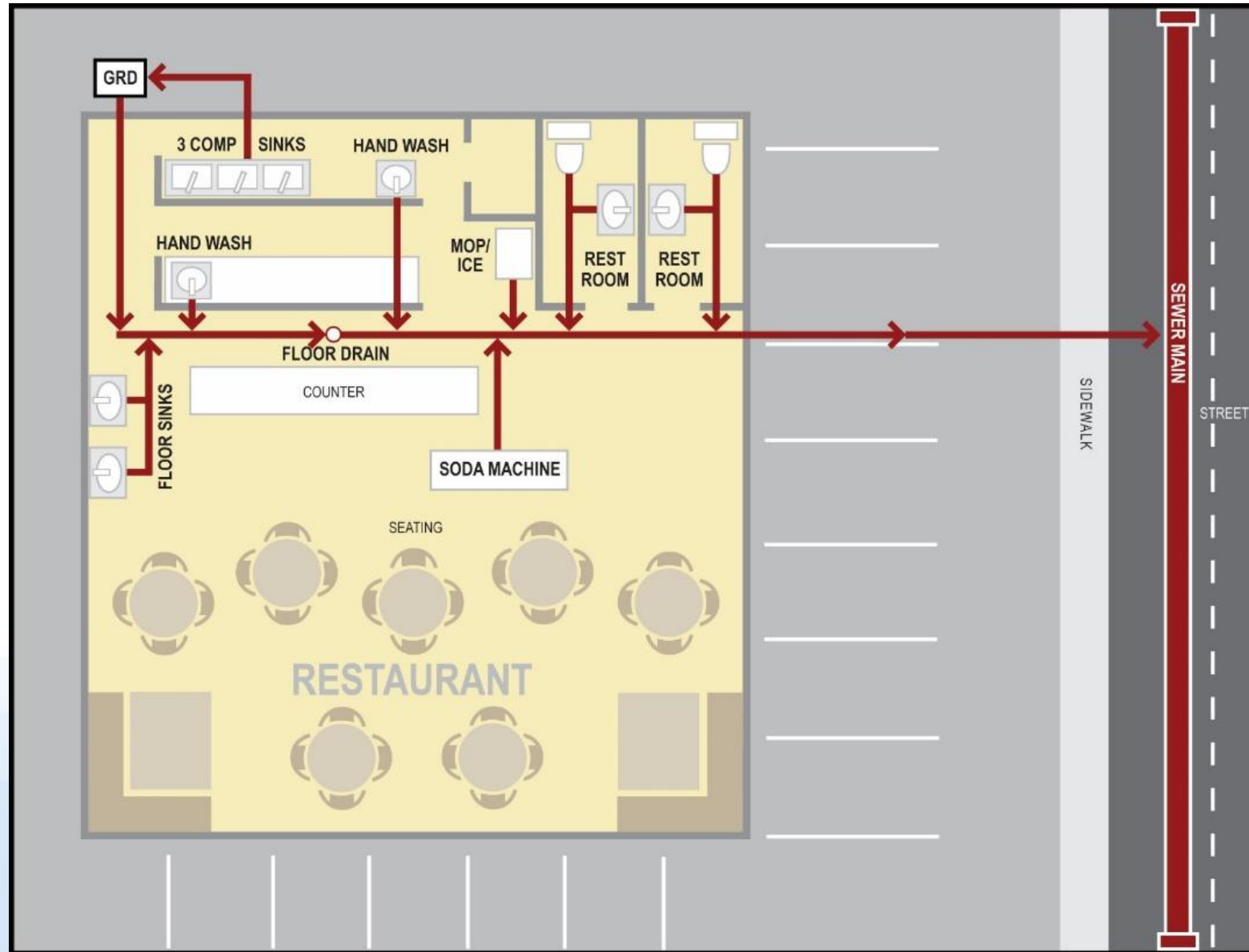
**Effective FOG pretreatment system includes maintenance prior to unacceptable FOG bypass**

# Effective Pretreatment

**All fixtures and drains (F&D) from the food/beverage service areas shall be connected to an appropriately sized grease interceptor.**

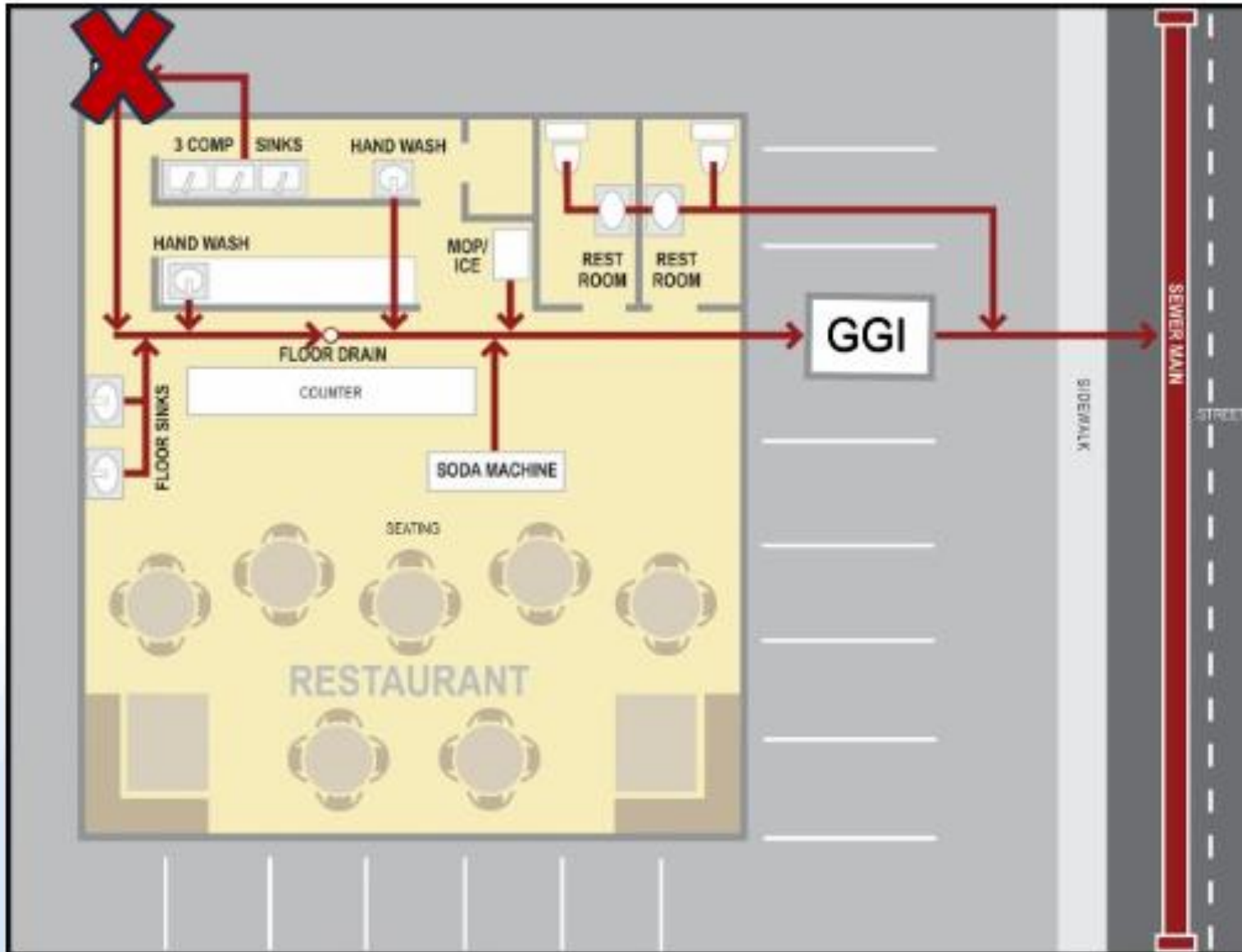
**“An appropriately sized grease interceptor is sized for the food service operation [grease production] and then the flow rate.”**

# Ineffective Pretreatment for FOG

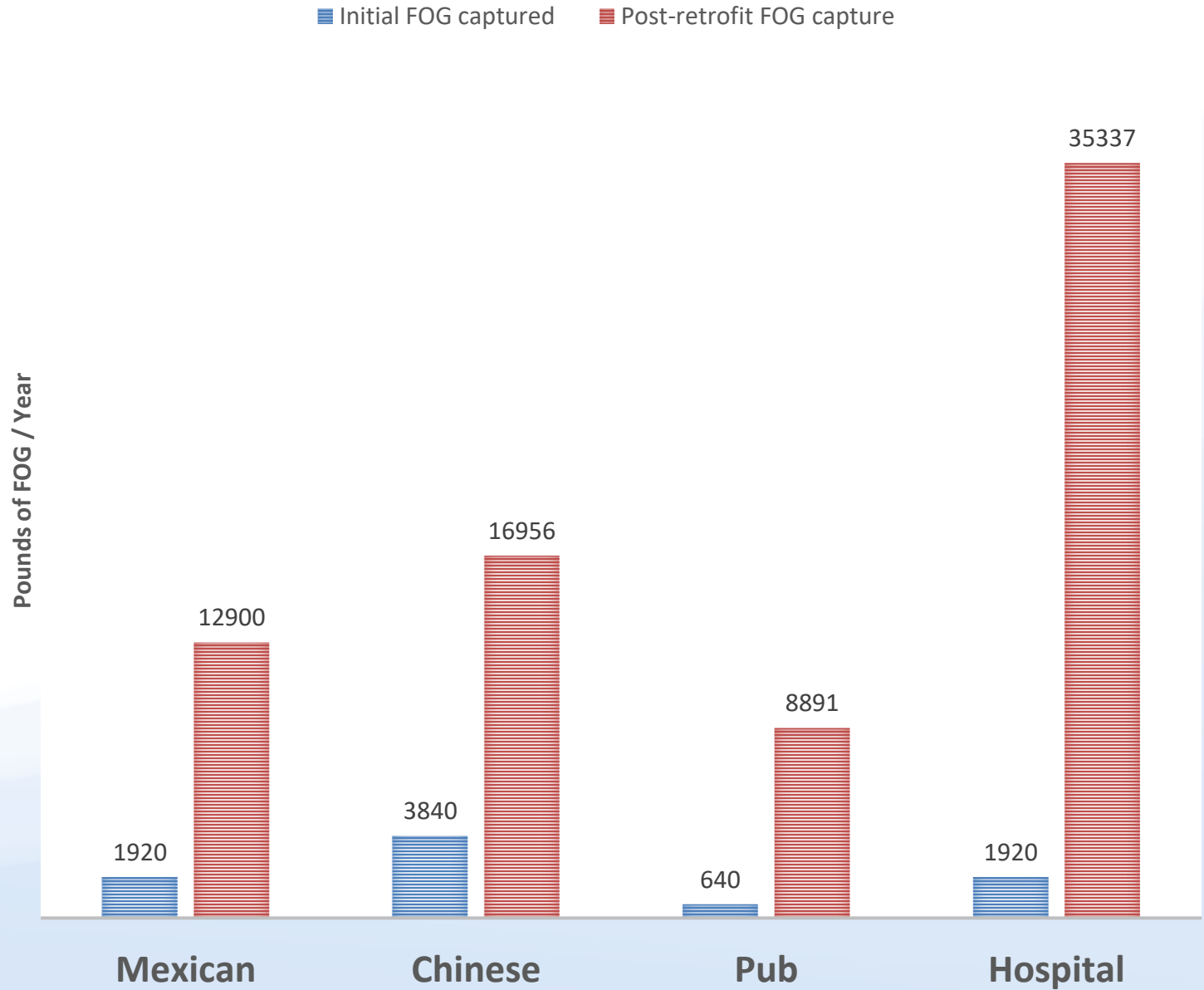


# Effective Pretreatment for FOG

All food/beverage service area fixtures and drains protected



# CASE STUDIES REVEAL PRE- RETROFIT FOG LOADING



The background of the slide is a close-up photograph of numerous spherical oil droplets of varying sizes dispersed in water. The droplets are highly reflective, showing bright highlights and dark shadows, which gives them a three-dimensional appearance. They are densely packed in some areas and more sparse in others, creating a complex, textured pattern. The overall color palette is dominated by warm, golden-yellow and brown tones, with some darker, almost black shadows within the droplets.

# **FOG & Water Separation**

# Effect of Size on Performance



# Effect of Size on Performance



# Effect of Size on Performance

FOG (Oil) Travel Time	
3-inch Rise at 68° F - 0.90 SG - Hour:Minute:Second	
Droplet Diameter in Microns	Rise Time
300	0:00:15
150	0:01:30
50	0:09:18
15	1:43:22

150 microns = .15 mm      50 microns = .05 mm

**Rise 5 ft. in 30 minutes**

# **GREASE REMOVAL DEVICE SIZING CONSIDERATIONS**

# Most Common Grease Removal Device Sizing Methods

- Uniform Plumbing Code – 2021 most current
  - International Plumbing Code – 2021 most current
- American Society of Plumbing Engineers Plumbing Engineer Design Handbook, Vol 4, Chapter 8, Table 8.3.
- EPA Methods – Onsite Wastewater and Disposal Systems, 1980 (Section 8.2.4)

# Grease Interceptor Standards

HGI

GGI

Standard	Publisher	Type of interceptor covered
PDI G-101	Plumbing and Drainage Institute	Passive Hydromechanical Grease Interceptor (HGI)
PDI G-102	Plumbing and Drainage Institute	Grease Interceptor Sensing and Alarm Devices
ASME A112.14.3	American Society of Mechanical Engineers	Passive Hydromechanical Grease Interceptor (HGI)
ASME A112.14.4	American Society of Mechanical Engineers	Automatic Grease Removal Device (GRD)
ASME A112.14.6	American Society of Mechanical Engineers	FOG (fats, oils and greases) Disposal Systems
CSA B481	Canadian Standards Association	Passive Hydromechanical Grease Interceptor (HGI)
IGC 273	International Association of Plumbing and Mechanical Officials	Passive Hydromechanical Grease Interceptor (HGI)
ASTM C1613	ASTM International	Precast Concrete Gravity Grease Interceptor (GGI)
IAPMO/ANSI Z1001	International Association of Plumbing and Mechanical Officials	Prefabricated Concrete Gravity Grease Interceptor (GGI)

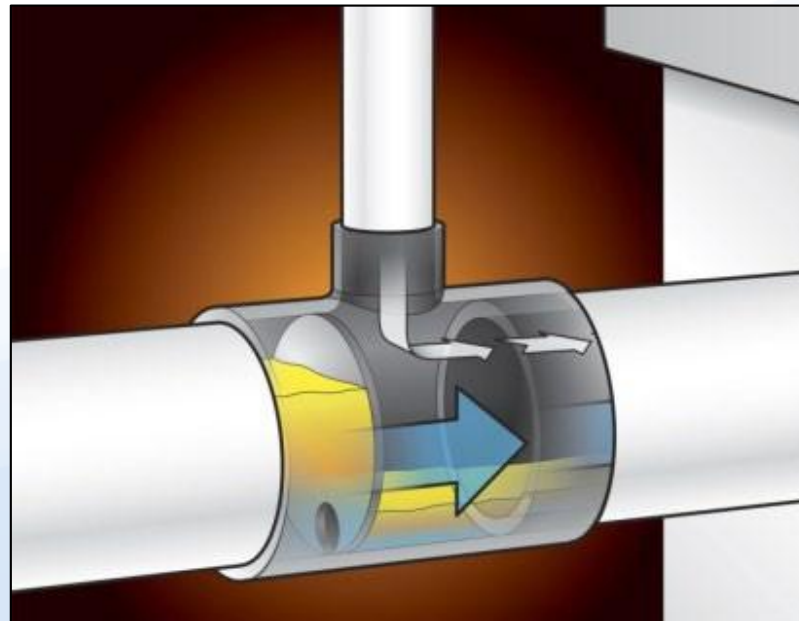
**Appurtenance:** A manufactured device, a prefabricated assembly, or an on-the-job assembly of component parts that is an adjunct to the basic piping system and plumbing fixtures. An appurtenance demands no additional water supply, nor does it add any discharge load to a fixture or the drainage system. It performs some useful function in the operation, maintenance, servicing, economy, or safety of the plumbing system. (IAPMO 2009)

# PDI G101/ASME A112.14.3

**Hydromechanical** – formerly called grease trap

**With EXTERNAL flow control**

This standard is design based requiring an external flow control with air vent (intake), to inject air into influent as it enters HGI

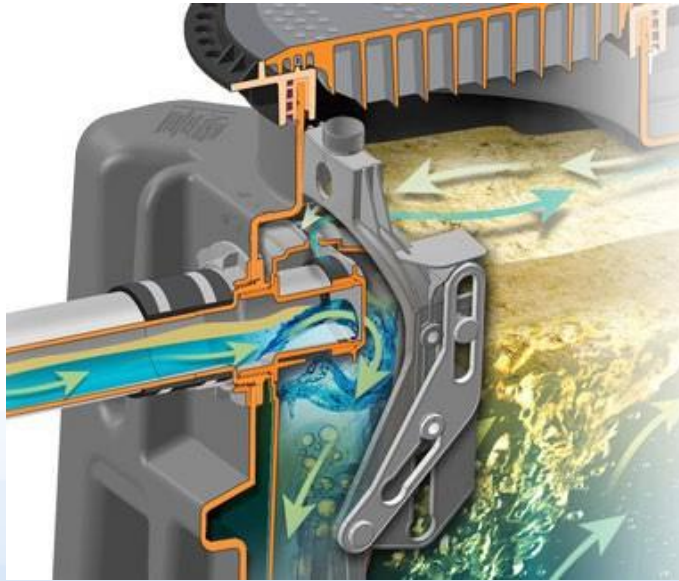


# PDI G101/ASME A112.14.3

**Hydromechanical** – formerly called grease trap

**With BUILT-IN (integral) flow control**

This standard is design based on using a built-in or integral flow control that does NOT require a vent



Endura Dynamic Baffle  
Built-in Flow Control



Schier Cartridge Built-in  
Flow Control

# Discharge Fixture Units (DFU's)

DRAINAGE FIXTURE UNIT VALUES (DFU)	
Sink Commercial 1½ inch drain	3 Units
Sink Commercial 2- inch drain	3 Units
Sink Bar 2 - inch drain	2 Units
Service or Mop Basin	3 Units
Dishwasher 2 - inch drain	4 Units
Floor Drain	2 Units
Food Waste Disposer	3 Units

Delete term: ~~Grease Trap~~

Add term: Hydromechanical Grease Interceptor (HGI)

Add sizing method for HGI:

Table 10-2 – 1015.1

**Table 10-2**  
**Hydromechanical Grease Interceptor (HGI)**  
**Sizing Chart\***

DFU	HGI FLOW (gpm)
8	20
10	25
13	35
20	50
35	75
172	100
216	150
342	200
428	250
576	350
720	500

\*Based on intermittent potentially full flow in drainage lines.

Delete ~~Appendix H~~

Add new sizing method for Gravity Grease Interceptors (GGI):

**Table 10-3**  
**Gravity Grease Interceptor Sizing**

DFUs (1)	Interceptor Volume (2)
8	500 gallons
21 (3)	750 gallons
35	1,000 gallons
90 (3)	1,250 gallons
172	1,500 gallons
216	2,000 gallons
307 (3)	2,500 gallons
342	3,000 gallons
428	4,000 gallons
576	5,000 gallons
720	7,500 gallons
2112	10,000 gallons
2640	15,000 gallons

Notes

(1) The maximum allowable DFUs plumbed to the kitchen drain lines that will be connected to the grease interceptor.

(2) This size is based on: the DFUs, the pipe size from this code; Table 7-5; Useful Tables for flow in half-full pipes (ref: *Mohinder Nayyar Piping Handbook*, 3rd Edition, 1992).

(3) Based on 30-minute retention time (ref.: Metcalf & Eddy, Inc. *Small and Decentralized Wastewater Management Systems*, 3rd Ed. 1998). Rounded up to nominal interceptor volume.

# Sizing based on DFUs

**Italian Restaurant;  
NO fryer, WITH flatware  
214 meals/day, 7 days/week  
3-compartment sink and dishwasher connected to GRD**

## Drainage Fixture Unit (DFU) Values

Sink: 3 units  
Dishwasher: 4 units  
Total: 7 units

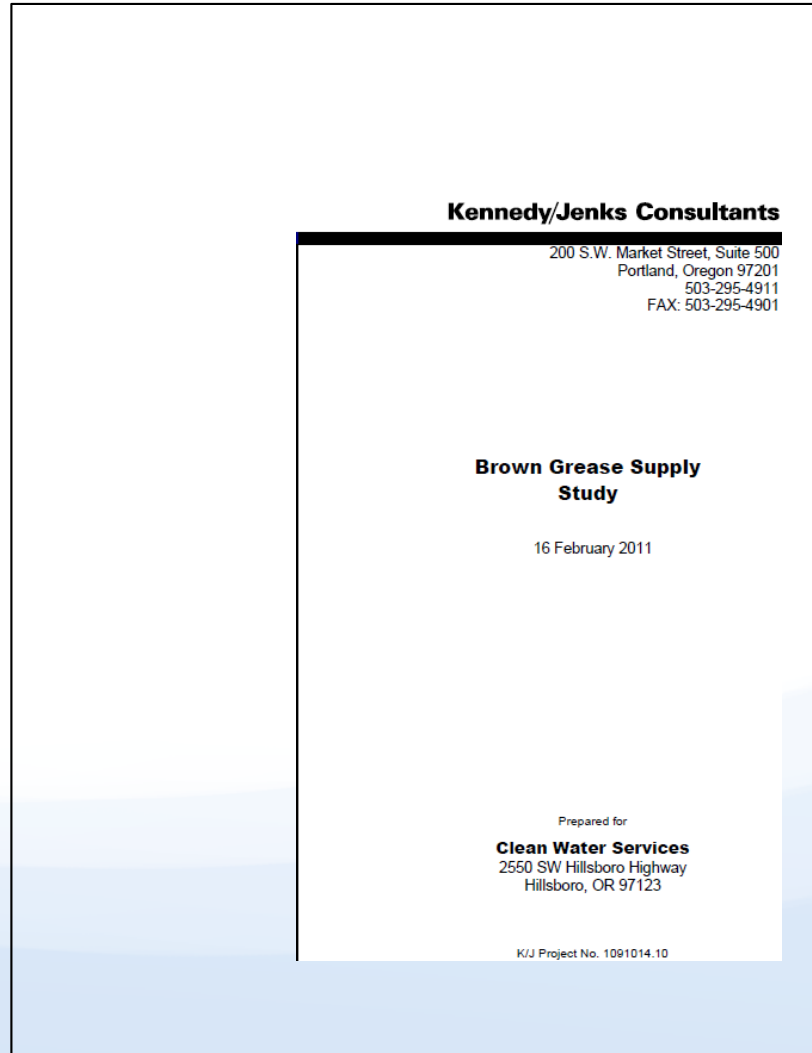
## HGI Sizing Chart

8 DFUs calls for a 20 HGI flow (gpm)  
A 20 HGI is rated for **40 lbs of FOG**

# International Plumbing Code (2015 and 2018)

- **1003.3.6 (2015 IPC) and 1003.6.7 (2018 IPC)**
- **Gravity grease interceptors and gravity grease interceptors with fats, oils, and greases disposal systems.** The required capacity of gravity grease interceptors and gravity grease interceptors with fats, oils, and greases disposal systems shall be determined by **multiplying THE Peak drain flow into the interceptor in gallons per Minute by a retention time of 30 minutes.**

# Sizing and selection of grease interceptors



# Categories are threatening...



What do you mean I'm a "high grease producer", I don't produce any grease?

**Table 8-3 Example Grease Production Values for Restaurants**

Restaurant Type	Grease Production Values	Examples
Low grease producer	0.005 lbs (2.268 g)/meal (no flatware)	Elementary cafeteria, grocery meat department, hotel breakfast bar, sub shop, sushi, take-and-bake pizza
	0.0065 lbs (2.948 g)/meal (with flatware)	
Medium grease producer	0.025 lbs (11.340 g)/meal (no flatware)	Cafe, coffee shop, convenience store, grocery deli, Greek, Indian, Japanese, Korean, Thai, Vietnamese
	0.0325 lbs (14.742 g)/meal (with flatware)	
High grease producer	0.035 lbs (15.876 g)/meal (no flatware)	Full-fare family, fast-food hamburger, hamburger bar and grill, German, Italian, fast-food Mexican
	0.0455 lbs (20.638 g)/meal (with flatware)	
Very high grease producer	0.058 lbs (26.308 g)/meal (no flatware)	Full-fare BBQ, fast-food fried chicken, full-fare Mexican, steak and seafood, Chinese, Hawaiian
	0.075 lbs (34.019 g)/meal (with flatware)	

# Case Studies Reveal FOG Loading

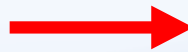
$$\text{Grease Capacity (See Below)} \div \left( \text{Meals Per Day} \times \text{Grease Production Values (see A B C D E F below)} \right) = \text{Operating Days Per Pump-out Cycle}$$

model	GB-15	GB-20	GB-25	GB-35	GB-50	GB-75	GB-250
maximum grease capacity (lbs.)	74	109	75	142	249	616	1,076

Restaurant Type	Grease Production Values	Examples
Low Grease Production	<b>A</b> 0.005 lbs (2.268 g) / meal (no flatware)	Sandwich Shop, Convenience Store, Bar, Sushi Bar, Delicatessen, Snack Bar, Frozen Yogurt, Hotel Breakfast Bar, Residential
	<b>B</b> 0.0065 lbs (2.948 g) / meal (with flatware)	
Medium Grease Production	<b>C</b> 0.025 lbs (11.340 g) / meal (no flatware)	Coffee House, Pizza, Grocery Store (no fryer), Ice Cream Parlor, Fast Food, Greek, Indian, Low Grease Output FSE (w/fryer)
	<b>D</b> 0.0325 lbs (14.742 g) / meal (with flatware)	
High Grease Production	<b>E</b> 0.035 lbs (15.876 g) / meal (no flatware)	Cafeteria, Family Restaurant, Italian, Steak House, Bakery, Chinese, Buffet, Mexican, Seafood, Fried Chicken, Grocery Store (w/fryer)
	<b>F</b> 0.0455 lbs (20.638 g) / meal (with flatware)	

**Example: Italian,  
without Fryer, with  
Flatware**

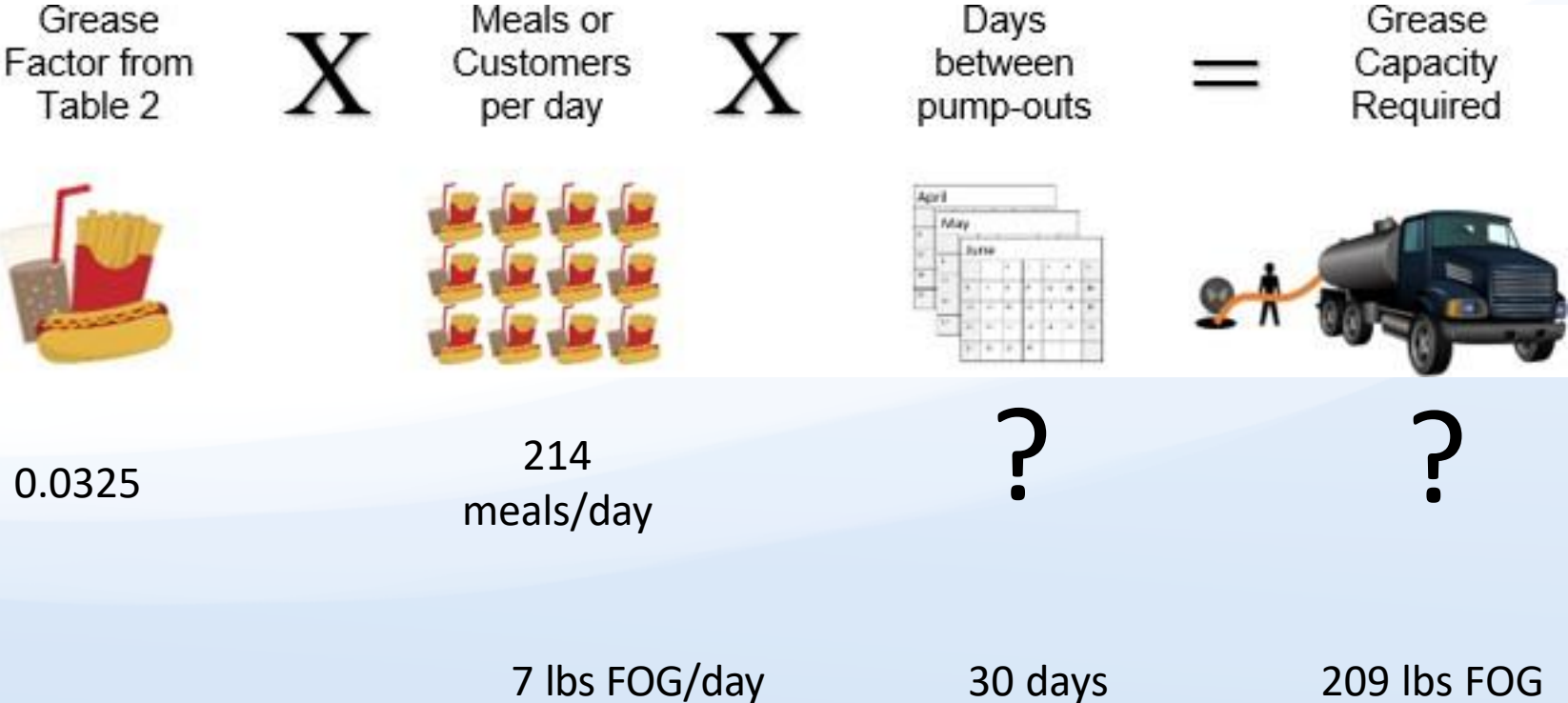
**Grease  
Production Factor  
would be 0.0325 lbs.  
per meal**



Type	Menu	Grease Factor ->	without Fryer without flatware	without fryer with flatware	with fryer without flatware	with fryer with flatware
			A	B	C	D
1	Bakery		0.025	0.0325	0.035	0.0455
2	Bar and Grille		0.005	0.0065	0.025	0.0325
3	Barbeque		0.025	0.0325	0.035	0.0455
4	Breakfast Bar - Hotel		0.005	0.0065	0.025	0.0325
5	Buffet		0.035	0.0455	0.058	0.075
6	Burger and fries, fast food		0.025	0.0325	0.035	0.0455
7	Cafeteria		0.025	0.0325	0.035	0.0455
8	Caterer		0.005	0.0065	0.025	0.0325
9	Chinese		0.035	0.0455	0.058	0.075
10	Coffee shop		0.025	0.0325	0.035	0.0455
11	Convenience Store		0.005	0.0065	0.025	0.0325
12	Deep fried Chicken / seafood		0.035	0.0455	0.058	0.075
13	Deli		0.005	0.0065	0.025	0.0325
14	Family Restaurant		0.025	0.0325	0.035	0.0455
15	Frozen Yogurt		0.005	0.0065	0.025	0.0325
16	Greek		0.005	0.0065	0.025	0.0325
17	Grocery Bakery		0.005	0.0065	0.025	0.0325
18	Grocery Deli		0.025	0.0325	0.035	0.0455
19	Grocery Meat Department		0.025	0.0325	0.035	0.0455
20	Ice Cream		0.025	0.0325	0.035	0.0455
21	Indian		0.005	0.0065	0.025	0.0325
22	Italian		0.025	0.0325	0.035	0.0455
23	Mexican, fast food		0.025	0.0325	0.035	0.0455
24	Mexican, full fare		0.035	0.0455	0.058	0.075
25	Pizza		0.025	0.0325	0.035	0.0455
26	Religious Institution		0.005	0.0065	0.025	0.0325
27	Sandwich shop		0.005	0.0065	0.025	0.0325
28	Snack Bar		0.005	0.0065	0.025	0.0325
29	Steak and seafood		0.035	0.0455	0.058	0.075
30	Sushi		0.005	0.0065	0.025	0.0325

# Application of grease production selection method

## Example 1: Italian, with Fryer, with Flatware Step 2: Calculate Grease Production



# Sizing based on Grease Production

**Italian Restaurant;**

**NO fryer, WITH flatware**

**214 meals/day, 7 days/week**

**3-compartment sink and dishwasher connected to GRD**

***Generates 209 lbs FOG/mo***

## **Based on DFUs**

A 20 HGI flow: captures 40 lbs of FOG,

Need to clean out weekly

( $209/40 =$  cleanout once/week)

## **Based on Grease Production**

Need 209 lb. capture/month

GB50 HGI is rated for 249 lbs/mo

( $209/249 =$  cleanout every 5 weeks)

**Either sizing method can work, but consider maintenance costs**

# Connecting all fixtures and drains

Italian Restaurant; NO fryer, WITH flatware; 214 meals/day, 7 days/week

## GRD size based on DFUs

Sink – Commercial	3 units
Dishwasher	4 units
Floor drains	2 units
Service/Mop Sink	3 units
Service bar sink	<u>2 units</u>

**Total 14 units**

## GRD size based on grease production

Need 209 lb capture/month

GB50 HGI is rated for 249 lbs/mo

( $209/249 = 0.8$  cleanouts/mo or 10/yr)

## HGI Sizing Chart

**14 DFU's** calls for a 50 HGI Flow (gpm)

A 50 HGI is rated for **100 lbs. of FOG**

( $209/100 = 2$  cleanouts/mo)

# Estimate Meals Served

- Convenience stores = 50 meals/hr
- Child daycares = total occupants \* 2 meals/day = total meals per day
- Hotel breakfast bars = total rooms \* 2/room = meals/day
- Pizza shops = 150/day (based on Pizza Hut stats)
- Fast Food/Quick Service Restaurants = 40 meals/hr
- Full Service Restaurants = 50 meals/hr

# Purpose of Grease Traps and Interceptors

## INDOOR GREASE TRAPS

To intercept greasy waste and retain it for a sufficient amount of time and separation of grease from water.

Indoor typical size 15-60 gallons (20-50 gpm holds 40-100 lbs. Grease)



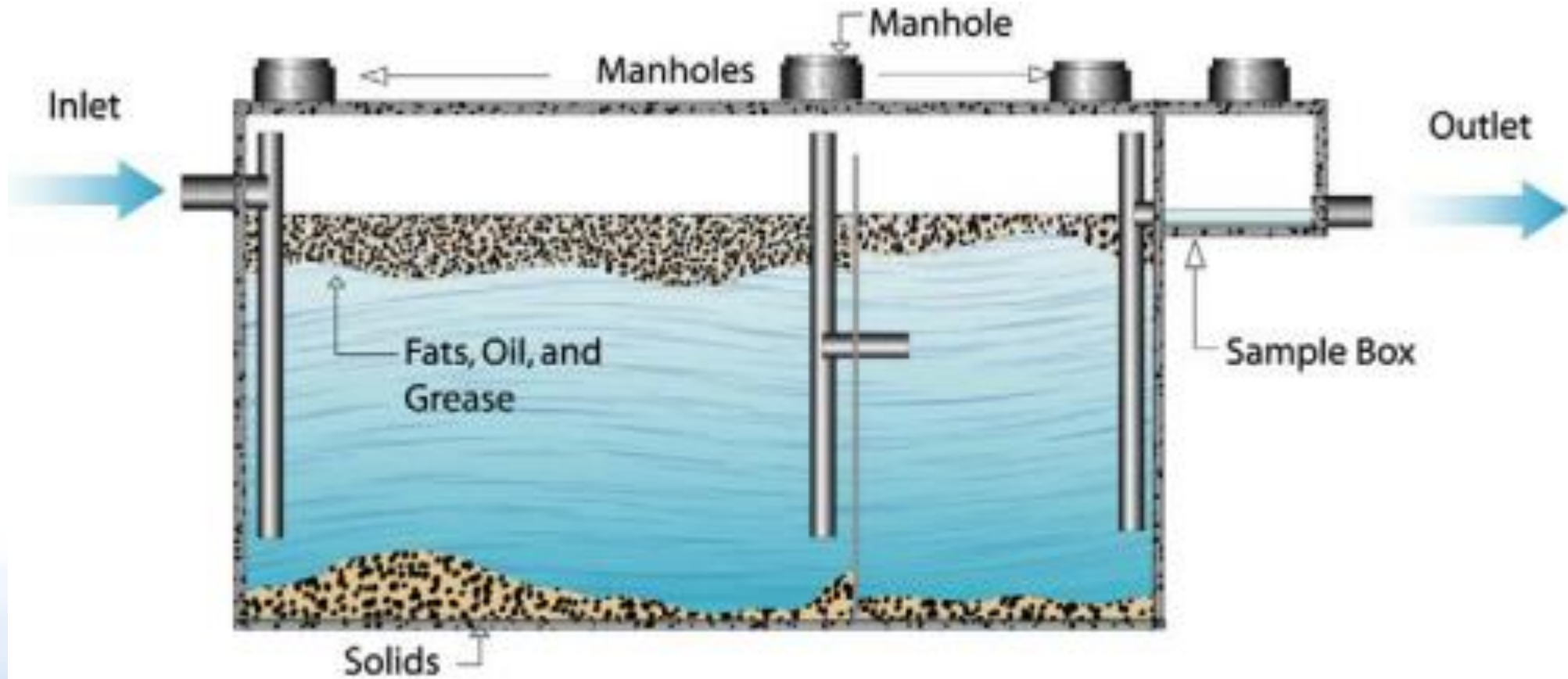
## OUTDOOR INTERCEPTORS

Grease is retained (for later disposal) and wastewater flows into the sanitary sewer.

Outdoor typical size 500 gallons, or greater



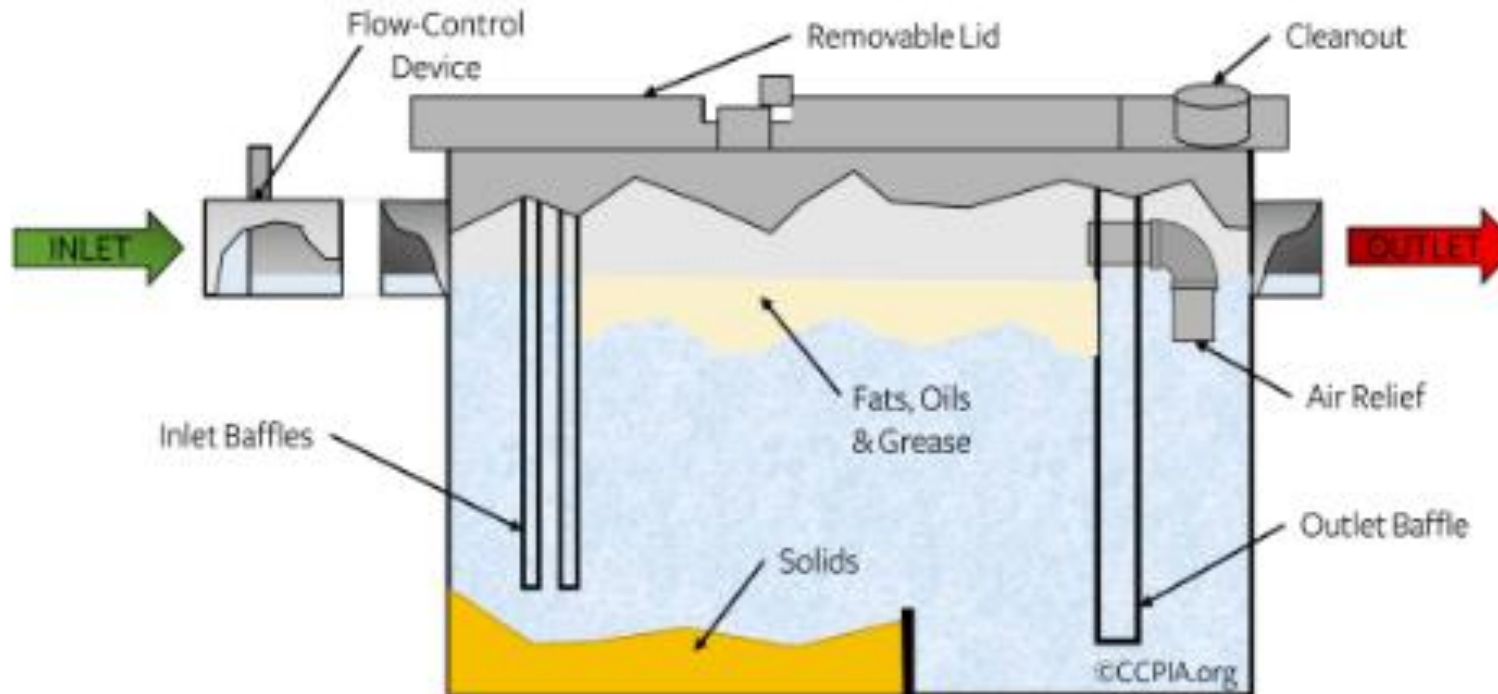
# Gravity Grease Interceptors (GGIs)



# Hydromechanical Grease Interceptor (HGI)

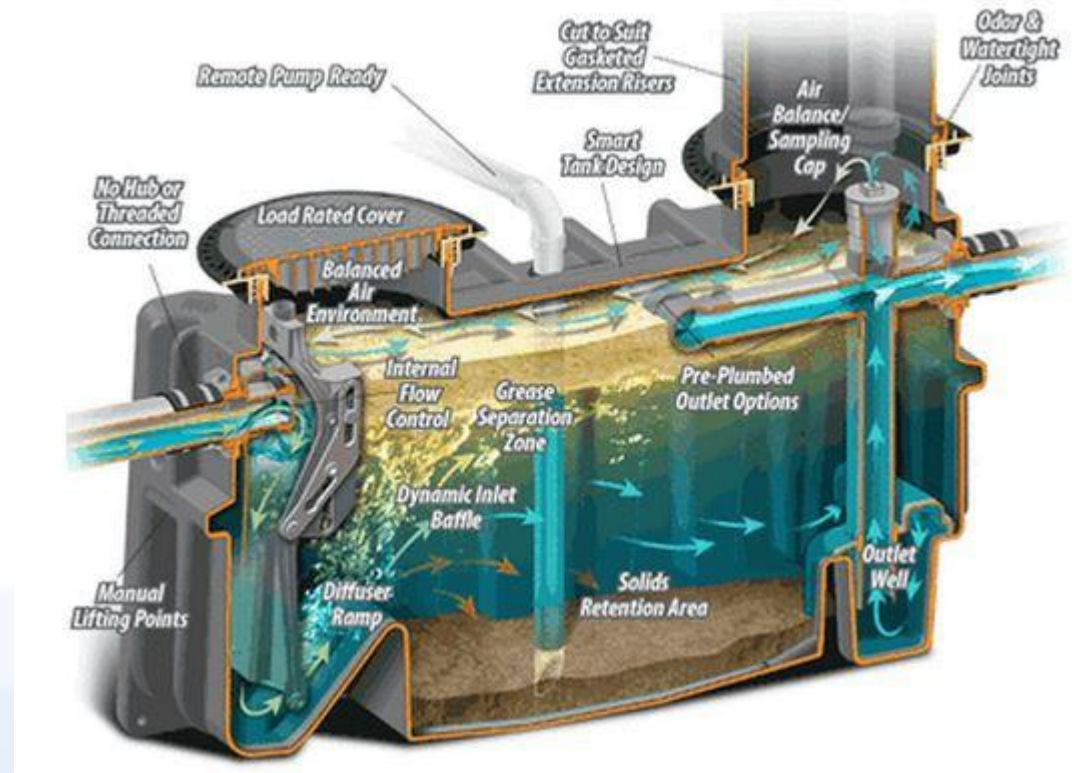
## HYDROMECHANICAL GREASE INTERCEPTOR (HGI)

Indoor, Above-Ground  
15-60 Gallons, 20-50 GPM  
40-100 Pounds of Fog Storage



# High-Capacity XL 75 GPM Endura Canplas

Grease Capacity:  
Up to 560 lbs.

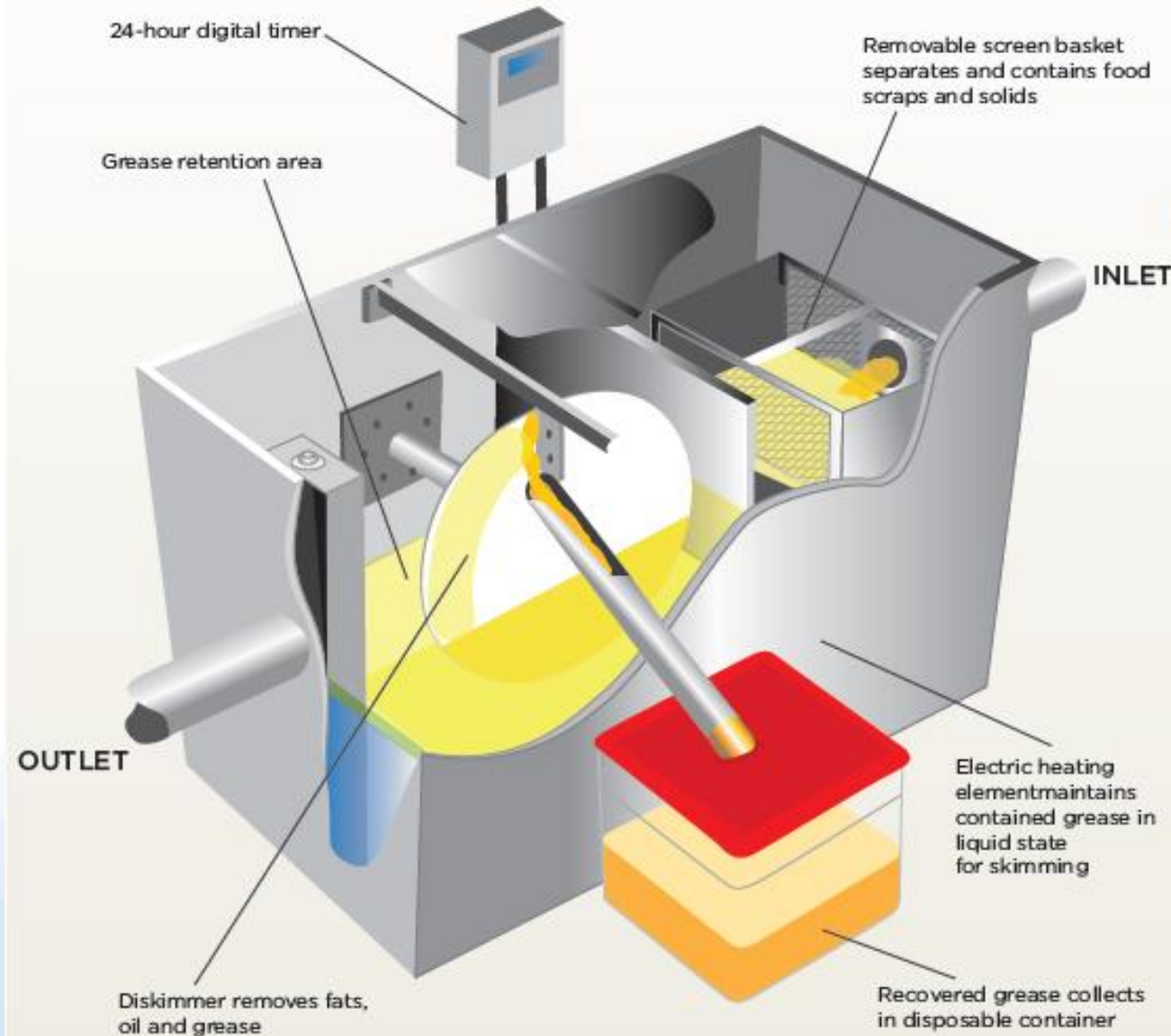


## Schier Great Basin High Capacity HGI

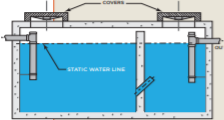
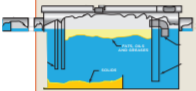
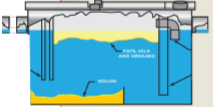
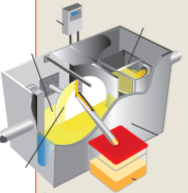
Grease Capacity:  
Up to 861 lbs.



# Automated Grease Removal Device (AGRD)



## Equipment Types: the Good, the Bad, and the Ugly (\$)

	Benefits	Drawbacks	Costs
 <p><b>GGI</b></p>	<ul style="list-style-type: none"> <li>• <b>Large FOG storage capacity</b></li> <li>• <b>Less maintenance</b></li> <li>• <b>Outside</b> installation for easy maintenance and inspection access</li> <li>• Maintenance can be performed during off hours</li> <li>• <b>Minimal contact</b> by employees</li> </ul>	<ul style="list-style-type: none"> <li>• Requires <b>more space</b> for installation</li> <li>• Can be <b>source of odors</b> if not maintained properly</li> <li>• <b>More expensive</b> to install</li> <li>• <b>Higher maintenance costs</b> per individual pumping events</li> </ul>	<ul style="list-style-type: none"> <li>• <b>New construction</b> restaurants = <b>\$15,000 - \$25,000</b></li> <li>• Existing restaurant <b>retrofit</b> = <b>\$25,000 - \$75,000</b></li> <li>• <b>Maintenance</b> = \$0.20/gallon - \$0.25/gallon</li> </ul>
 <p><b>HGI</b></p>	<ul style="list-style-type: none"> <li>• Requires significantly <b>less space</b></li> <li>• <b>Less expensive</b> to install</li> <li>• Can be made with durable polyethylene materials</li> <li>• <b>Lower maintenance</b> costs per event</li> <li>• Can be <b>maintained</b> by restaurant staff</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Less FOG storage</b> capacity; more frequent maintenance</li> <li>• Requires <b>flow control device</b> and additional <b>venting</b></li> <li>• <b>Indoor installation</b> requires space for device</li> <li>• <b>Potentially indoor odors</b> if lid not sealed</li> <li>• Typically requires <b>health department approval</b></li> <li>• Inspected or maintained during business hours</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Above ground</b> installation = <b>\$2,500 - \$5,000</b></li> <li>• New construction, <b>below ground</b> installation = <b>\$5,000 - \$15,000</b></li> <li>• Existing restaurant <b>retrofit</b>, below ground installation = <b>\$10,000 - \$25,000</b></li> <li>• <b>Maintenance</b> = Typically a base fee of \$100 - \$150 per event</li> </ul>
 <p><b>Large HGI</b></p> <p>Just like "regular" HGI but bigger.</p>	<ul style="list-style-type: none"> <li>• Uses <b>less space</b> than a GGI</li> <li>• Typically <b>less expensive</b> installation than a GGI</li> <li>• Typically made with <b>durable polyethylene</b> materials</li> <li>• <b>Lower maintenance</b> costs per event than a GGI</li> <li>• <b>Larger FOG storage space</b> than an HGI</li> <li>• <b>Airtight lids prevents odors</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Less FOG storage</b> capacity than a GGI; more frequent maintenance</li> <li>• Requires <b>flow control device</b> and additional venting</li> <li>• <b>Indoor installation</b> requires space for device</li> <li>• Typically requires <b>health department approval</b></li> <li>• Restaurant staff cannot conduct maintenance</li> </ul>	<ul style="list-style-type: none"> <li>• <b>New construction</b> restaurants = <b>\$10,000 - \$20,000</b></li> <li>• Existing restaurant <b>retrofit</b> = <b>\$20,000 - \$50,000</b></li> <li>• <b>Maintenance</b> = \$0.20/gallon - \$0.25/gallon</li> </ul>
 <p><b>AGRD (type of HGI)</b></p>	<ul style="list-style-type: none"> <li>• Doesn't require significant space</li> <li>• <b>Lower maintenance costs</b> per event</li> <li>• <b>Self-cleaning</b> resulting in less frequent complete pumping</li> <li>• Often preferred by sewer agencies over regular HGIs</li> <li>• Can be maintained by restaurant staff</li> </ul>	<ul style="list-style-type: none"> <li>• Requires <b>daily, weekly</b> and <b>monthly maintenance</b></li> <li>• High degree of <b>restaurant staff training required</b></li> <li>• No air tight seals; <b>potential indoor odors</b></li> <li>• <b>More expensive</b> than passive HGI</li> <li>• Requires management of recyclable grease container</li> <li>• Typically cannot be installed below ground</li> <li>• Requires <b>flow control device</b> and additional <b>venting</b></li> <li>• Typically requires <b>health department approval</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Above ground</b> installation = <b>\$5,000 - \$10,000</b></li> <li>• Existing restaurant <b>retrofit</b> = <b>\$10,000 - \$15,000</b></li> <li>• <b>Maintenance</b> = Typically a base fee of \$100 - \$150 per event</li> </ul>

## National Restaurant Association

[https://www.franklin.in.gov/egov/documents/1649345257\\_66435.pdf](https://www.franklin.in.gov/egov/documents/1649345257_66435.pdf)

# GGI vs HGI - Replacement Cost Comparison



certified grease capacity  
1,895 lbs.



grease capacity  
912 lbs. (using 25% rule\*)

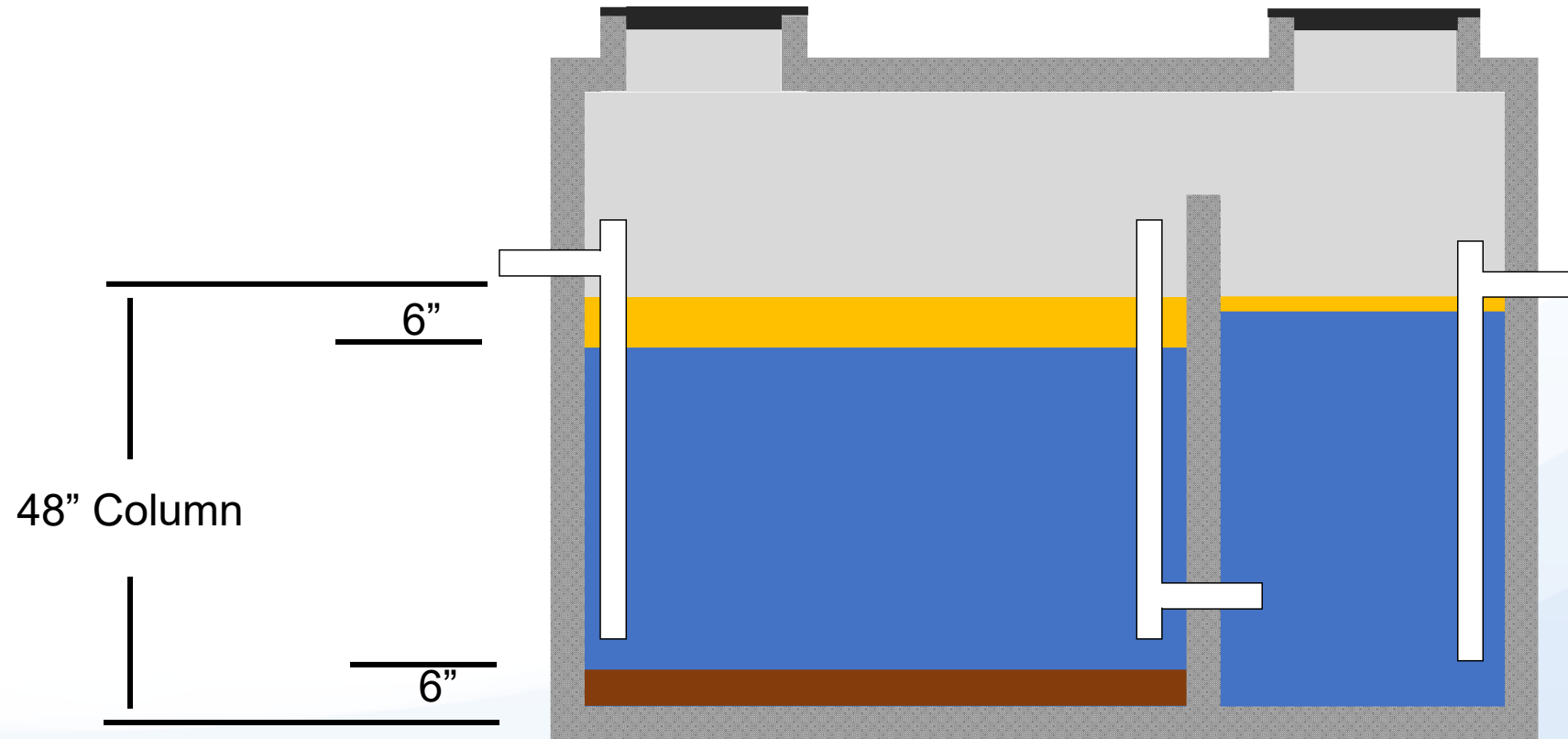
	<b>GB-250 (100 GPM)</b>	<b>CONCRETE (1,000 gal.)</b>
Initial installation	\$6,665	\$9,744
Pumpouts over 10 years	\$6,050	\$16,400
Replacement cost after 10 years	\$0	\$14,744
10-year cost of ownership	<b>\$12,715</b>	<b>\$40,888</b>

Courtesy SCHIER, Catalog 13, March 2023

# GRD OPERATION

When should you pump-out a GRD?

# How much FOG + Solids in a 1000 gal. GGI?



(FOG depth) / (total water column) x (total gallons) = gallons of FOG

(125 Gallons of FOG) x (7.3 lbs per gal.) = **912 lbs**

# How to Measure the Depth of FOG and Solids

❑ Dip Stick Pro or Sludge Judge

❑ 25 % Rule:

Measure depth of **grease**

plus depth of **solids**

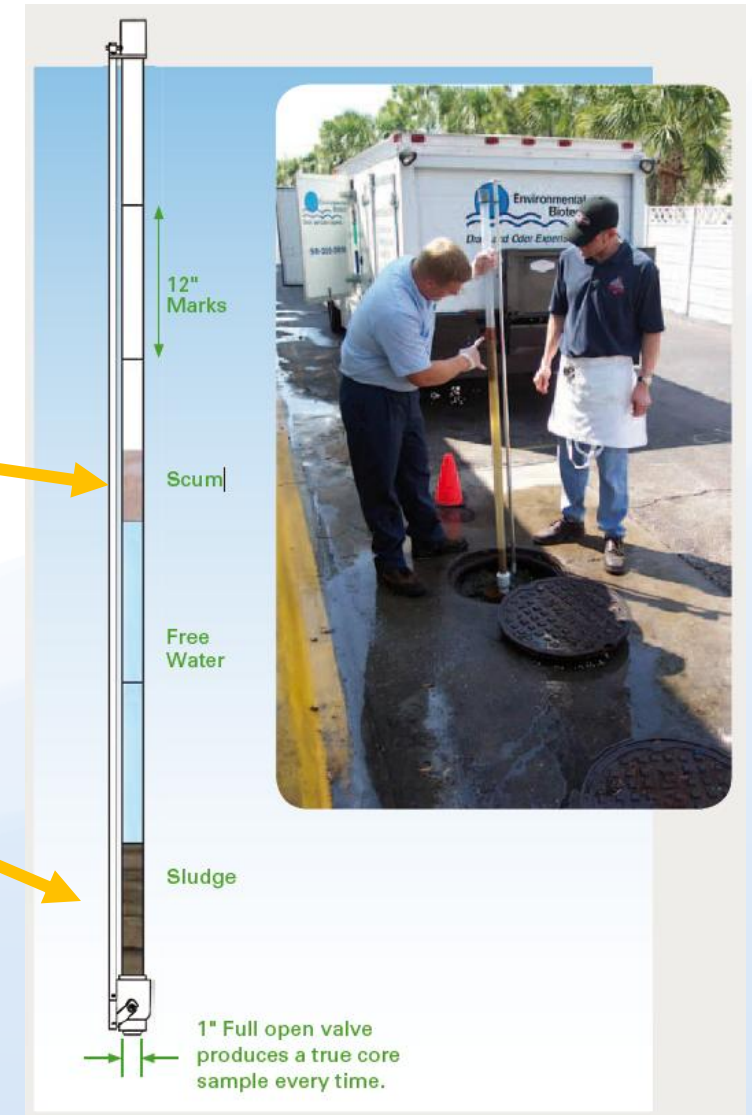
**Pump out if > 25 % of operating depth**

48" operating depth

6 " FOG + 12" solids = 18 "

$(18") \times (100) / 48 " = 37.5 \%$

**It's Time to Pump**

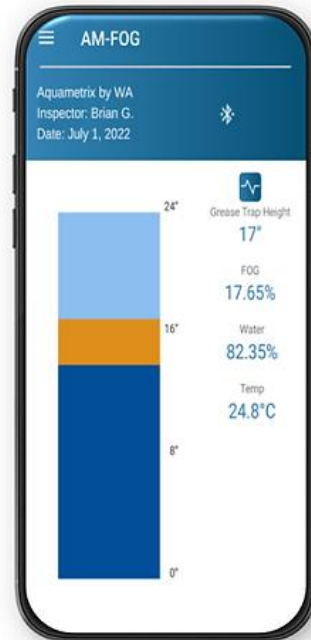


Courtesy Dip Stick Pro





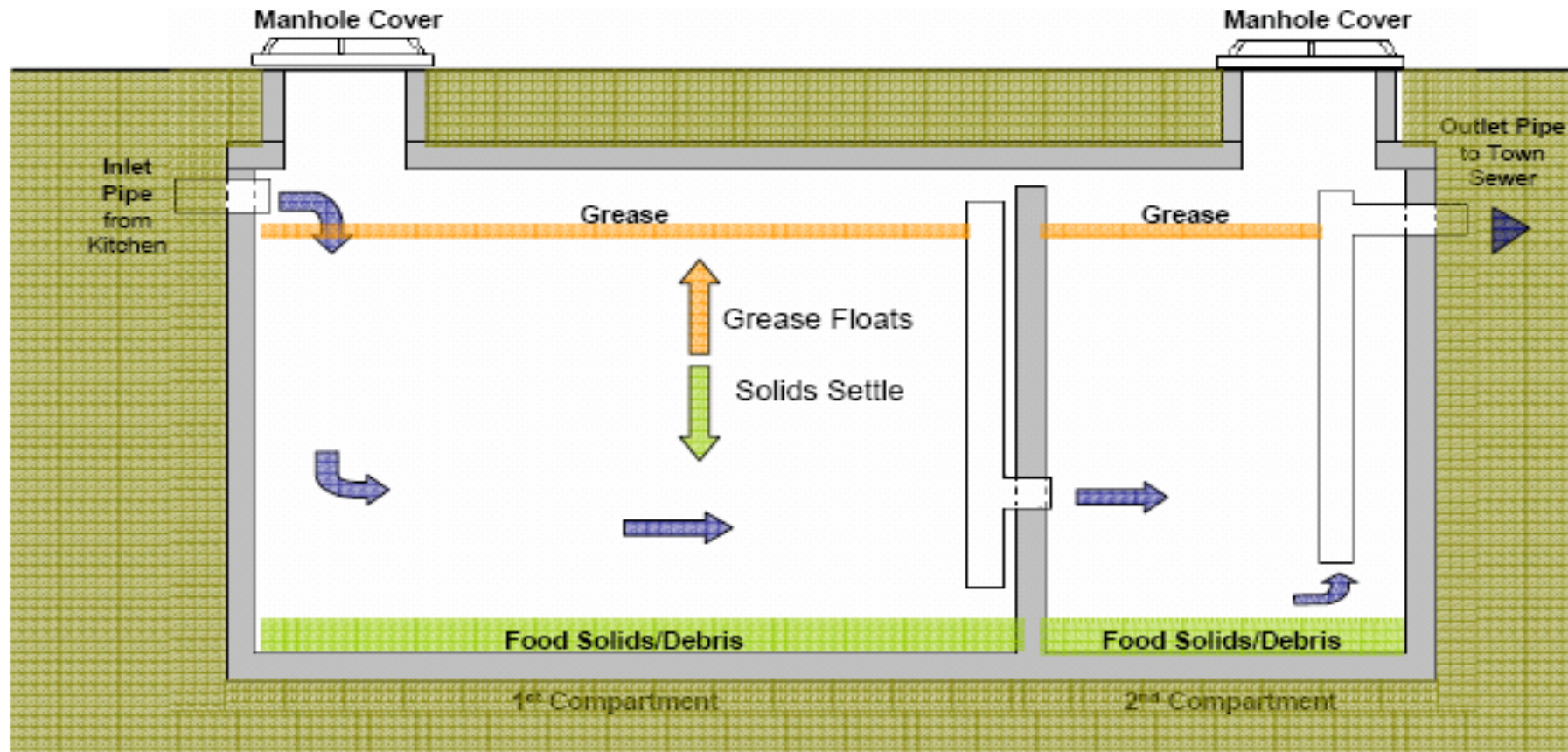
# AM-FOG Probe



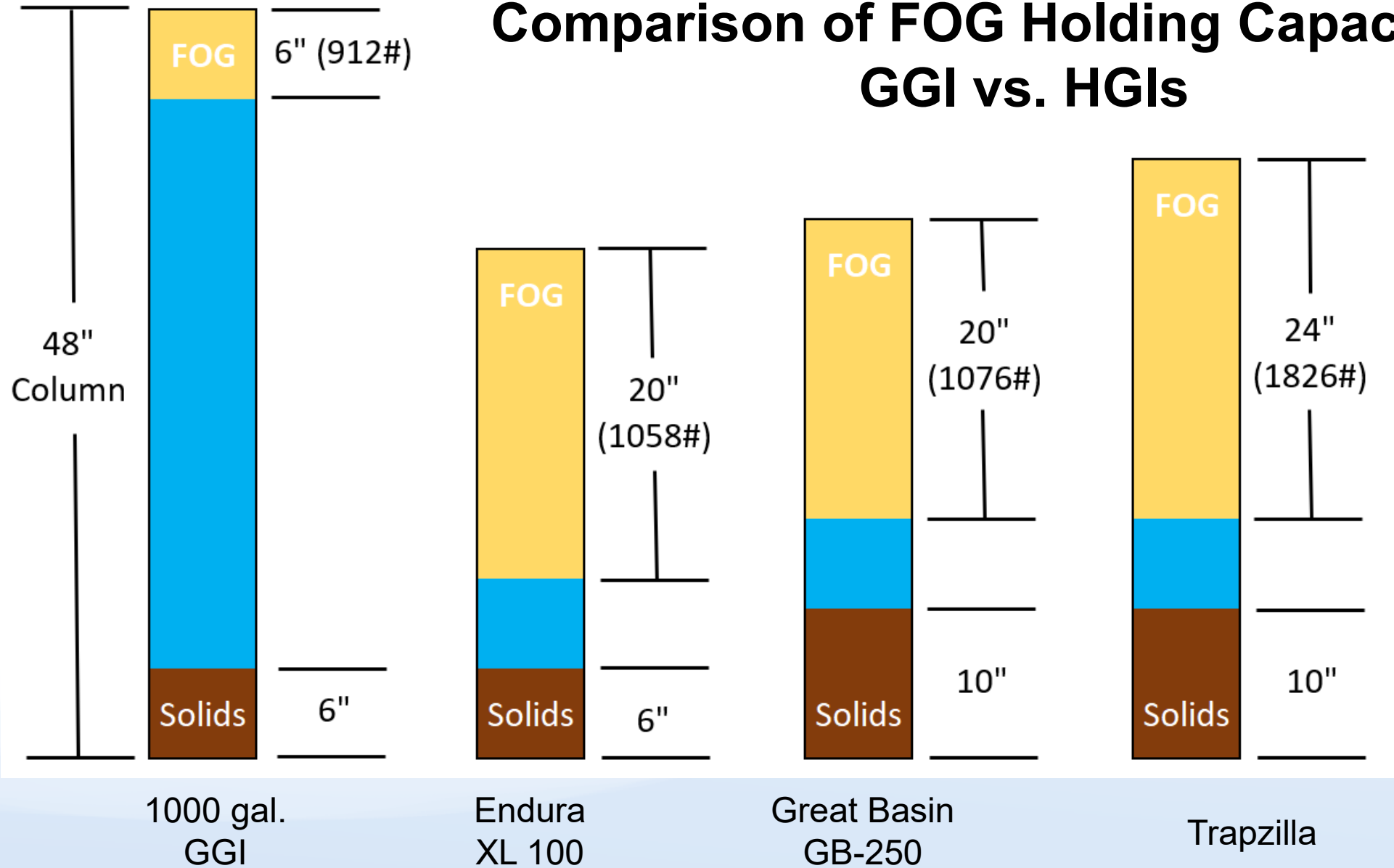
[www.digitalfogprobe.com](http://www.digitalfogprobe.com)

# 25% Rule says..

“When interceptor reaches 25% FOG/solids by volume, it’s at capacity, and begins bypassing”



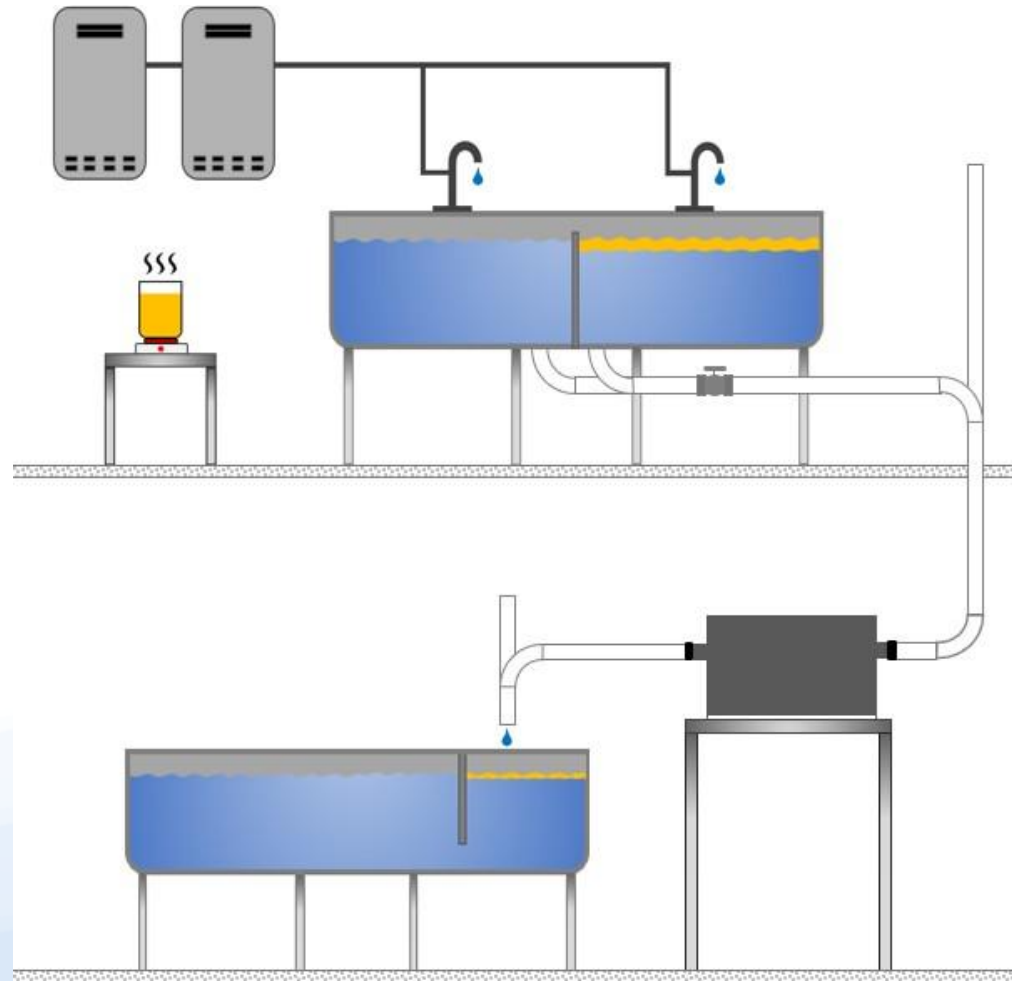
# Comparison of FOG Holding Capacities - GGI vs. HGIs



measurements calculated

# HGI Testing to Certify Performance

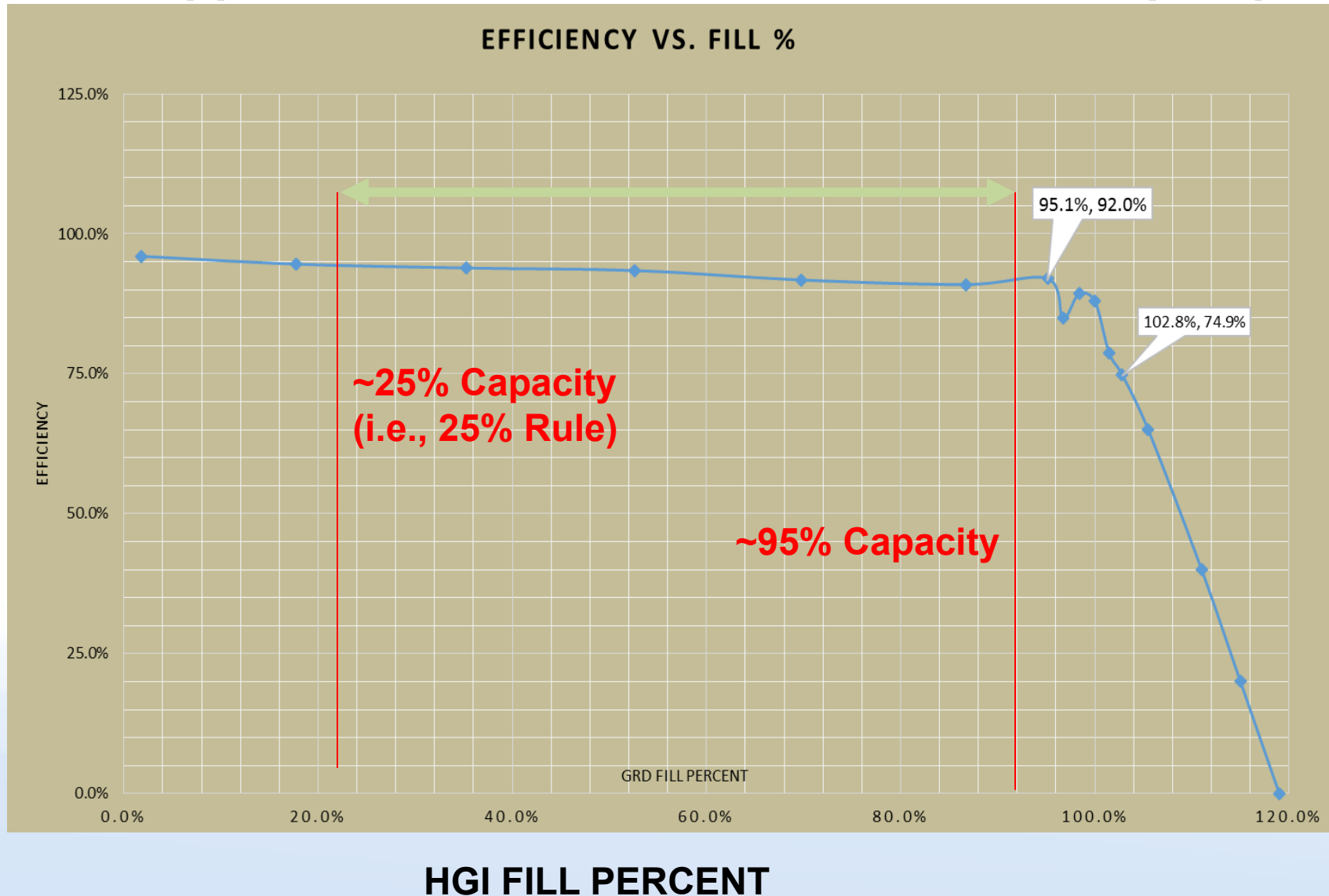
- Temperature between 150° F and 160° F
- 1 lb. lard to 10 gal. water
- 2-minute run duration
- Lard from skim tank de-watered and weighed



For illustration purposes only

# HGI EFFICIENCY TESTING RESULTS / FOG STORAGE CAPACITY

## 25% Rule applied to HGIs can cost FSEs excessive pump-out costs



# TYPICAL LIMITS

Monitor depth of FOG and  
solids layer in removal  
device

<25 percent  
operating depth

<10 to 12 inches  
grease layer  
depth



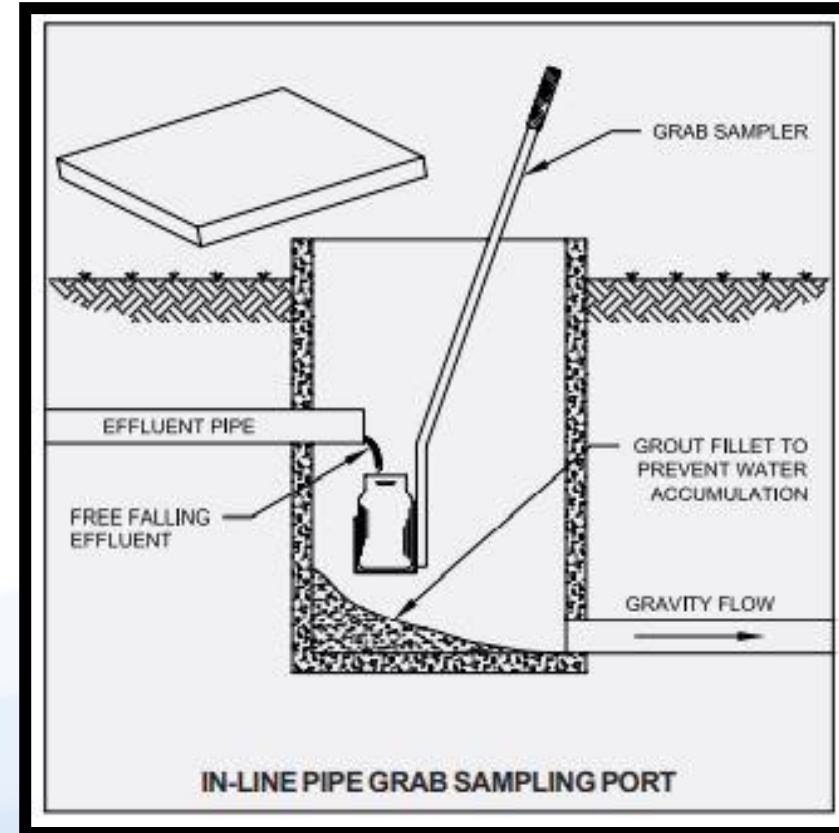
No or limited free-floating  
FOG in grease removal  
device discharge

< 0.25 inches visible in a sample  
(King County, WA)

# Sampling for Numeric FOG Limits

## Sample Location

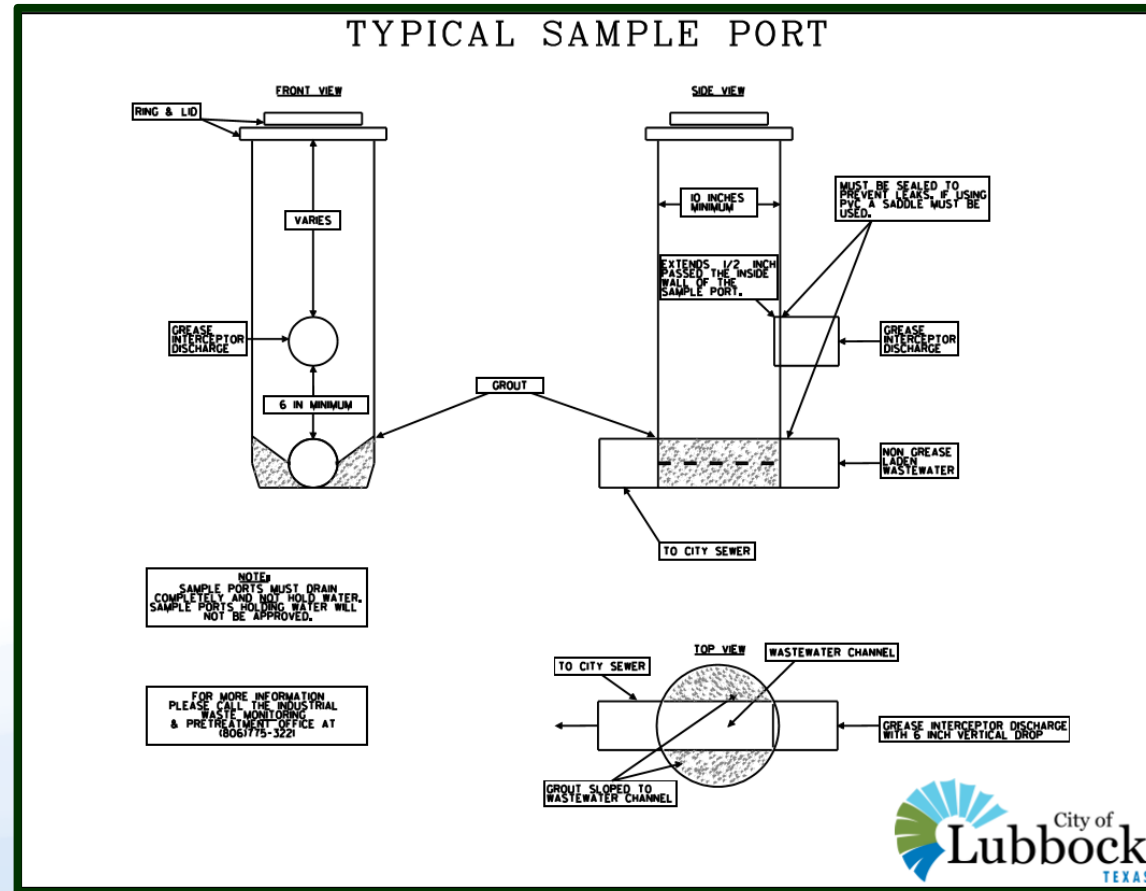
- ❖ GRD effluent
- ❖ Need to collect “free-flow” grab sample
- ❖ Collect directly in clean, wide-mouth glass container
- ❖ Acidified to  $\text{pH} < 2$



# Representative FOG Samples

## Sample Location

- ❖ Need a port to collect “free-flow” sample
- ❖ Collect directly in clean, wide-mouth glass container
- ❖ Acidified to pH<2



**Typical  
FOG**

---

100-600 mg/L

Common: 200 mg/L

---

**Discharge  
Numeric  
Limits**

---

pH  $\geq$  5.0 but  $<$  12.0  
standard units

---

Temperature: 85-140 °F

---

## The time of day to sample a FSE is important

### Oil & Grease Sampling

#### O&G results

- Chinese Restaurant – open from 10am-10pm

– 9:25 am	22 mg/L
– 12:40 pm	530 mg/L
– 3:30 pm	150 mg/L

- Cafeteria-American style food- open from 11am – 8pm

– 11:00 am	60 mg/L
– 12:50 pm	390 mg/L
– 1:30 pm	230 mg/L
– 2:45 pm	340 mg/L

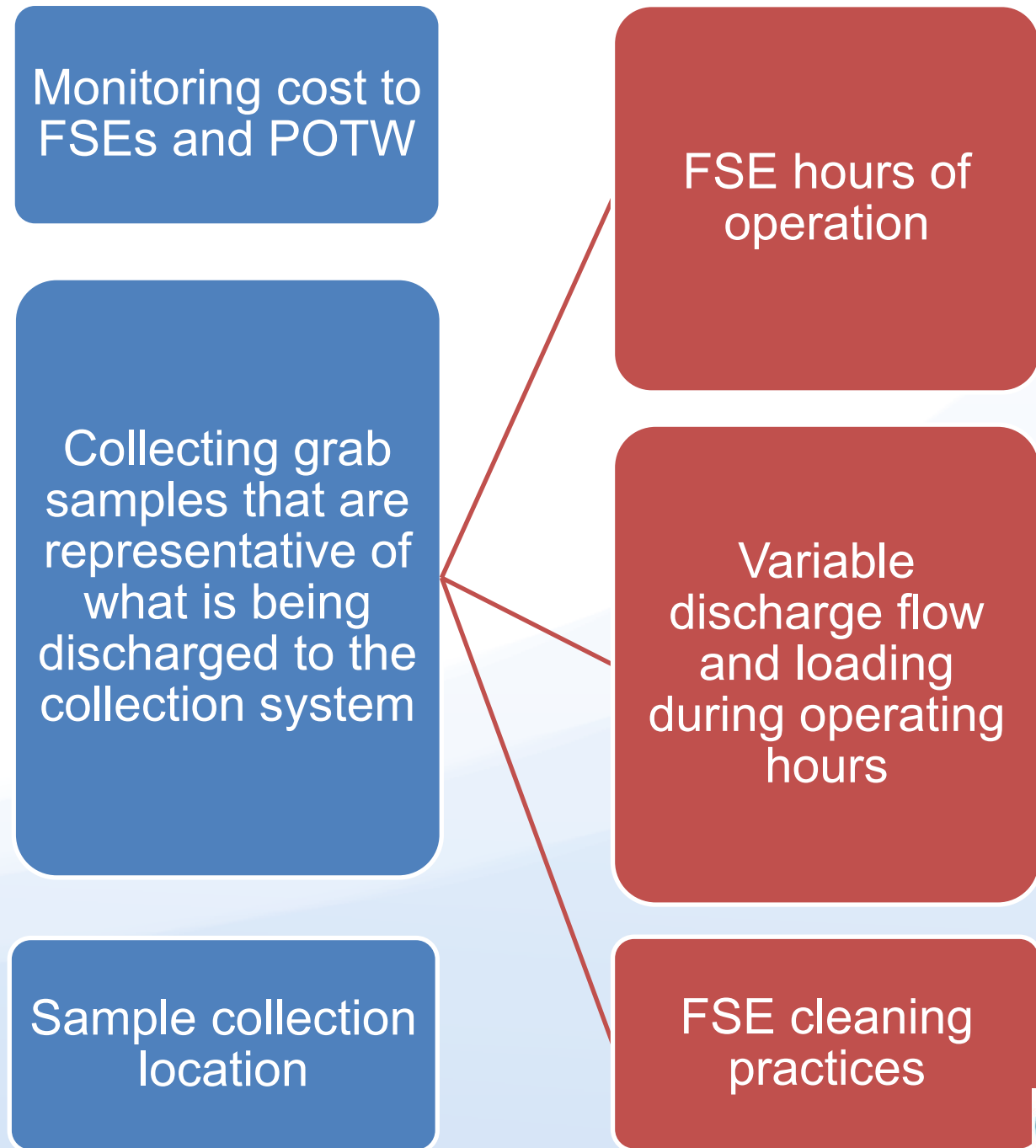
Monitoring and Management Services, LLC

## The time of day to sample a FSE is important

### Oil & Grease Sampling O&G results

- American Style Food Full Service- 7am to 4pm
  - 8:00 am 68 mg/L
  - 10:45 am 320 mg/L
  - 12:30 pm 305 mg/L
  - 3:15 pm 270 mg/L
  - 5:15 pm 80 mg/L (after clean up)

# Challenges of Numeric FOG Limits



# FOG Limit Pros & Cons

- Used for surcharge of high-strength wastewater
- Minimizing FOG accumulations
- Minimize collection system maintenance
- Minimizing SSOs
- Determine when GRDs performance
- Determine when GRDs need to be pumped out
- Determine program effectiveness
- Hard to collect "representative" sample without a sample port
- Grab samples reflects FOG concentration at the time of sampling
- Hard to duplicate sample results on split samples
- Increased monitoring costs

# FSE Inspections

# Inspect the Food Service Establishment

- Walk Through the Facility
- Identify Where the Grease Removal Device (GRD) is
  - *It's a Different Plan if there is NO GRD*
- Find Out What Fixtures are Connected to the GRD
- What is the Condition of the GRD
- How Often is the GRD Pumped
- Establish a Pump Out Schedule



# What to look for during an inspection...

Is the entire kitchen area plumbed to a Grease Removal device?

Are all fixtures properly plumbed/connected?

Is everything in proper working order?

# Grease Interceptor Location is Very Important



Where's the accessibility to  
**PRESSURE WASH**



What are the chances of  
**REGULAR CLEANING**

**Which fixtures produce grease in quantities that can affect line stoppage?**



Floor Sink drain used as a condensate drain

**All drains are being impacted**

Deck Wash at the end of the day

Floor drain

Handwash sink



# What's happening outside the interceptor ?



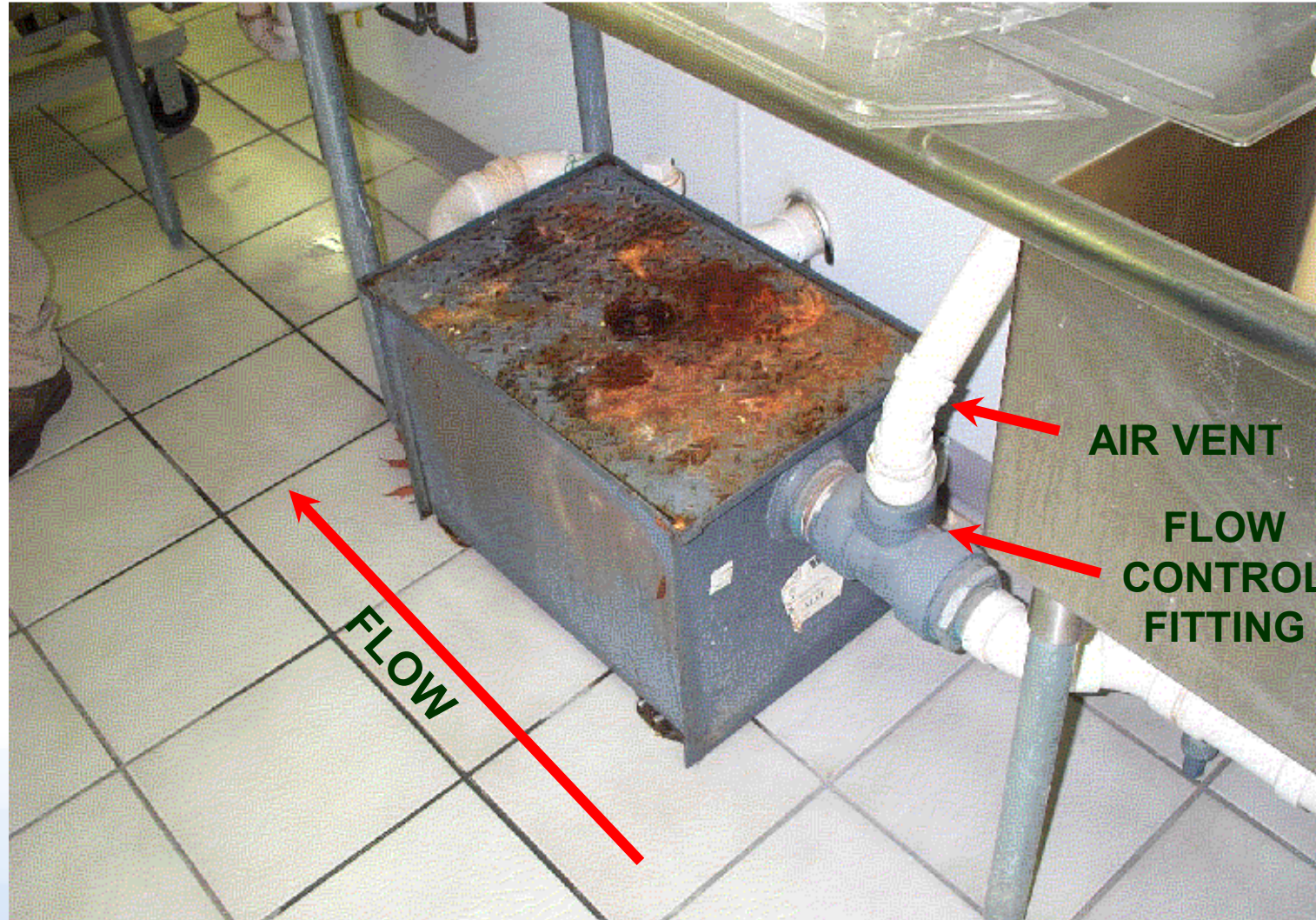
Can you see the FOG  
going down the drain?





**Always check the plumbing**

# THINGS YOU WILL SEE...



Venting and flow control is important!



Plumbing code requires they be accessible but really you need to be a plumber and mechanic to open some of these.

**“We have never dumped  
grease down the drain.”**



**This restaurant invented their own grease trap.**



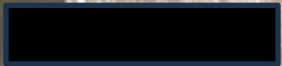
# Down The Dishwasher Drain



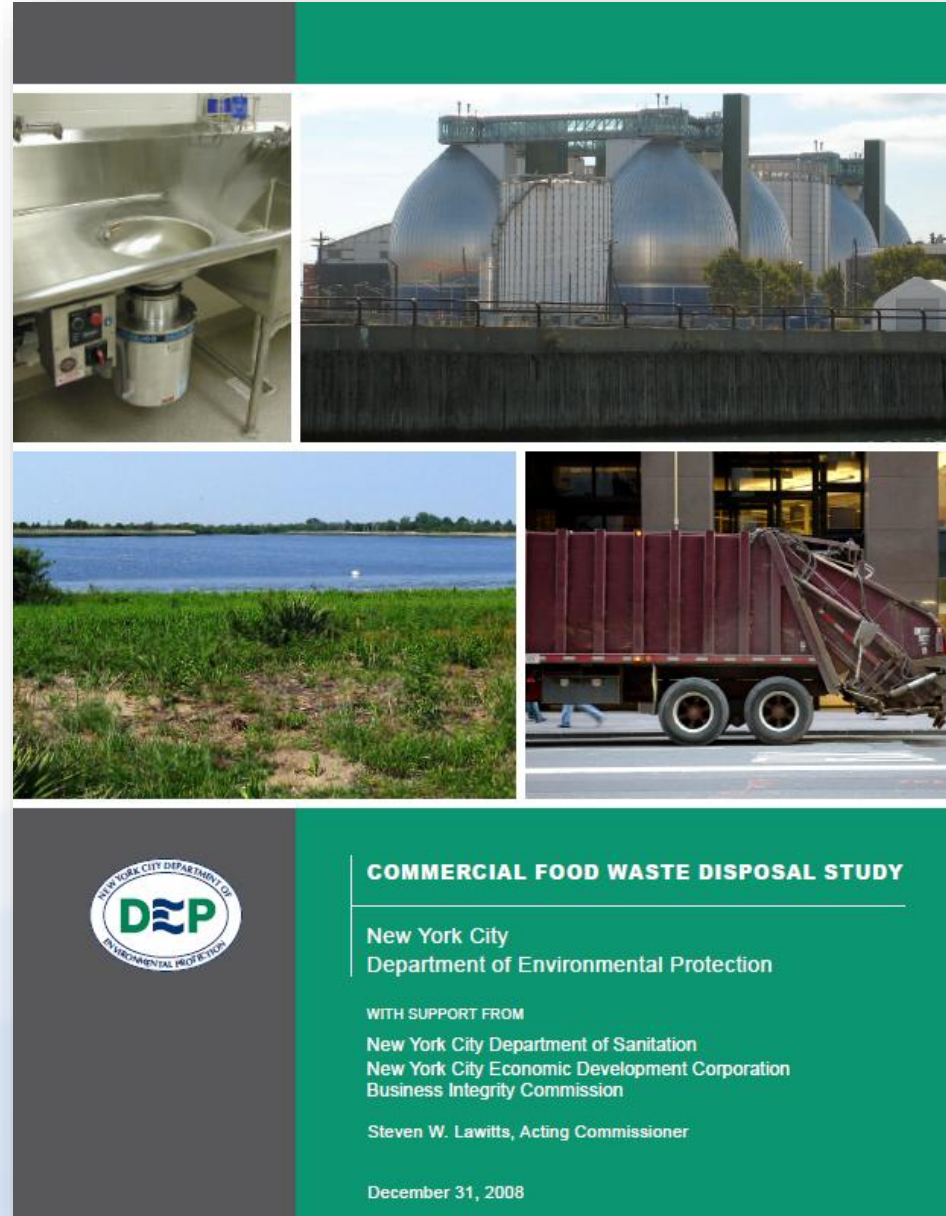


**There goes  
the FOG!!!**

**First cycle  
from the  
dishwasher...**



# FOG loading from food waste disposal units



## COMMERCIAL FOOD WASTE DISPOSAL STUDY

New York City  
Department of Environmental Protection

WITH SUPPORT FROM

New York City Department of Sanitation  
New York City Economic Development Corporation  
Business Integrity Commission

Steven W. Lawitts, Acting Commissioner

December 31, 2008

# Food Waste Disposal Study



Food waste before grinding



Food waste after grinding

EPA Method 1664 laboratory results for FSEs  
(all types)

– Range: 6 to 10 g/Kg food waste

Source: NYCDEP Commercial Food Waste Disposal Study 2008

# FSE sampling for FOG loading from food waste disposal units

Category	No. of Samples	1664 Oil and Grease (g/kg food waste)
Colleges and Universities	15	14.83
Medical Facilities	32	1.03
Retail Food Establishments (supermarkets)	29	6.16
Restaurants and hotels	61	18.59
Other FSEs (caterers, shelters, non-public schools, and senior centers)	35	18.21

Category	No. of Samples	1664 Oil and Grease (mg/L food waste)
Colleges and Universities	15	14830
Medical Facilities	32	1030
Retail Food Establishments (supermarkets)	29	6160
Restaurants and hotels	61	18590
Other FSEs (caterers, shelters, non-public schools, and senior centers)	35	18210

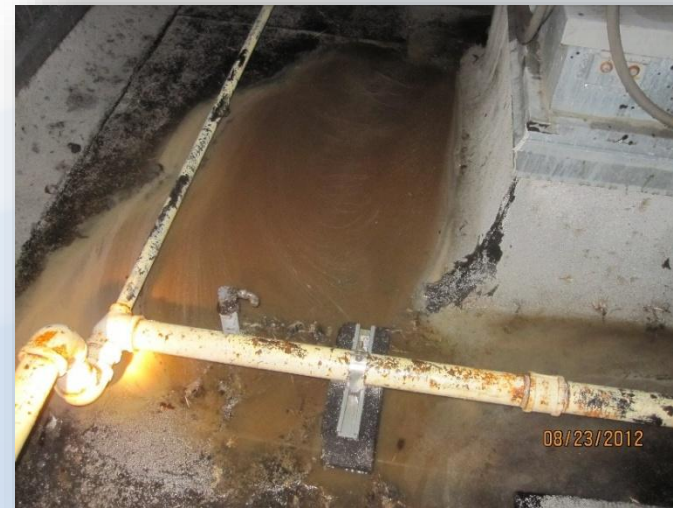
# Hood and Vent Hood Cleaning



# Hood and Vent Hood Cleaning



# Roof Top Exhaust



**Public  
Sewer**



**3  
Compartment  
Sink**

**Inspection  
Port**



01/05/2011

# How Many Backups?



# How hard do we make it to service?



# Current FOG Abatement



- Not all Food Service fixtures/drains connected
- Grease interceptor not serviced until drains plug



**What's wrong with these devices?**





## 13 months in service

Inaccessibility for maintenance & inspection

- Problem for plastic as well as fiber glass models



**Do the photos  
demonstrate  
FOG bypass?**





## Cacaklacks & Zeeks - (2 of 4 kitchens coming on board)

- High food production
- No ware washing, only 3comps, Handwash (s), Foodprep (s), floor drain (s)
- Plumbing Engineer's design - anticipated 30 days (Regulatory Frequency 20 days)

- Heavy food production
- Expecting to take over sales from Wilsonville & Beaverton
- Plumbing Engineer's design - anticipated 90 days

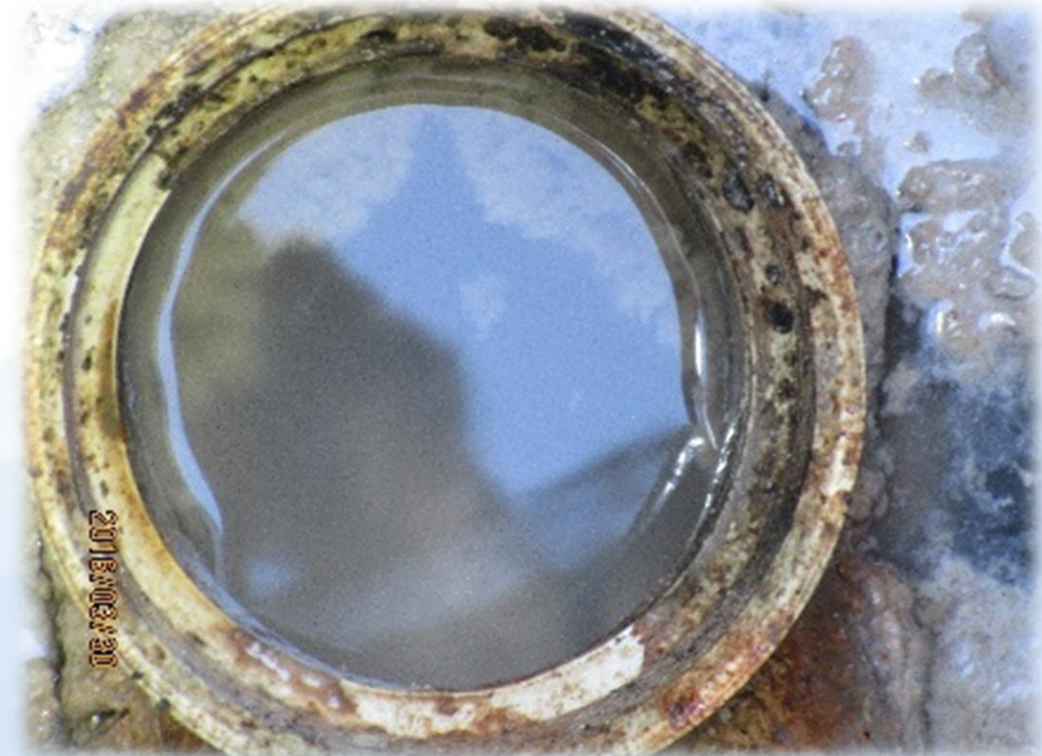
(1<sup>st</sup> spec 1000 gallon)



**22 days in service**



**43 days in service**





**Do these photos demonstrate  
FOG compliance?**



# How do you miss this?



If I can see it, you MISSED IT...

# How do you miss this?



# What about the self-cleaners?



**Pumping  
grease is  
hard work!**



# Grease Pumpers and the Preferred Pumper Program



# Preferred Pumper Program

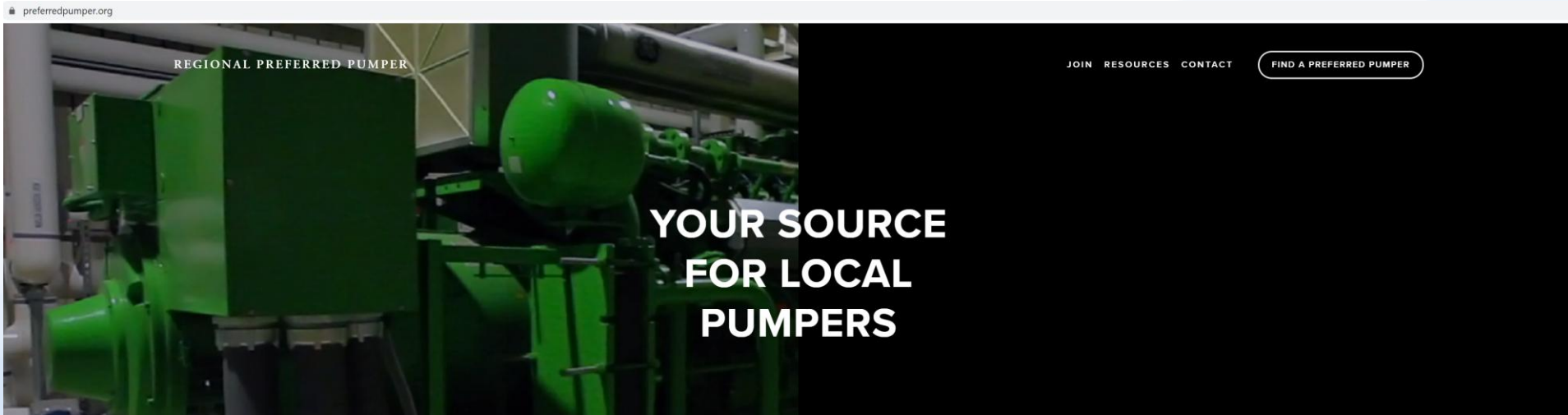


The Preferred Pumper Program (PPP) is an alliance of pumper companies working with local sewer agencies to establish standards of cleaning and reporting procedures for grease interceptors.

The developed criteria encourages effective maintenance, which extends the life of pretreatment equipment, helps prevent building sewer backups and helps promote compliance with local sewer use ordinances.

# Preferred Pumper Standards

- Follows approved best practices for interceptor service
- Submits schedule of interceptor maintenance to sewer agency seven days in advance
- Submits FOG pump-out reports to sewer agency within 10 days of pump-out
- [www.preferredpumper.org](http://www.preferredpumper.org)



# PREFERRED PUMPER PROGRAM CLEANING STANDARDS



A well-cleaned and compliant grease interceptor.

Pumpers registered with the Preferred Pumper program sign agreements to certify that they will implement these cleaning standards during each pumpout and that staff will be trained and educated about these standards. If a Preferred Pumper is not used, then the FOG generator, or food service establishment, is responsible for maintaining these standards and alerting the local sewer agency seven days prior and submitting a FOG report within 10 days of a pumpout.

## Gravity Grease Interceptor (GGI) Cleaning Standards

1. Completely pumpout all contents in the interceptor, so its integrity can be inspected
2. Pressure Wash
3. Remove all accumulated grease from the walls
  - Ledge/Ridge 3D grease buildup
  - Formed gel buildup on GGI rings (manhole covers)
  - No grease clumps on the walls
  - Pressure wash the inside of the inlet and outlet tees
  - Pressure wash the inside of the transfer piping (baffle wall)
4. Note GGI condition for FOG report
5. Report a missing outlet tee
6. Note baffle wall condition
  - Missing pipe
  - Water leaking any part of the baffle wall
7. Water leaking in from any of the outer walls



Interceptor operating correctly.

# PREFERRED PUMPER PROGRAM CLEANING STANDARDS



Interceptor pumped out - NOT cleaned to standards.



Interceptor pumped out - cleaned to standards.

## Hydromechanical Grease Interceptor (HGI) Cleaning Standards

1. Remove lid and scrape/clean off any FOG buildup on inner part of lid
2. Pumpout all the material in the HGI – completely
3. Remove baffles or diffusers and scrape/clean off all 3D FOG buildup
4. Scrape/Clean inside of HGI before refilling with clean water
  - Remove visible 3D grease
  - Remove as much harden grease along the top ridge of HGI
  - Vacuum any residue left at bottom of HGI
  - Replace baffle or diffusers
5. Note HGI condition for FOG report
  - Missing/rusted out baffle
  - Diffuser condition
  - Holes in HGI - metal/plastic
  - Missing bolts/screws
  - Replace lid

## Inspection Standards

### HGI inspection - while pumper is on site

1. Baffle is removed and scraped/cleaned
2. Walls are cleaned
3. Review pumper's Pumpout measurements
4. Complete a FOG report
5. Leave a copy with the food service establishment (FSE)

### GGI inspection - while pumper is on site

1. Observe that entire GGI is evacuated of waste water
2. Observe that the GGI is pressure washed:
  - All internal concrete components
  - Formed gel buildup on GGI rings (manhole covers)
  - Inlet & outlet tee/downspouts cleaned meticulously
  - Send pressure washer stream through transfer piping (baffle wall)
  - Remove all 3D grease buildup on walls
  - Copy of FOG report to \_\_\_\_\_



## **PREFERRED PUMPER TRAINING AND OUTREACH**

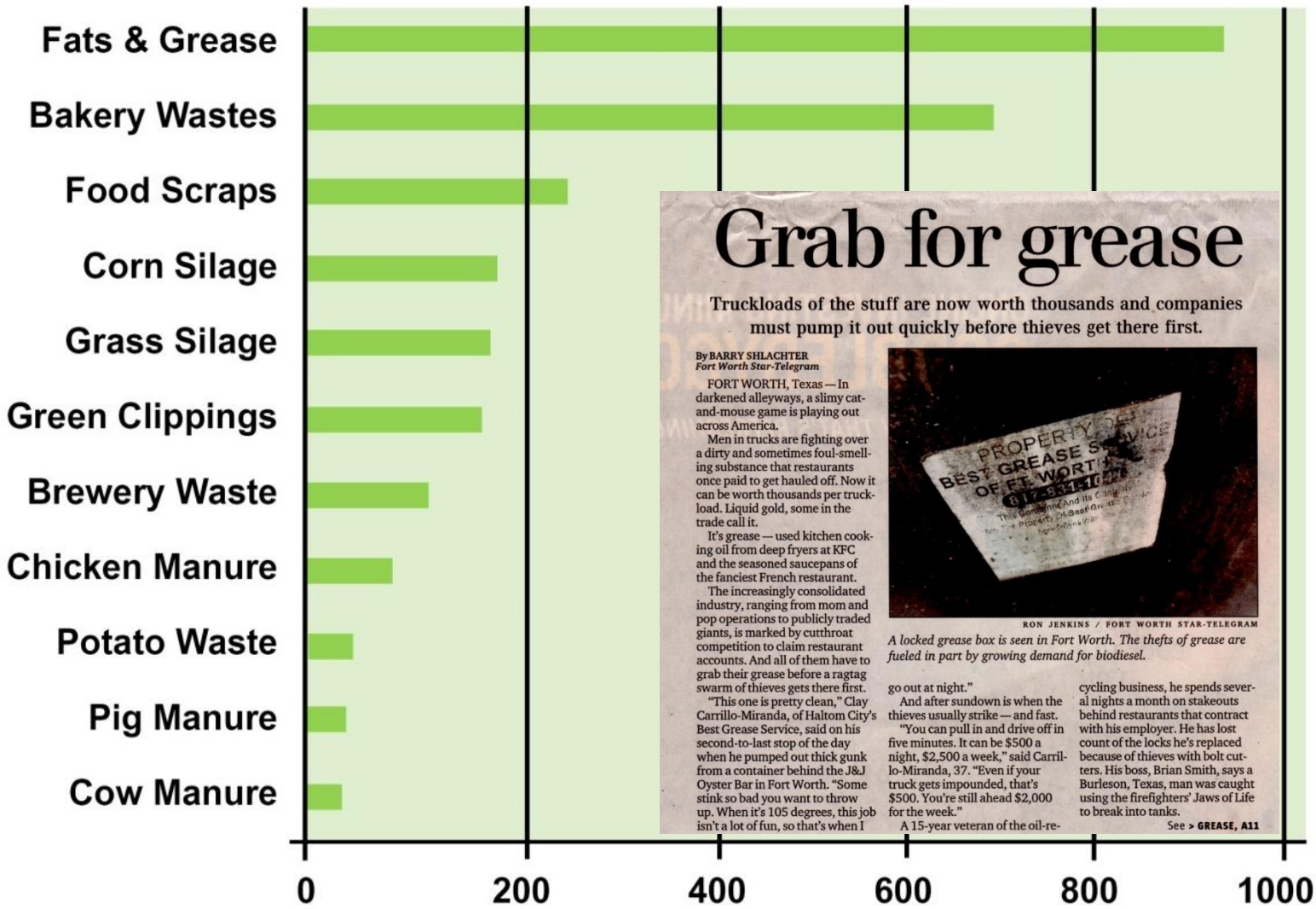
- Worked with pumpers to develop best maintenance standards
- Published standards on the Preferred Pumper web site
- Meet with individual pumpers on a rotating basis during municipal monthly meetings
- Provide training to new pumpers



# MUNICIPAL STANDARDS

- Follows up with FSE if pumper notes a deficiency in a pump-out report
- When a deficiency is noted, FOG inspector coordinates with pumper and FSE manager to be on-site at next pump-out to verify deficiency
- Participates in regional Preferred Pumper meetings to keep informed and provide assistance to other municipal members
- [www.preferredpumper.org](http://www.preferredpumper.org)

# YELLOW GREASE AS A COMMODITY



## Grab for grease

Truckloads of the stuff are now worth thousands and companies must pump it out quickly before thieves get there first.

By BARRY SHLACHTER  
Fort Worth Star-Telegram

FORT WORTH, Texas — In darkened alleyways, a slimy cat-and-mouse game is playing out across America.

Men in trucks are fighting over a dirty and sometimes foul-smelling substance that restaurants once paid to get hauled off. Now it can be worth thousands per truckload. Liquid gold, some in the trade call it.

It's grease — used kitchen cooking oil from deep fryers at KFC and the seasoned saucepans of the fanciest French restaurant.

The increasingly consolidated industry, ranging from mom and pop operations to publicly traded giants, is marked by cutthroat competition to claim restaurant accounts. And all of them have to grab their grease before a ragtag swarm of thieves gets there first.

"This one is pretty clean," Clay Carrillo-Miranda, of Haltom City's Best Grease Service, said on his second-to-last stop of the day when he pumped out thick gunk from a container behind the J&J Oyster Bar in Fort Worth. "Some stink so bad you want to throw up. When it's 105 degrees, this job isn't a lot of fun, so that's when I go out at night."

And after sundown is when the thieves usually strike — and fast.

"You can pull in and drive off in five minutes. It can be \$500 a night, \$2,500 a week," said Carrillo-Miranda, 37. "Even if your truck gets impounded, that's \$500. You're still ahead \$2,000 for the week."

A 15-year veteran of the oil-re-

cycling business, he spends several nights a month on stakeouts behind restaurants that contract with his employer. He has lost count of the locks he's replaced because of thieves with bolt cutters. His boss, Brian Smith, says a Burleson, Texas, man was caught using the firefighters' Jaws of Life to break into tanks.

See > GREASE, A11

RON JENKINS / FORT WORTH STAR-TELEGRAM

A locked grease box is seen in Fort Worth. The thefts of grease are fueled in part by growing demand for biodiesel.

**PRICE AS OF Nov 3, 2023**  
**40¢ - 50¢ PER POUND**

Cubic meters of biogas production per ton of substrate

# Gresham WWTP anaerobic digester FOG receiving station



**Grease-zilla turn-key FOG-to-energy system scalable for WWTP with anaerobic digester**

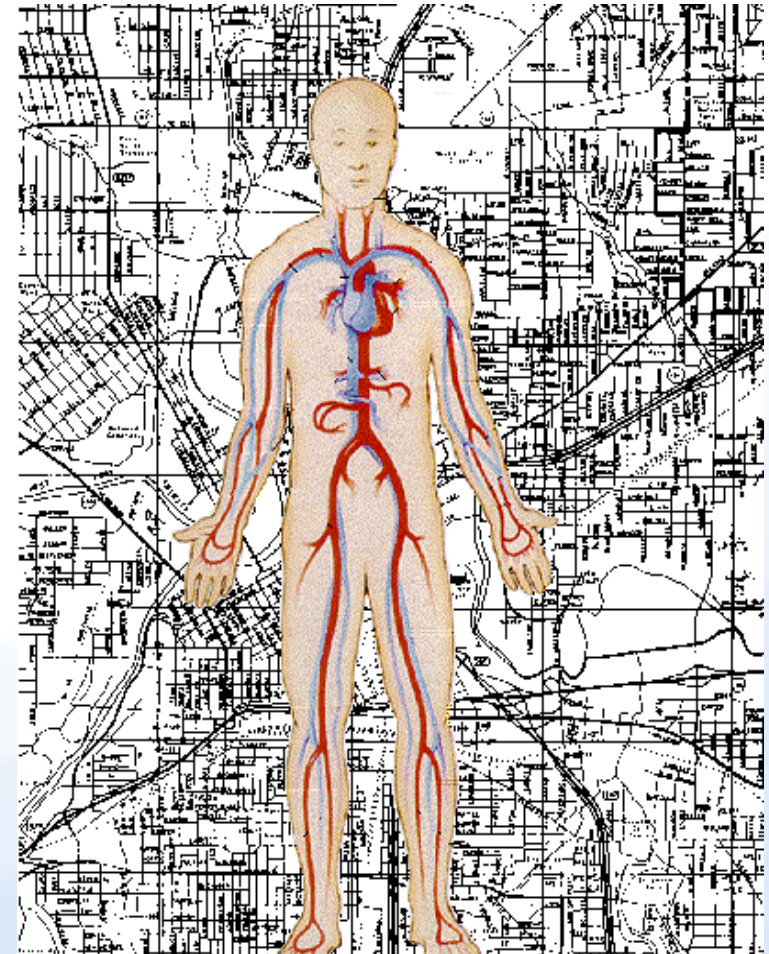
# Grease is like Cholesterol

Cities have been on a high fat diet for far too long.

We have blocked arteries.

Cities have spent millions on angioplasty.

Cities spend millions every year to combat the ongoing problem.

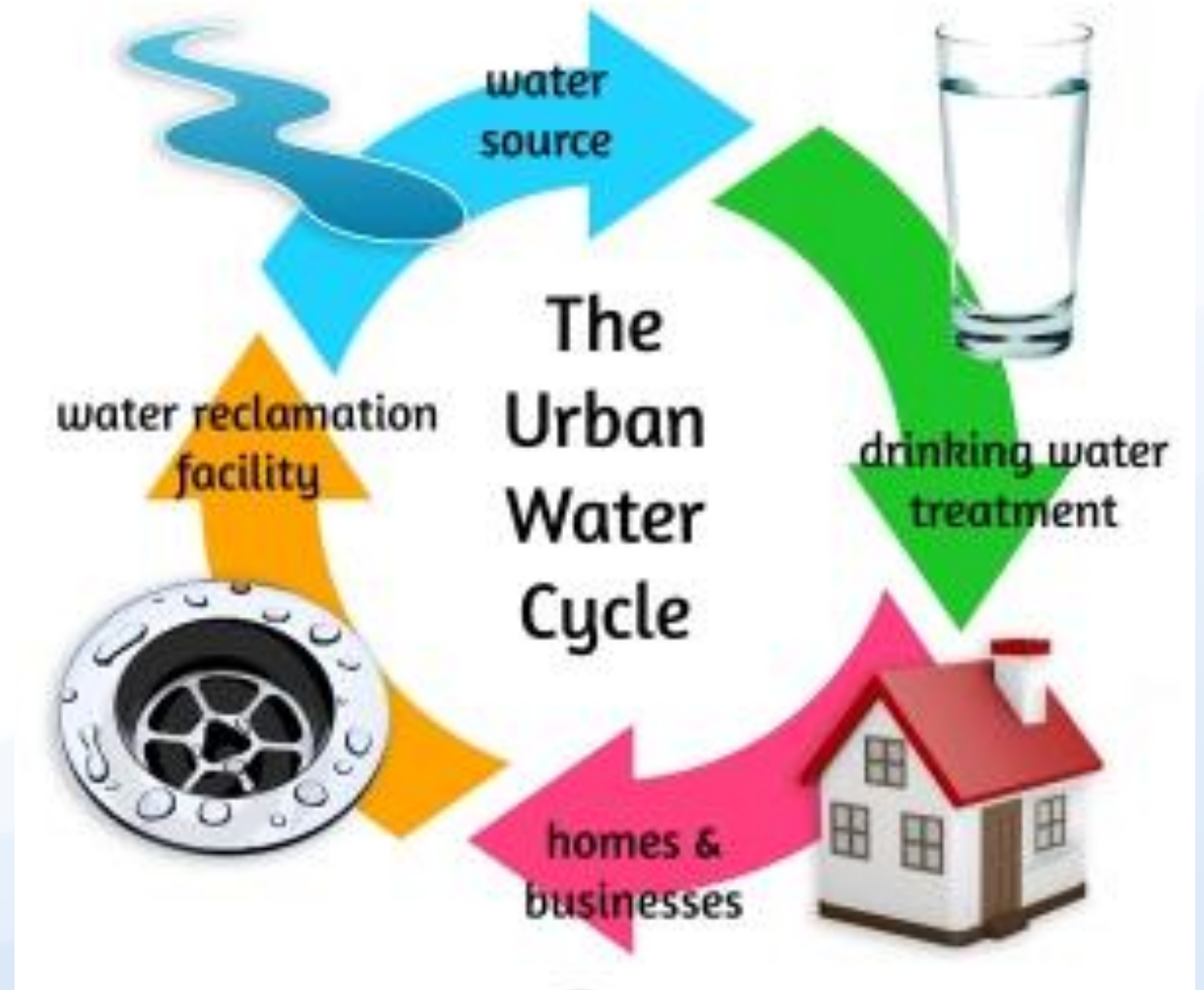


**If we don't change our diet and follow an exercise program,  
the problem will persist.**

# Contaminants of Emerging Concern (CEC) and Publicly Owned Treatment Works (POTWs)

# What are Contaminants of Emerging Concern?

- Contaminants of emerging concern are chemicals found in waterbodies that may cause ecological or human health impacts and are not currently or fully regulated.
- Treatment plants cannot always remove these contaminants.
- Cleaner influent water = lower treatment costs and fewer public health risks



[WSA Emerging Contaminants Page](#)

# After attending this session, you will:

Understand the public health and environmental concerns of CECs

Understand the connection between indoor CEC use, pathways to the sewer, and subsequent impacts to your agency

Have thorough information about specific CECs:

- Unwanted/expired pharmaceuticals
- Pesticides
- Fluorinated compounds (PFAS)
- Phthalates

Be aware of implementation strategies to limit PFAS

- Best practices
- Resources & Tools

# CECs include chemicals that might not be completely treated or removed at your POTW

Example classes that might not be completely treated or removed

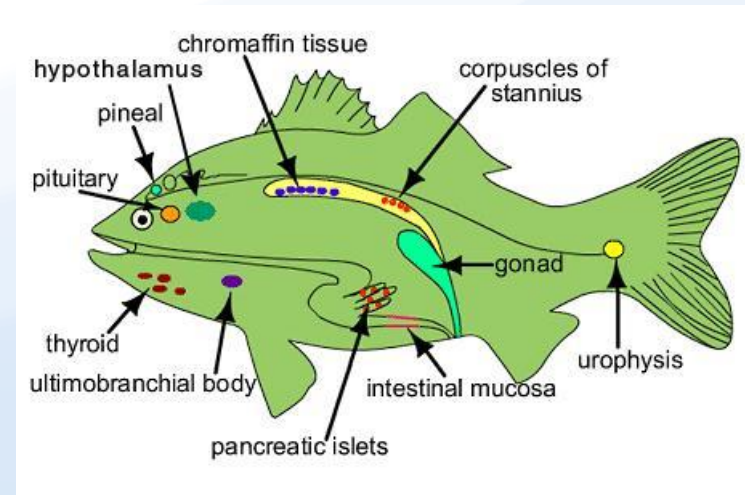
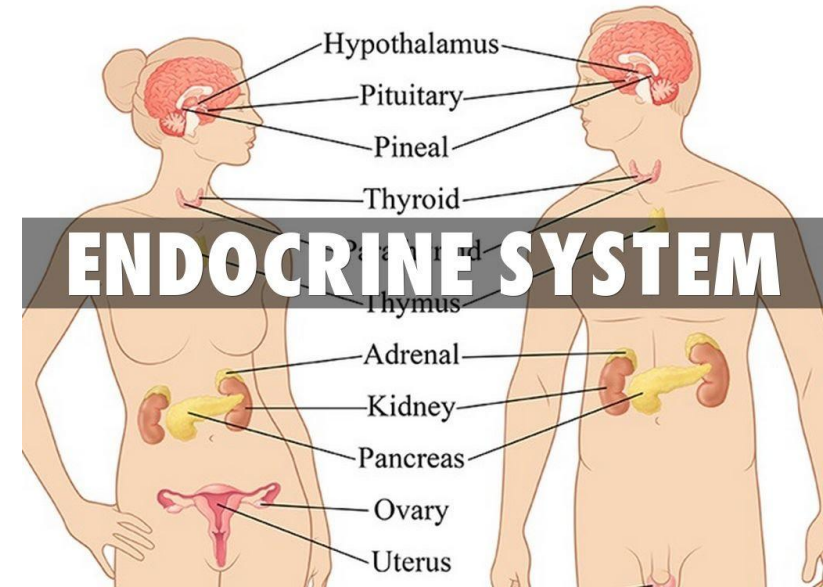
- Heavy metals
- Pharmaceuticals
- Pesticides
- Ortho-Phthalates
- Halogenated compounds
  - Brominated fire retardants
  - Fluorinated nonstick and water-repellent products (PFAS)

Types of harm

- Acute toxicity
- Chronic toxicity
- Endocrine disruption

# The Endocrine System

- Regulates hormones
  - Estrogenic (feminine)
  - Androgenic (masculine)
  - Thyroidal
- Responsible for metabolism, growth, reproduction



# Many Contaminants of Emerging Concern are also Endocrine Disrupting Chemicals

Category	Examples
Prescription and non-prescription drugs	birth control pills, steroid-based medications, chemotherapy medications, blood pressure meds, anti-depression meds...
Household products	detergents, surfactants, plasticizers (e.g., phthalates), some personal care products and their breakdown products
Industrial chemicals	Styrenes, mercury, lead, dioxins and furans, PCBs, fire retardants
Fungicides	hexachlorobenzene, maneb, tributyltin
Herbicides	2,4-D, 2,4,5-T, atrazine
Insecticides	carbaryl, chlordane, dieldrin, lindane, parathion
Animal husbandry products	steroid-based supplements to increase milk, egg &

# Pharmaceutical Disposal

- Never flush down a toilet
- Always remove your name & personal info
- Permanent Collection Sites
- Periodic Take Back Events
- Trash (NOT preferred...)  
Empty from container; crush and mix with other waste (e.g., pet waste, food waste) to make unusable

<https://www.dea.gov/takebackday#collection-locator>



# Pesticides Can Harm the Environment and Be Costly

Pesticides are currently found in wastewater

They can

- Interfere with wastewater treatment processes
- Cause adverse impacts to receiving waters (such as a river, bay, or ocean)
- Create permit compliance issues
- In some states, expose cities to the potential for third party lawsuits
- Impact costs to recycle water and/or ability to reuse biosolids

*Meanwhile, local governments are prohibited from restricting pesticide use.*

# Non-agricultural uses of pesticides are ubiquitous

- Structural and landscape insecticides and herbicides
- Antimicrobial/ fungicides
- Industrial biocides
- Pesticides added to non-pesticide products, like building paint
- Disinfectants for drinking water and wastewater
- Pesticides for pet parasite control



Image credit: Tammy Qualls Sources: CDPR databases, Moran et al. (2020)

# Antimicrobials – what are they?

## EPA definition

*An **antimicrobial pesticide** is intended to **disinfect, sanitize, reduce, or mitigate growth or development** of microbiological organisms or protect inanimate objects, industrial processes or systems, surfaces, water, or other chemical substances from contamination, fouling, or deterioration caused by bacteria, viruses, fungi, protozoa, algae, or slime.*



# Safer Alternatives to QAC Products



## Safer Disinfectant Options:

- Ethanol, isopropanol (isopropyl alcohol)
- Hydrogen Peroxide
- L-Lactic Acid,
- Citric Acid

## Use the right product for the surface!

**Cleaning is different from sanitizing and disinfecting**

[https://oshce.uw.edu/sites/default/files/documents/FactSheet\\_Cleaning\\_Final\\_UWDEOHS\\_0.pdf](https://oshce.uw.edu/sites/default/files/documents/FactSheet_Cleaning_Final_UWDEOHS_0.pdf)

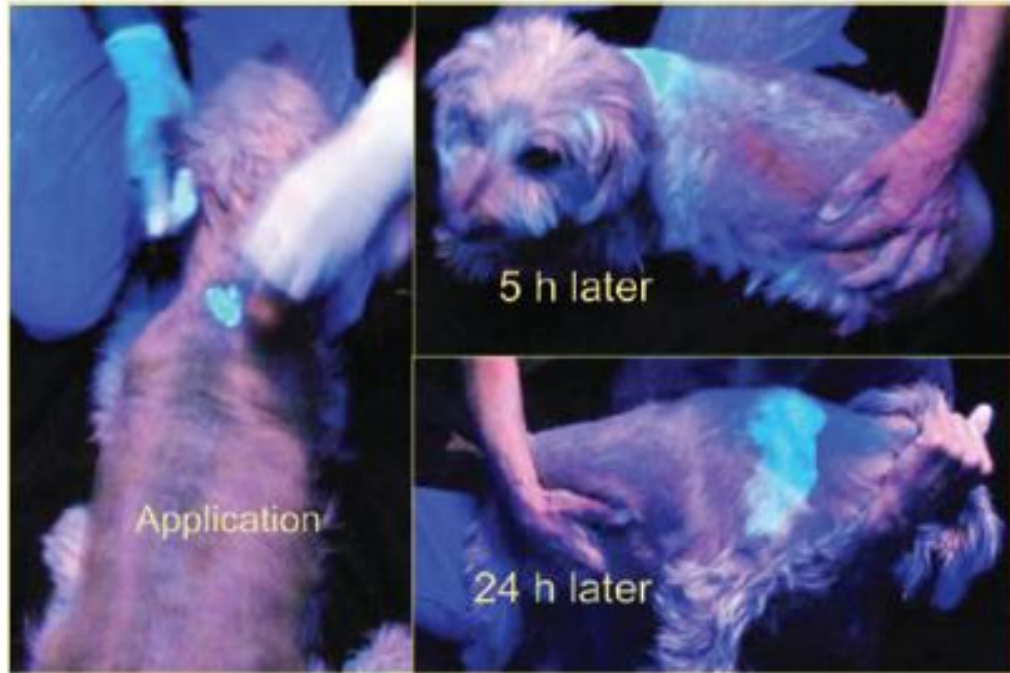
Indoor and on-pet flea/tick control is the overwhelming source of pesticides that exhibit aquatic toxicity and persist in the environment.

- Fipronil
- Imidacloprid
- Pyrethroids
  - Bifenthrin
  - Cypermethrin
  - Deltamethrin
  - Permethrin

Here are example products



# Topical Treatments Do Not Remain on the Pet



Researchers incorporated a fluorescent dye into the spot treatment to photograph the spread.



Fig. 3. Handling of a dog treated with Frontline<sup>®</sup> containing 1% Tinopal<sup>®</sup> CBS-X fluorescent tracer revealed contamination of hands during routine application and handling of a treated dog (color figure available online).

"Fate and Distribution of Fipronil on Companion Animals and in Their Indoor Residences Following Spot-On Flea Treatments," Bigelow Dyk, M., et al., J. of Env Science and Health, Part B, 2012, Vol 47, pp 913-924.

# Integrated Pest Management (IPM)

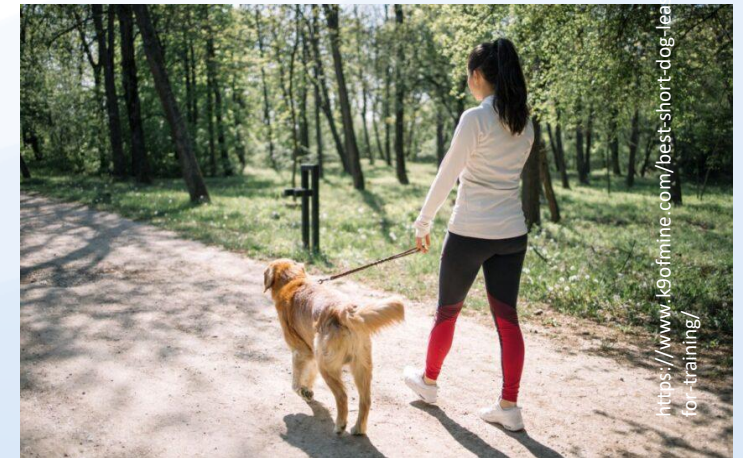
**Preventive measures  
(Preferred Option)**



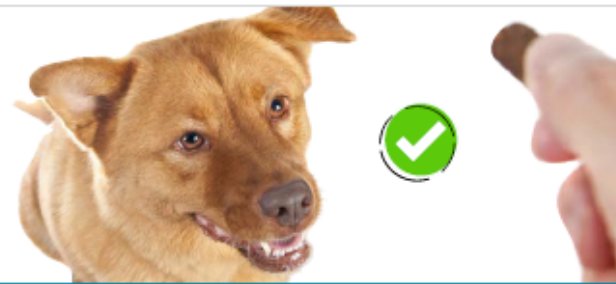
**Pet medications  
Orals/chewables**



**Pesticides (last resort)**



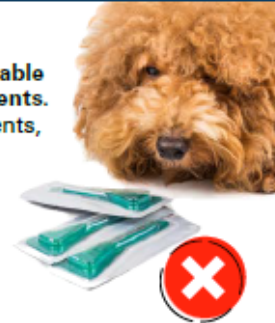
Bay Area toolkit includes a flyer to hand out at vet offices and shelters



### Prevent Fleas and Ticks

*Ask your vet if chewable flea and tick medications are an option for your pet.*

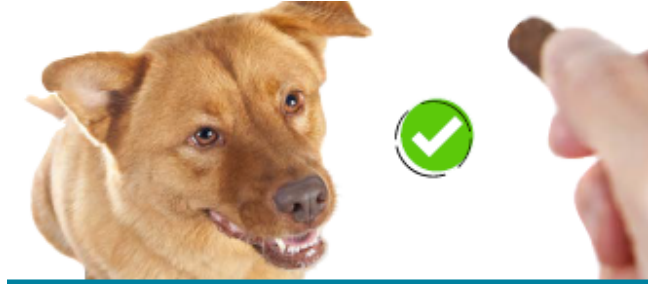
**Chewable flea and tick medications may be a preferable alternative to topical treatments.** Pesticides in spot-on treatments, collars, sprays, and foggers transfer onto you and indoor surfaces around your home. When washing pets, bedding, clothing, and your hands, these pesticides go down the drain and impact San Francisco Bay water quality.



**The best defense is a good offense.** Follow these tips to help reduce flea and tick problems before they start:

- **Fleas** - regularly vacuum floors, furniture, pet bedding and other fabrics. Use a flea comb dipped in soapy water to capture fleas.
- **Ticks** - regularly groom and inspect your pet for ticks and keep them out of tall grasses and shrubs during tick season.

For more information, visit [baywise.org](http://baywise.org).



### Prevención de pulgas y garrapatas

*Consulte a su veterinario si los medicamentos masticables contra pulgas y garrapatas son una opción adecuada para su mascota.*

**Los medicamentos masticables contra pulgas y garrapatas pueden ser una alternativa preferible a los tratamientos tópicos.** Los pesticidas que se encuentran en tratamientos tópicos, collares, aerosoles y nebulizadores se transfieren a usted y las superficies del interior de su hogar. Cuando baña sus mascotas, lava la cama para mascotas, la ropa y las manos, estos pesticidas salen por el desagüe y tienen un impacto en la calidad del agua de la bahía de San Francisco.



**La mejor defensa es un buen ataque.** Siga estos consejos para ayudar a reducir los problemas de pulgas y garrapatas antes de que comiencen:

- **Pulgas:** pase la aspiradora de forma regular por pisos, muebles, cama lecho para mascotas y otras telas. Utilice un peine para pulgas mojado en agua jabonosa para atrapar las pulgas.
- **Garrapatas:** acicale regularmente a su mascota y haga una inspección regular de su mascota para detectar garrapatas. Manténgala alejada de la hierba alta y de los arbustos durante la temporada de garrapatas.

Para mayor información visite [baywise.org](http://baywise.org).



# Phthalates

## What Are Phthalates?

Chemicals that make plastics **flexible and durable**, primarily in polyvinyl chloride (**PVC**) materials.

Ingredients in some personal care products to help **scents last longer** (perfumes), **reduce brittleness** (nail polish) and **avoid stiffness** (hair sprays)

## What Types of Products Contain Phthalates?

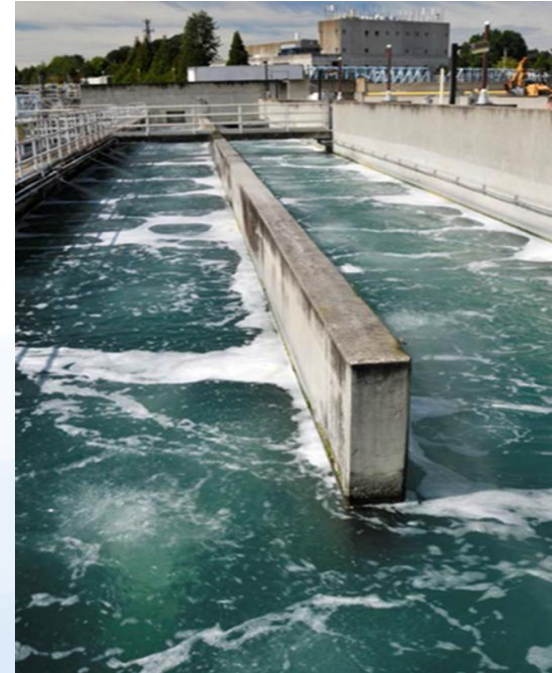
- **Home and building products:** vinyl flooring, shower curtains, toys, plastic packaging, garden hoses, plastic pipes, wire and cable housings, roof membranes
- **Personal-care products:** soaps, fragrances, shampoos, hair sprays, lotions, air fresheners, and nail polish
- **Public works and institutional products:** traffic cones, sealants, Thermoplast pavement marking, synthetic lubricating oils, vinyl gloves, medical tubing and devices

[Oregon ACWA Guide for Avoiding Phthalates in Product Purchasing](#)



# Why are Phthalates a Concern for Water and Wastewater?

- Water quality criteria (EPA 0.3-0.4 ppb)
- Wide range of removal rates (2 – 99%)
- Found frequently in stormwater and wastewater



# What are PFAS?

**PFAS** - per- and polyfluoroalkyl substances

- More than 15,000 PFAS compounds (aka “forever chemicals”), and some have been found to be extremely persistent, bioaccumulative and toxic to humans and wildlife
- Some of the most common include Perfluorooctane Sulfonate (PFOS) and Perfluorooctanoic Acid (PFOA or C8), Perfluorobutanoic Acid (PFBS)

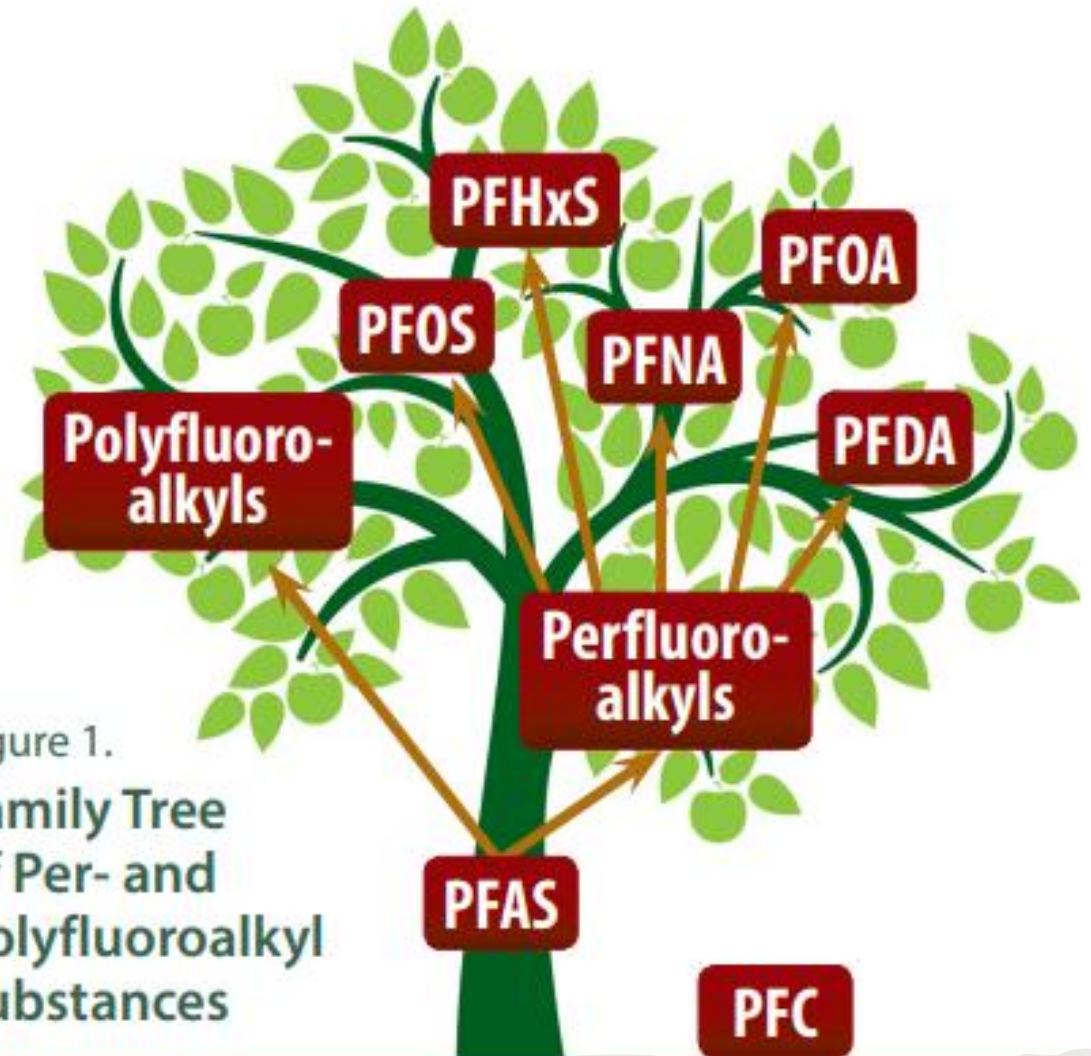


Figure 1.  
Family Tree  
of Per- and  
polyfluoroalkyl  
Substances

# Where are PFAS compounds commonly found?



# PFAS in Lubricating Oils: Uses Could Encompass Range of Industries

PFAS are reportedly used as additives in automotive lubricant oils and hydraulic fluids, to reduce surface tension, prevent fires and evaporation.

A study determined concentrations and profiles of 13 perfluoroalkyl acids (PFAAs) determined in 18 automotive lubricants purchased in the United States, and PFAA concentrations increased by ~ 25-fold after the oxidation of lubricant extracts.

<https://www.sciencedirect.com/science/article/abs/pii/S235218642030724>

0



Persistent perfluorinated    Non-fluorinated - Biologically/Chemically removed

Poly-

(Precursors)

Biotransformation / Chemical Oxidation

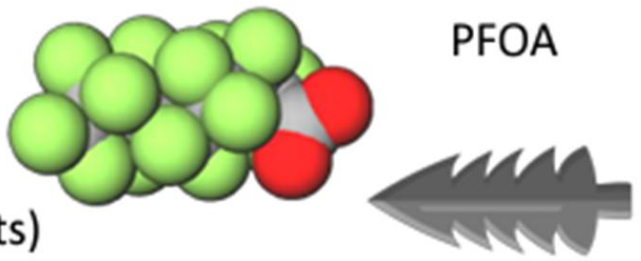


Stone arrowhead, like perfluorinated section of molecule, persists forever

Wooden shaft, like non-fluorinated section of molecule, is degraded so rots away in ground / in vivo

Per-

(Terminal products)



Perfluoroalkyl acid formed from precursor persists indefinitely as "chemical rocks", like stone arrowheads

# Potential PFAS impacts on human health



Increases in cholesterol levels (PFOA, PFOS, PFNA, PFDA)



Changes in liver enzymes (PFOA, PFOS, PFHxS)



Small decreases in birth weight (PFOA, PFOS)



Lower antibody response to some vaccines (PFOA, PFOS, PFHxS, PFDA)



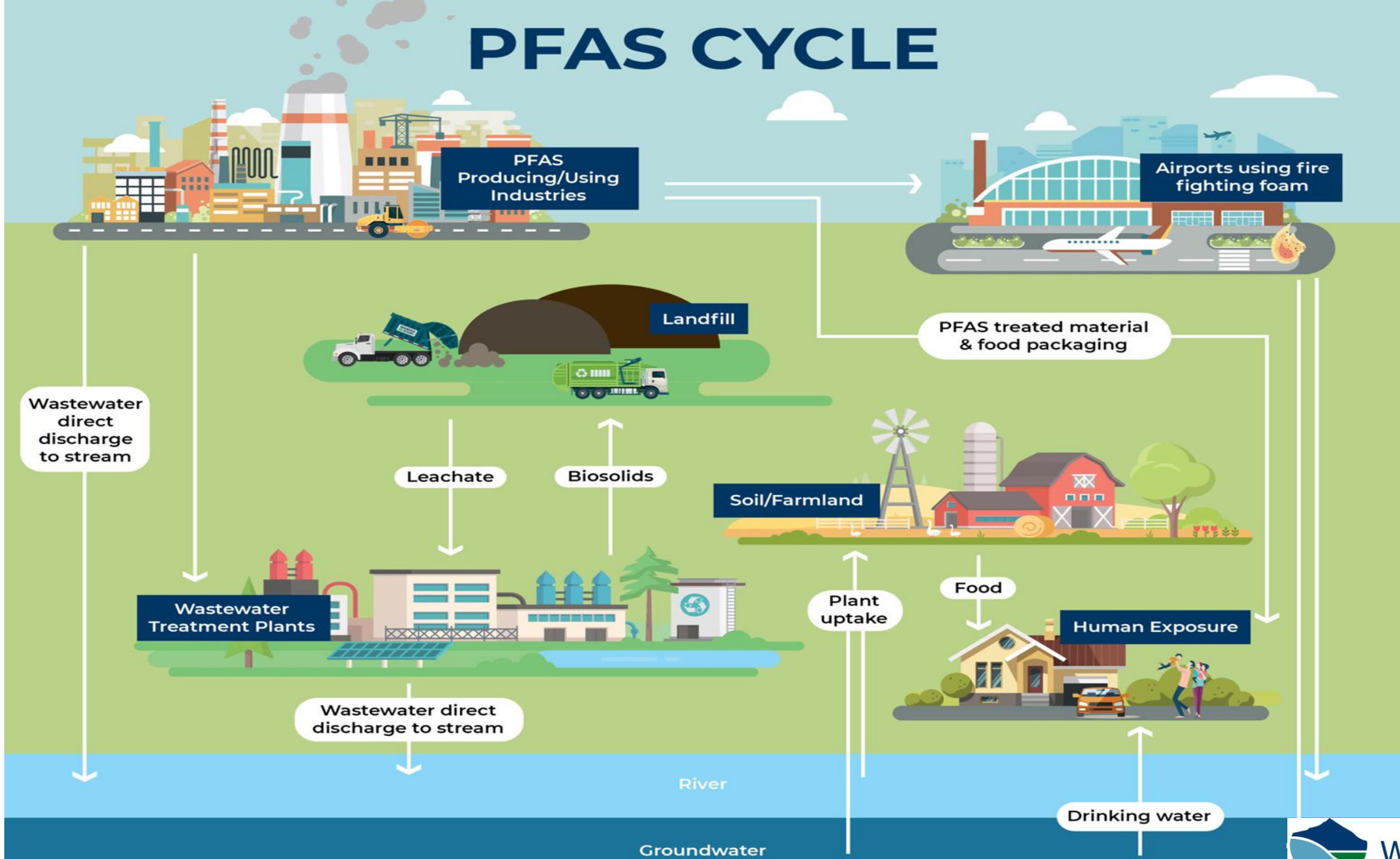
Pregnancy-induced hypertension and preeclampsia (PFOA, PFOS)



Kidney and testicular cancer (PFOA)

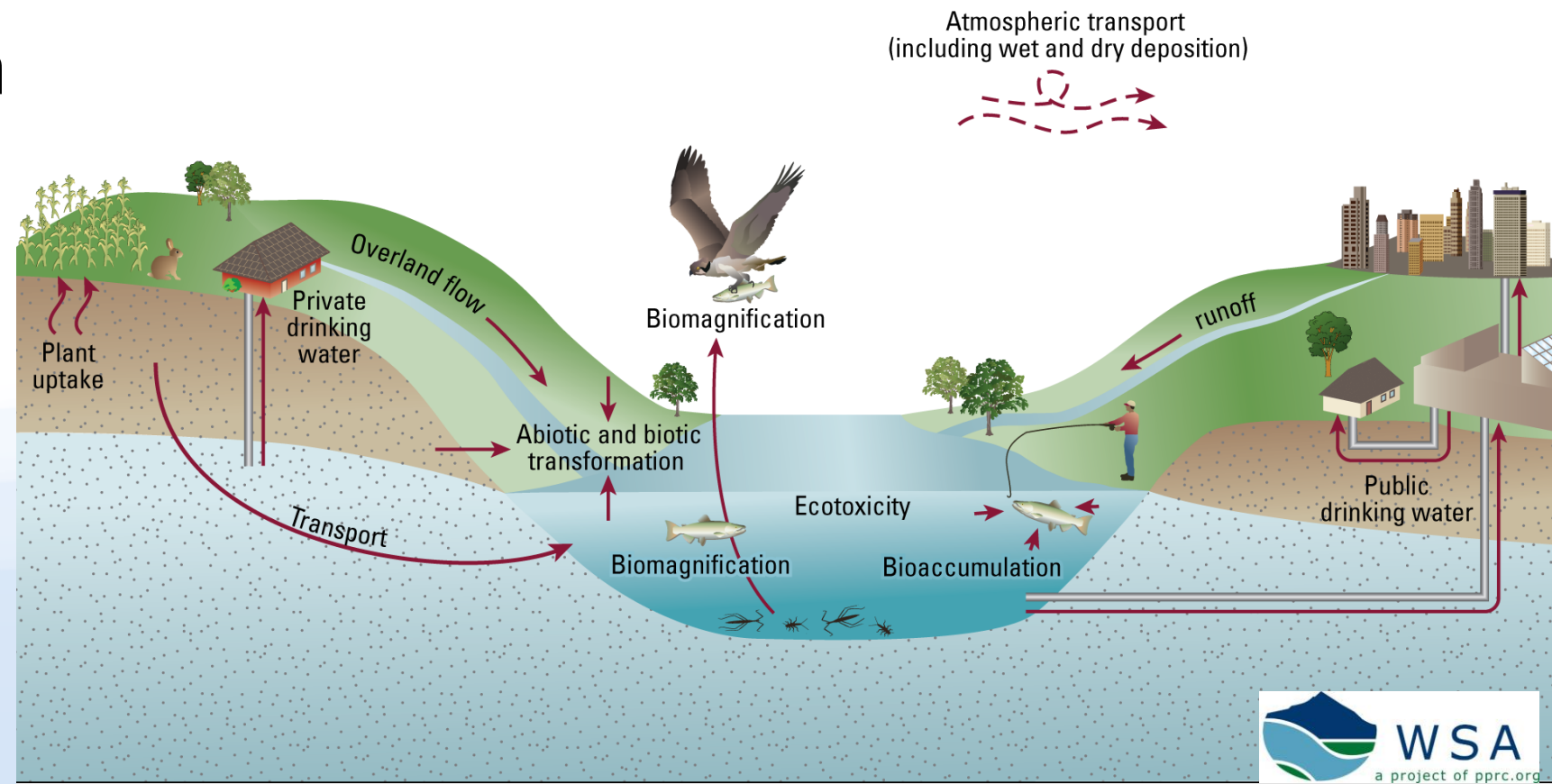
Source: <https://www.atsdr.cdc.gov/pfas/health-effects/index.html>

# PFAS CYCLE



# PFAS are problematic in water environments

- Mobility
- Persistence
- Bioaccumulation
- High Toxicity



# PFAS Water Pollution Sources and Pathways

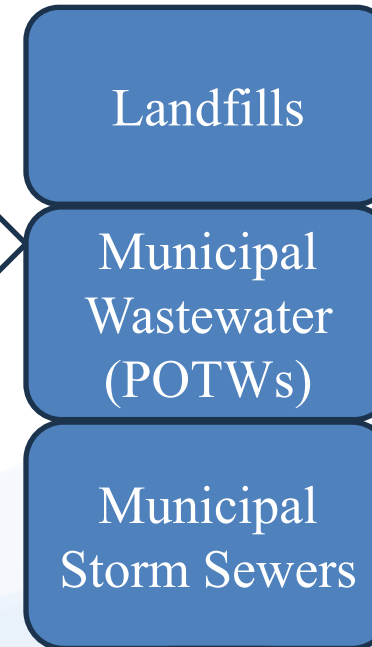
## Originating Sources



**Discharge / Disposal of PFAS Wastes**

**Discharge / Disposal of PFAS Wastes**

## Passive Receivers



**Leachate**



*Industries, commercial businesses, public service entities, and individual consumers use PFAS-containing products and then typically dispose of wastes containing residues from those products to solid or liquid waste management facilities. Those receiving facilities release PFAS to the environment when standard – and legally compliant - management and treatment methods do not remove them. In some instances, PFAS-using entities discharge wastes or materials containing PFAS directly to soils or waters.*

# EPA's Final Drinking Water MCLs

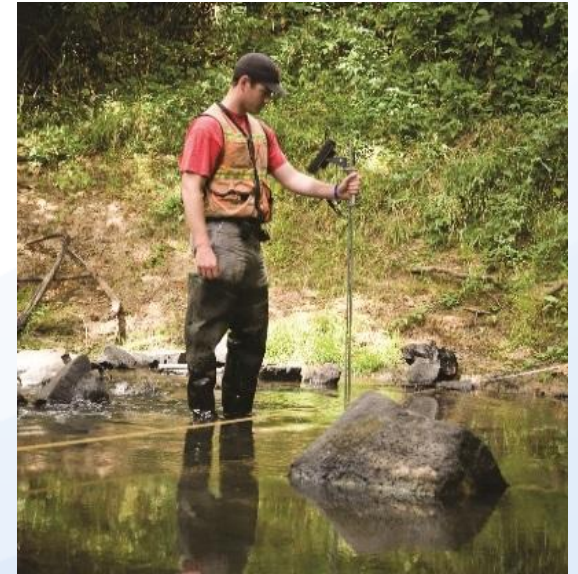
Compound	Final MCLG	Final MCL (enforceable levels)
PFOA	Zero	4.0 parts per trillion (ppt) (also expressed as ng/L)
PFOS	Zero	4.0 ppt
PFHxS	10 ppt	10 ppt
PFNA	10 ppt	10 ppt
HFPO-DA (commonly known as GenX Chemicals)	10 ppt	10 ppt
Mixtures containing two or more of PFHxS, PFNA, HFPO-DA, and PFBS	1 (unitless)	1 (unitless)
	Hazard Index	Hazard Index

# EPA Recommendations to State Clean Water Act Permitting Authorities on PFAS

## EPA Recommendations to the States for POTWs:

- Quarterly influent, effluent, and biosolids monitoring
- Update industrial user (IU) inventory
- Quarterly industrial effluent monitoring
- Incorporate pollution prevention actions
- Collaboration on biosolids assessments

[https://www.epa.gov/system/files/documents/2022-12/NPDES\\_PFAS\\_State%20Memo\\_December\\_2022.pdf](https://www.epa.gov/system/files/documents/2022-12/NPDES_PFAS_State%20Memo_December_2022.pdf)



Source: unknown public image

# EPA PFAS Clean Water Act Actions (As of 2025):

## Industrial Discharges

- Effluent Limitation Guidelines (ELGs) for Certain Industries
- EPA’s Effluent Guidelines Program “Plan 15”
  - PFAS-related ELG rules proposed for these sectors:
    - Landfills
    - Metal finishing
    - Electroplating
    - Organic Chemicals, Plastics, and Synthetic Fibers



Source: U.S. EPA  
(<https://www.epa.gov/eg/metal-finishing-effluent-guidelines>)



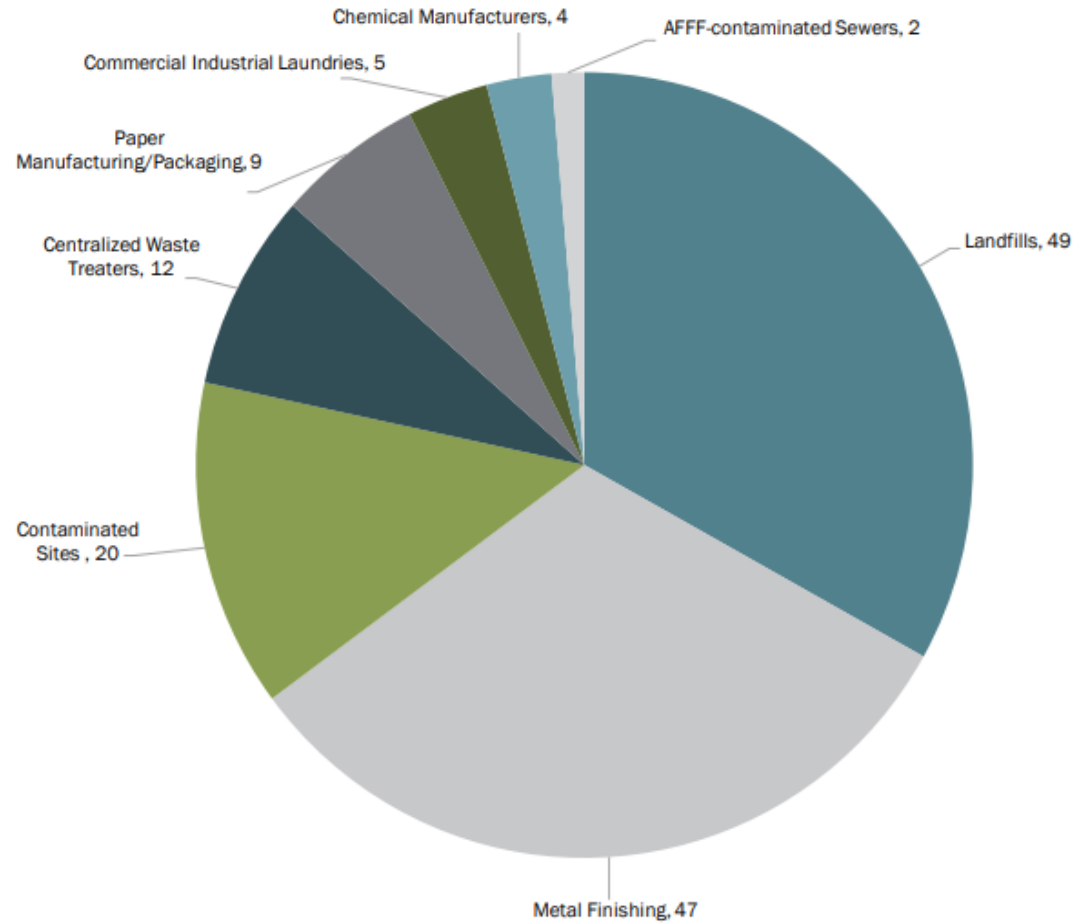
Source: U.S. EPA <https://www.epa.gov/eg/landfills-effluent-guidelines>

([https://www.epa.gov/system/files/documents/2023-01/11143\\_ELG%20Plan%2015\\_508.pdf](https://www.epa.gov/system/files/documents/2023-01/11143_ELG%20Plan%2015_508.pdf))

# Implementation Strategies - POTWs & Pretreatment Programs

- Legal Authority
- Resources (training/implementation)/Funding (sampling budget increases?)
- Industrial User (IU) Inventory
  - Source Identification/Characterization, including existing Significant Industrial Users (SIUs)
- Industrial User Permits
  - Source Control/Waste Minimization
  - Monitoring of SIUs and IUs (PFAS 1633 and AOF 1621)
- Develop Local Limits and BMPs
- Non-Domestic Sources
  - Outreach/Education

Figure 1. Sources of PFOS, Number by Type



Michigan PFAS Initiative –  
Industrial Pretreatment Programs

# Industrial user survey

- Expand to include IUs that have the potential to discharge PFAS

Ancillary operations

Historically used at site

Pollution prevention/BMP educational opportunity

Permit application as screening tool

“Trust but verify”

***IUs may not know if their products and materials contain PFAS - encourage them to contact vendors***

- Tool to identify PFAS in products <https://pfas.chemsec.org/>

# EPA PFAS Clean Water Act Actions (As of 2025): Surface Water Criteria

- EPA published final Aquatic Life Criteria for PFOA and PFOS in 2024
  - The most stringent criterion in the set of values set by EPA is the Chronic Water Column Criteria for PFOS, 250 ng/l (parts per trillion)
- EPA developed draft Human Health Water Quality Criteria in 2024 for POFA, PFOS, and PFBS



# State PFAS Regulations and Standards for POTWs

- **State level regulations vary widely and are rapidly evolving**
  - POTWs are required or recommended to
    - ❑ Monitor
    - ❑ Identify industrial sources
  - Biosolids standards determine management methods.
  - Surface water criteria or wastewater discharge limits.
- **Many states have developed PFAS drinking water standards and screening values**



Image Source: unknown

# Example Permit Language in NPDES Permits – New England EPA (Massachusetts POTWs)

6. Beginning the first full calendar year after the effective date of the permit, the Permittee shall commence annual sampling of the following types of industrial discharges into the POTW:

- Commercial Car Washes
- Platers/Metal Finishers
- Paper and Packaging Manufacturers
- Tanneries and Leather/Fabric/Carpet Treaters
- Manufacturers of Parts with Polytetrafluoroethylene (PTFE) or teflon type coatings (*e.g.*, bearings)
- Landfill Leachate
- Centralized Waste Treaters
- Known or Suspected PFAS Contaminated Sites
- Fire Fighting Training Facilities
- Airports
- Any Other Known or Expected Sources of PFAS

Sampling shall be conducted using Method 1633 for the PFAS analytes listed in Attachment E. The industrial discharges sampled, and the sampling results shall be summarized and included in the annual report (see Part I.E.3).

# EPA PFAS Pollution Prevention Strategies

EPA-833/F-23-  
008 July 2023



## BEST MANAGEMENT PRACTICES: WHERE TO START?

For some pollutants, developing numeric discharge limits may not be feasible.

The NPDES and Pretreatment regulations allow for Best Management Practices (BMPs) to be used in lieu of numeric, end-of-pipe limits in such instances. See 40 CFR 122.44(k) and 40 CFR 403.5(c)(4).

EPA has published guidance on implementing BMPs for NPDES and Pretreatment:

- EPA Guidance for Developing Best Management Practices <https://www3.epa.gov/npdes/pubs/owm0274.pdf>
- Chapter 9 of the NPDES Permit Writer's Manual [https://www.epa.gov/sites/default/files/2015-09/documents/pwm\\_chapt\\_09.pdf](https://www.epa.gov/sites/default/files/2015-09/documents/pwm_chapt_09.pdf)
- Guides to Pollution Prevention: Municipal Pretreatment Programs [https://www3.epa.gov/npdes/pubs/pretreatment\\_mun\\_guide.pdf](https://www3.epa.gov/npdes/pubs/pretreatment_mun_guide.pdf)
- Pretreatment Streamlining Rule Fact Sheet 7.0: Best Management Practices [https://www.epa.gov/sites/default/files/2015-10/documents/pretreatment\\_streamlining\\_7.0.pdf](https://www.epa.gov/sites/default/files/2015-10/documents/pretreatment_streamlining_7.0.pdf)

## PFAS IN INDUSTRIAL WASTEWATER

PFAS can be found in the wastewater discharges of certain industrial facilities subject to NPDES permitting or pretreatment requirements (U.S. EPA, 2021).

Permit writers and pretreatment coordinators are encouraged to include PFAS monitoring in permits for facilities where PFAS are suspected of being present in the discharge. For some facilities where PFAS are found, it may be appropriate to require permit limits. In some cases, numeric discharge limits based on treatment technologies using granular activated carbon, ion exchange resins, reverse osmosis may be appropriate, but for others, pollution prevention practices and BMPs may be more appropriate.

Permit writers and pretreatment coordinators have observed some of the following pollution prevention practices for industries in their state or service area.

### CHROME FINISHING

PFAS can be found in the effluent discharged from chrome plating facilities due to the use of PFAS-containing chemical fume suppressants used primarily in hexavalent chrome plating operations. Many of these facilities discharge to wastewater treatment plants (U.S. EPA, 2009). According to EPA's [Effluent Guidelines Program Plan 15](#) published in January 2023, preliminary investigations by EPA have indicated that some facilities may have the option of switching operations to trivalent chromium, which does not require the use of chemical fume suppressants, and that PFAS-free alternatives exist or are in development for processes which require hexavalent chromium (U.S. EPA, 2023). Additionally, because historic use of PFOS-containing fume suppressants is believed to be a legacy source of PFAS discharges, some agencies have found that equipment replacement has been necessary to achieve reductions in PFAS concentrations in effluent from these facilities (Michigan Department of Environment, Great Lakes and Energy, 2020).



EPA-833/F-23-008  
July 2023

# OUTREACH RESOURCES



CALENDAR LEADING THE WAY COMMITTEES RESOURCES CONTACT LOG IN SEARCH THIS WEBSITE

## PFAS and Phthalate Public Education & Outreach Toolkit

The Oregon Association of Clean water Agencies (ACWA) is committed to working closely with our Members to improve Oregon's water quality, including through public outreach and education strategies. To that end, we are excited to provide communications resources that educate and inspire behavior change related to reducing high priority toxic chemicals in our communities and waterways.

This outreach toolkit was developed through a collaboration of ACWA's Stormwater, Groundwater, Water Quality, and Education Committees, and funded by a grant from the US Environmental Protection Agency's Columbia River Basin Restoration Project.

The toolkit is designed to support and offer a framework for public agencies to conduct outreach to various audiences. This includes hard-to-reach audiences that may not receive information about chemical toxins through mainstream channels.



## Reducing PFAS from Airports, Military Bases, & Fire Depts.

PFAS contamination can be caused by the release of firefighting foam at military bases, airports, and fire training centers. PFAS in the discharge ends up at wastewater treatment plants, but may also contaminate groundwater, drinking water, and other local receiving waters.

For decades, aqueous film forming foam products (AFFF) and other PFAS-based foams have been the primary type of products used to suppress "Class B" liquid fuel and chemical fires. Due to the concern regarding PFAS, there has been increased development of fluorine-free alternatives and changes in firefighting rules and specifications, to reduce contamination. In 2022, Congress directed the Federal Aviation Administration (FAA) to prepare a transition plan to ensure an orderly move to fluorine-free foam for aircraft firefighting. The plan was coordinated with the Department of Defense, the Environmental Protection Agency, and industry partners.

## Safer Alternatives to PFAS in Firefighting Foam

Currently, there are more than three dozen products produced by several manufacturers that do not contain PFAS that have been certified by the [Green Screen for Safer Chemicals Program](#) as safer alternatives to AFFF. Facilities using AFFF can switch to certified safer alternatives for training purposes while testing their effectiveness on liquid fuel or chemical fires. These fluorine-free Class B foams fall into the following categories (ITRC, 2024):

## 3 Ways You Can Reduce PFAS Exposure

### What is PFAS?

PFAS, or per- and polyfluoroalkyl substances, are a family of human-made chemicals used to make products that resist heat, oil, stains, grease, and water. PFAS do not break down easily, so they persist in the environment and are often referred to as "forever chemicals." Some PFAS are known to be toxic. Even those that have yet to be studied for toxicity have raised concerns due to their high persistence.

Residential and industrial use of products and materials laden with PFAS causes these chemicals to enter wastewater treatment plants and the environment, where they cannot be removed and do not break down.

### 1 Choose PFAS-Free Products

In response to consumer demand and some state restrictions, more manufacturers are making commitments to producing PFAS-free products. However, consumers still should diligently check the ingredients of the products they purchase. Helpful resources for finding PFAS-free alternatives for apparel, furniture, cleaners, dental floss, cosmetics, and other personal care products include: [pfascentral.org/pfas-free-products](https://pfascentral.org/pfas-free-products) and [www.ecowatch.com/skindeep](https://www.ecowatch.com/skindeep)



### 2 Make Small Changes in the Kitchen

Transfer takeout foods into glass, ceramic, or other non-plastic containers before reheating them. Look for takeout food packaging certified by the Biodegradable Products Institute (BPI), or your own glass/ceramic container from home. If you own any PFAS-containing nonstick cookware, do not heat it above 400°F and discard per the instructions from your local collection agency if the cooking surface is scratched or chipped. Replace non-stick cookware with safer alternatives, such as cast-iron or enamel-coated cookware.



### 3 Look for the Right Labels



## Reducing PFAS from Metal Plating and Finishing Operations

### What is PFAS?

For the purpose of this fact sheet, PFAS includes per- and polyfluoroalkyl substances as well as other fluorinated substances. They are a group of man-made chemicals known for fire resistance and oil, stain, grease, and water repellency. The strong carbon-fluorine bonds prevent PFAS from breaking down and contribute to their persistence in the environment. The most effective way to reduce the prevalence of PFAS in the environment is to reduce the use of products containing PFAS.

### PFAS Uses in Metal Plating and Finishing

PFAS used in multiple types of metal finishing operations and processes ultimately end up in wastewater discharges to the wastewater treatment plants. Wastewater limits for PFAS are not currently in place but will likely be in the parts per trillion (ppt). A Michigan report noted that 15% of metal finishers were discharging to waste water treatment plants at concentrations greater than their screening criteria of 12 ppt perfluorooctane sulfonic acid (PFOS). Many metal finishers use PFAS-containing products for their surfactant properties of fume suppression and wetting agents. Additionally, some PFAS may be found in chemical conversion coatings, such as teflon.

ishing industry, hexavalent chrome plating represents the most significant environment. Historically, perfluorooctane sulfonate (PFOS) was commonly and finishing industry. Although PFOS was phased out of use in the early ement in the metal finishing industry has been 6:2-fluorotelomersulfonic acid other PFAS, including perfluorohexanoic acid (PFHxA), into the environment

### o Reduce PFAS in Wastewater Discharges

issue of PFOS containing fume suppressants can be a legacy source of

# PFAS Pollution Prevention Opportunity for Airports, Military Bases, and Fire Departments

There are now dozens of Green Screen Certified fluorine-free alternatives to PFAS containing fire-fighting foam (“AFFF”)

<https://www.greenscreenchemicals.org/certified/products/category/firefighting>



GREENSCREEN  
FOR SAFER CHEMICALS

- Class B foams for liquid fuel or chemical fires
- At a minimum, can be used for training purposes to minimize environmental harm
- FAA has now approved use of alternative foams
- Port of Seattle and City of Seattle using AFFF alternatives for live fires

<https://airportimprovement.com/our-transition-fluorine-free-foam>

# PFAS SEPARATION TECHNOLOGIES

full scale with a high degree of commercialization including municipal wastewater

Technology	Technology description
<b>Nanofiltration (NF)/Reverse Osmosis (RO) Membrane Separation</b>	PFAS separated into a concentrate stream by physical separation via high-pressure membranes
<b>Foam Fractionation</b>	PFAS stripped from liquid phase as foam using fine air bubbles
<b>Granular Activated Carbon (GAC)</b>	PFAS sorbs to hydrophobic GAC surface in a fixed-bed pressure vessel.
<b>Reactivated GAC</b>	Similar to virgin GAC, PFAS sorbs to the hydrophobic GAC surface in a fixed-bed pressure vessel.
<b>Colloidal Activated Carbon</b>	PFAS sorbs to colloidal activated carbon particles in aqueous suspension
<b>Ion Exchange Resins (Single Use Media)</b>	PFAS attaches to resin via surface charge interactions in a fixed bed pressure vessel.
<b>Ion Exchange Resins (Regenerable Media)</b>	PFAS attaches to resin via surface charge interactions with resin support material in a fixed-bed pressure vessel
<b>Modified Clay</b>	PFAS attaches to clay minerals, sometimes modified, via surface charge interactions. Media is in a fixed bed pressure vessel
<b>Ion Exchange Resin Solvent Regeneration</b>	A proprietary solvent brine solution removes PFAS from the IX media by targeting removal of the ionic head and desorption of the fluorinated carbon tail from the media


# **Destruction Technologies – mostly still in pilot scale**

- Electrochemical oxidation
- Plasma discharge
- Supercritical water oxidation
- Thermal degradation/incineration
- Photocatalysis
- Sonolysis
- Pfas annihilator
- Aclarity

# PFAS Sampling Protocol

## 1. Quality Assurance (QA) and Quality Control (QC)

Develop a Quality Assurance Project Plan (QAPP)

-  with the key questions:  
**WHAT? WHY? WHERE? HOW?**
- Tailor your QAPP to your specific needs, including:
  - ★ Background of your facility
  - ★ Frequency
  - ★ Sampling locations
  - ★ Methods

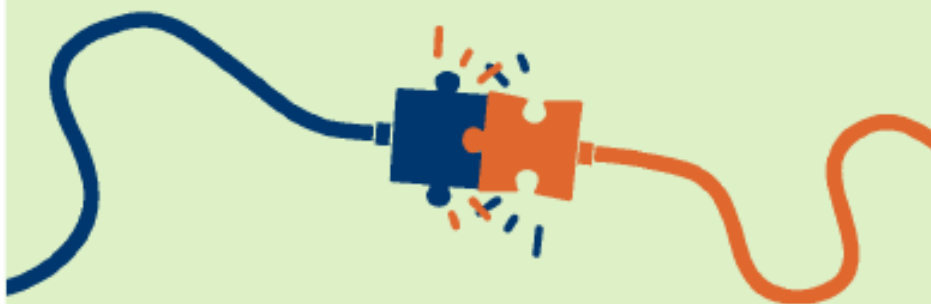
## 2. Sample Collection and Handling

Sampling equipment falls under two categories:

### Category 1

Directly contacts wastewater  
(e.g. samplers, tubing).

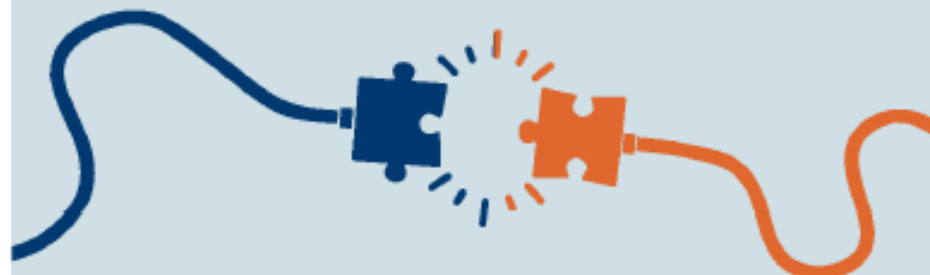
**Must be PFAS-free.**



### Category 2

Does not directly contact  
wastewater  
(e.g., GPS, notebooks).

**Prevent cross-contamination.**



**⊗ Avoid equipment containing fluoropolymers  
(e.g., PTFE, PVDF, PCTFE).**

### 3. Sampling materials



#### Use PFAS-free materials:

- ★ Stainless steel
- ★ High-density polyethylene (HDPE)
- ★ Polypropylene
- ★ Polyvinyl chloride (PVC)
- Silicone

Use equipment provided by a contract lab to ensure PFAS-free components.

### 4. Sampling methods



#### Grab Samples:

Preferred method.  
Use PFAS-free tools  
(e.g., uncoated metal rods,  
stainless steel trowels).

#### Composite Sampling:

Use PFAS-free equipment and  
rinse thoroughly with PFAS-free  
water if necessary.

## 6. Personal Care Products and Field Items

Avoid personal care products that may contain PFAS.

Approved sunscreens



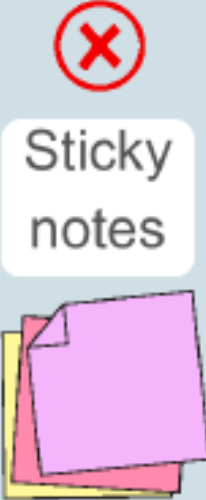
Approved Insect repellents




Fine point or medium point sharpie markers



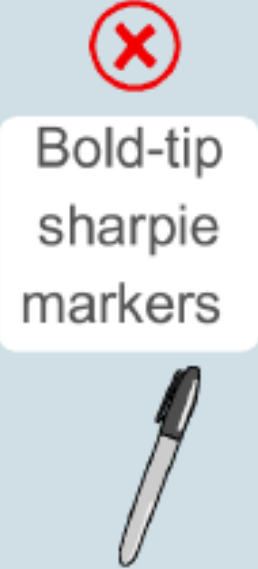
Do not use the following:



Sticky notes

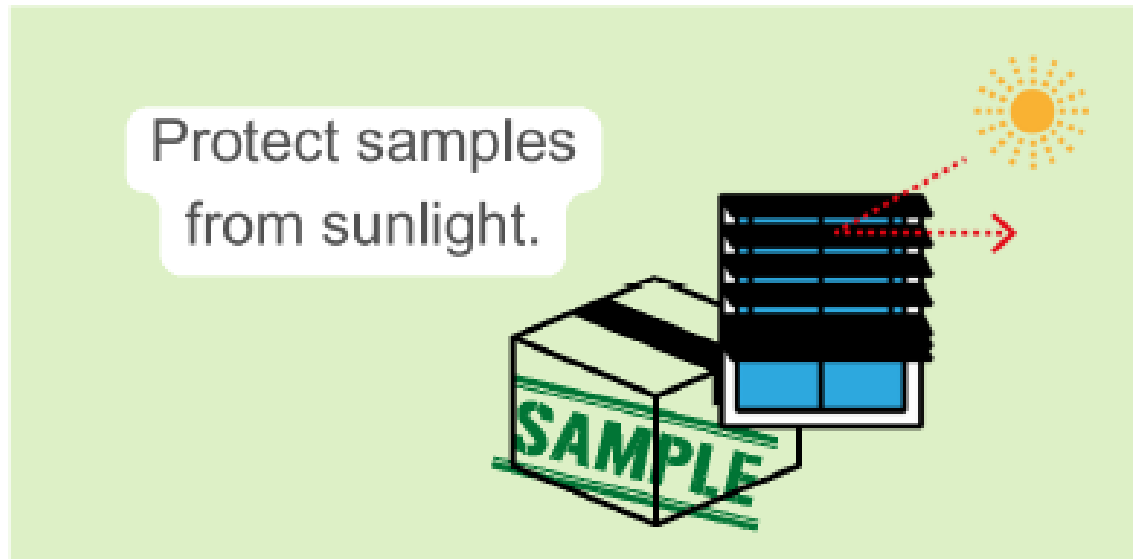


Gore-Tex clothing



Bold-tip sharpie markers

## 7. Sample Storage and Shipping



Lastly! Ship samples with a completed Chain of Custody (COC) within 48 hours.



# Services Available Through EPA WaterTA

WaterTA providers offer diverse services, including but not limited to:

Infrastructure  
needs  
identification

Capital  
improvements  
planning

Funding  
application  
development

Regulatory  
compliance  
assistance

Financial,  
managerial,  
and/or technical  
capacity building

Disaster and  
climate  
resiliency

Utility  
cybersecurity

Water quality  
optimization

Utility  
workforce  
development

**Communities can  
submit a request  
for TA:**

[https://www.epa.gov/water-  
infrastructure/forms  
/water-technical-  
assistance-request-  
form](https://www.epa.gov/water-infrastructure/forms/water-technical-assistance-request-form)

**Never ever give up!**



**F**ats **R**ags **O**il **G**rease

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