Considerations for the Management of Discharge of Fats, Oil and Grease (FOG) to Sanitary Sewer Systems

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This publication is the result of the cooperative efforts of representatives of state agencies, local governments and other interested parties serving on the FOG Task Force (see Appendix A).

This report is intended to offer information and guidance for identifying opportunities and options for FOG management. The task force anticipates this information will be useful as a starting point in reexamining both local FOG regulatory programs and in the management practices of FOG generators. These materials are not held out as the ideal or as the single best method, but are offered as a framework for consideration of a variety of approaches. We have endeavored to respect the authority of local officials to make appropriate decisions to protect both their wastewater collection systems and the environment while addressing the needs of businesses and residential property owners for a reasonable and equitable approach to FOG management.

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State of North Carolina
Michael F. Easley, Governor
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1. INTRODUCTION

Fats, oils and grease (FOG) discharged by residential, commercial, institutional and industrial users present a significant problem for wastewater collection and treatment systems. FOG can clog municipal sewer lines and lift stations, causing sanitary system overflows (SSOs). FOG also has the potential to disrupt the effective operation of wastewater treatment plants.

To address these problems, a growing number of local governments have adopted public education and regulatory programs dealing with FOG management. These educational programs have been designed to discourage residential customers from pouring FOG down kitchen sinks, while the regulatory programs may require commercial and institutional system users to install FOG control devices and to meet defined effluent limits.

As FOG pretreatment programs are established in North Carolina, parties regulated by those programs have expressed concern about the need (i) for a sound technical basis for those programs; (ii) for ensuring that pretreatment programs address all sources of FOG; and (iii) for program consistency across the state. Local governments, on the other hand, have expressed concern about the need (i) to prevent sanitary sewer overflows and protect publicly-owned infrastructure; (ii) to comply with their wastewater treatment plant National Pollutant Discharge and Elimination System (NPDES) permits and sanitary sewer collection system permits; and (iii) to preserve local flexibility and autonomy in formulating local regulatory programs.

The purpose of this document is to provide considerations for local governments in developing FOG programs and to educate FOG dischargers about the keys to successful FOG management so they can reduce FOG discharges and comply with state and local regulatory requirements.

By providing guidance to food service managers and staff, as well as to local governments, it is anticipated that this document will facilitate development of FOG programs that are effective and reasonable. The user will find information illustrating proper grease separation device design, optimal sizing suggestions, servicing pointers and technical considerations that can be used to design grease control systems for food service facilities. Information is also available on how penalties could be assessed by communities to achieve compliance with regulatory requirements.

This is a living document prepared by a working group of stakeholders listed in Appendix A. For purposes of this document these stakeholders are referred to as the Task Force. Appendix B is a special acknowledgement section that provides credits to organizations that have granted the use of noted resources.

This guidance document addresses the following specific topics:

- **technology and design criteria for FOG control devices;**
- **FOG best management practices;**
- **FOG sampling;**
- **FOG effluent regulatory considerations;**
- **proper management and disposal of FOG waste;**
- **administrative fees;**
- **education and outreach programs; and**
- **chemical, bacteria and enzyme additives.**

1.1 What is FOG and Where Does It Come From?

Grease is the common term for animal fats and vegetable oils. Animal fats and vegetable oils are lipids. Lipids are organic molecules essential to animal life for the production of hormones and energy storage. If a lipid is liquid at room temperature, it is usually referred to as an oil. If it is solid at room temperature, the lipid is referred to as a fat or grease. Animal fats and vegetable oils are 8 – 12 percent lighter than water and do not mix with water. FOG forms a floating layer on the water that enables free-floating fats and oils to be easily removed by grease separation devices.

FOG comes from a wide range of residential, commercial and industrial generators. Residences, apartment complexes, restaurants, school cafeterias, day care facilities, grocery stores, bakeries, hospitals, churches, correctional institutions, airports and food processing plants are all FOG sources. FOG is a natural consequence of cooking and occurs naturally in many foods such as meat. Oil and grease are also incorporated as ingredients into many recipes for bread, salads and desserts and are used as a medium for frying food.

1.2 What's the Problem with FOG?

The increased development of central business districts encircled by suburban areas, the increasing mobility of our society, and decreased cooking at home have led to significant growth in the commercial food sector. These trends have led to the increase of commercial areas containing high densities of restaurants, mall food courts and supermarket ready-to-eat meals. Additionally, many other new food preparation facilities such as sports arenas, strip shopping centers, convenience stores and carry-out kiosks have raised the numbers of high-loading grease sources on municipal sewer systems. With more restaurants, institutional kitchens and other commercial-handling venues, the nation's sewer systems experience increasing difficulty with grease clogging sewer lines/ pumping stations and affecting sewage treatment operations.

Drainage pipes within buildings are usually made from metals or plastics. Municipal sewer piping may be made from metals, plastics or ceramic materials such as terra cotta. All of these materials are hydrophobic and oleophilic. Hydrophobic means water does not stick to the material, a good property for water-handling pipes. Oleophilic means oily substances are naturally attracted to the material, which is why piping encounters grease clogging. Fats and oils naturally stick to piping walls. Fats and oils also possess an inherent surface "stickiness" which leads to sewage-borne solids sticking to the grease layer on a sewer pipe's inside walls.

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Over time a building's internal drain lines or a municipality's sewer pipe's diameter is significantly reduced by grease/solids build-up. This may result in clogged pipes and sewage overflow, potentially jeopardizing public health and the environment.

Since 1998, 23-28 percent of all reported SSOs statewide have been the result of FOG accumulation in municipal sewer collection systems. On a local level, towns are experiencing FOG blockages at a greater rate of at least 50 percent. These overflows (1998 to September 2001) have resulted in over 19 million gal-

lons of spilled untreated wastewater. FOG overflows not only cause tremendous environmental and health impacts but are also expensive to repair.

In addition, high levels of FOG may inhibit the proper functioning of pump stations and wastewater treatment plants. Municipal systems are subject to federal and state regulatory enforcement–including substantial fines–for any overflows, permit violations or water quality problems that result. The cleaning and replacement of building drain lines and municipal sewer lines are an expensive but necessary process that can be significantly reduced by implementing best management practices (BMPs).

1.3 How Do FOG Enter the System?

Warm fats and vegetable oils are liquid and can be poured. Unfortunately, food handling staff and home cooks do not always understand that waste fats and oils should be disposed of by pouring into a rendering container, and instead may pour the fats/oils down a convenient sink drain. Disposing of the contents of a deep fat fryer down a sink or other plumbing drain damages the draining system. Grease drippings and fryer oils should be poured into a rendering container and kept out of the drainage system. Other fats routinely enter sanitary sewer systems as a result of normal kitchen operations, including residential and food service facility washing of dishes, silverware and pots and pans.

1.4 How Can FOG Discharges Be Minimized?

For commercial and institutional facilities, both interior and exterior equipment exists to collect FOG prior to discharge into the sanitary sewer system. Small point source grease separation devices continue to be designed into commercial kitchen plumbing systems to protect the building's internal drainage system. Today, municipalities commonly require restaurants and other commercial food handling establishments to install large outside grease separation devices to protect the sewer infrastructure from grease problems. In addition to the use of properly designed and sized grease separation devices, FOG generators–including residences–can implement BMPs to keep FOG out of plumbing systems. These BMPs include proper grease disposal and handling, proper kitchen practices, and proper grease separation device maintenance. BMPs are also the solution to minimizing residential FOG discharges.

BMPs are practical measures that when implemented will significantly reduce the quantities of FOG released into municipal discharge pipes. The best way to manage FOG is to keep it out of the drains. Whether in a home setting or a 200-seat food service facility, noncommercial, commercial and institutional generators can minimize FOG discharges by implementing simple preventive measures.

Since 1998, 23-28 percent of all reported SSOs statewide have been the result of FOG accumulation in municipal sewer collection systems. These overflows (1998 to September 2001) have resulted in over 19 million gallons of spilled untreated wastewater.

Note: The terms "grease trap" and "grease interceptor" are often used interchangeably. For purposes of this document, the terms "grease trap" and "grease interceptor" will be represented by the single term, "grease separation device." Whether the device is interior or exterior will be identified.

2. BEST MANAGEMENT PRACTICES FOR MANAGEMENT OF FATS, OIL AND GREASE

2.1 Noncommercial Generator BMPs

Homeowners, apartment/ condominium/ townhouse dwellers, and vacationers with kitchen access make up the diverse group of noncommercial oil and grease generators. This sector encompasses anyone who prepares food in a dwelling whether temporary or permanent. BMPs for these generators are summarized below.

Residential Education - Education and outreach are vital to engage this group and raise awareness of the group's potential contributions to sanitary sewer overflows. Providing materials on proper oil and grease management and the results of improper disposal of these and other wastes into residential sinks and toilets will help educate this group and reduce the number of SSOs from residential areas. Information on the following should be made available to this group:

- Why FOG poured down the drains can produce potential harmful environmental and health impacts;
- Where FOG originate in a residential setting; and
- What actions noncommercial generators can take to prevent blockages from occurring in their homes and neighborhoods.

Refer to *Section 3. FOG Generator Education and Outreach* on how to provide effective educational materials to noncommercial generators.

2.2 Commercial/Institutional Generator BMPs

In an effort to provide consistent and realistic methodologies for FOG generators to consider, the N.C. Restaurant Association (NCRA), Division of Pollution Prevention and Environmental Assistance (DPPEA), Division of Water Quality (DWQ), Division of Environmental Health (DEH), and N.C. Pretreatment Coordinators (NCPC) established a fact sheet for Best Management Practices for Fats, Oils and Grease (see Appendix C) intended for commercial generators. The aforementioned parties encourage commercial establishments and institutions to use these BMPs as the first line of defense to prevent SSOs. These BMPs (included in the enforcement response plan table) are summarized on the following pages.

Dry Clean-up

Workers should be strongly encouraged to use dry clean-up to remove FOG from surfaces before washing with water. Pots, pans, dishware and food preparation surfaces should be "dry wiped" prior to washing. Utensils needed for dry clean-up include spatulas to scrape ware interiors/exteriors, brushes to remove baked-on food, towels/ rags to wipe areas clean, and

The following can be expressed to residential generators to keep their drains fat-free:

Do

- Collect grease in a container and dispose of it in the garbage. Grease can also be mixed with an absorbent such as coffee grounds, used pa per towels, or cat litter in a lidded container and placed in a trash receptacle.
- Scrape grease and food scraps from cooking/ serving ware for grease collection.
- Place a wastebasket in the bathroom to dispose of solid wastes. Dis posable diapers, condoms, and personal hygiene products do not belong in the sewer system.
- Encourage neighbors to help keep FOG out of their drains as well!

Don't

- Pour oil or grease down the drain or toilet.
- Dump greasy or oily food waste into the drain.
- Use the toilet as a waste basket.
- Use the sewer as a means to dispose of food scraps.

brooms or wet/dry vacs to remove solids from floor surfaces. To increase collection of FOG and food residuals, recycling/trash containers should be visible and accessible to all employees. Again, employees need to be trained on how to perform dry clean-up, be provided the appropriate tools, and have recycling/disposal containers within easy reach.

FOG Recycling

Waste cooking oil can be recycled, which keeps the substance out of drains and also reduces garbage costs. A routine schedule should be established for collecting waste grease from fryers, grill drip pans, oven drippings and other grease generation/containment sources including hoods. To avoid spills, use a cover when transporting the accumulated oil from under-the-sink separation devices and other in-house collection vessels. Some recyclers/haulers offer services at no charge and others may give a rebate on the collected materials. See *Section 8. Disposal/Management Considerations* for assistance in choosing a service company.

Outdoor grease and oil storage areas should be covered to prevent contact with stormwaters during a rain event or spill. The storage area should also be located away from storm drain catch basins. Allowing water into the rendering container will increase the moisture content of the material and potentially deem it unacceptable to the recycler. Discharge of oil and grease to the storm drain may result in noncompliance with water quality regulations. Keeping this area clean of grease will also help minimize the presence of vermin.

Control Device(s) Maintenance

If the control devices are not in working order, FOG discharges can congeal on sewer pipes and equipment, resulting in a blockage and eventual overflow into the establishment or into the environment. Reducing the amounts of food waste discharged to the grease separation devices results in less cleaning and expense. Routine cleaning prevents grease accumulation from causing the trap to operate poorly or improperly. Maintenance is performed by permitted haulers or recyclers and consists of removing the entire volume (liquids and solids) from the grease separation device and properly disposing of the material in accordance with federal, state and local laws. Except in those cases where a variance detailing specific pump-out requirements exists (see Appendix D), exterior grease separation devices should be emptied monthly. Manual passive grease separation devices should be serviced according to manufacturer specifications. Automatic grease removal systems should be visually inspected weekly. Outlet and inlet baffles should be checked for corrosion damage. Additionally, outlet piping should be checked to ensure invert piping is in the correct position.

Employee Training

The behavior of employees determines if FOG is discharged into the drains. Food service staff must know and understand how their work practices can contribute to unwanted blockages and how they can prevent overflows. Training kitchen staff helps to ensure the BMPs are put into practice. Employees usually support an effort if they understand the basis for it. Employee training is not a "one time only" event but should be conducted on a routine basis and for all new employees.

Visual aids demonstrating the dos and don'ts of FOG management are helpful in maintaining employees' awareness to keep the drains "fat-free." Posters in English, Spanish and Mandarin Chinese are available at *http://ww.p2pays.org/food/* or by calling DPPEA at (800) 763-0136.

A service company should have the proper operating permits and licenses as required by federal, state and local authorities. (See *Section 8. Disposal/Management Considerations* for additional information.) The establishment's manager should observe all cleaning and maintenance activities to ensure proper removal and handling of the waste grease and food residuals. A maintenance log is beneficial to document cleaning frequency and volumes. Many pretreatment coordinators require that records be maintained to demonstrate device maintenance. (See Appendix E for a sample manifest document and grease separation device management schedule form.)

Equipment Cleaning

Keep kitchen exhaust filters clean. These devices often are overlooked when identifying FOG sources. Oil and grease escaping through the exhaust system can build up on the roof and eventually get washed into the storm sewers. Establish a routine cleaning schedule and maintain records accordingly. Wipe down the filters with cloths before washing with water. Ensure that the filter wash water is routed to the grease separation device so the FOG will not enter the sewer system. For the hoods to operate properly, the ventilation system should also be balanced with sufficient make-up air.

Additionally, any outdoor equipment cleaning should not be performed in an area where water can flow to the gutter, storm drain or street. Grease and other contaminants washed off the equipment may enter the storm drain system and flow to nearby streams. All grease-laden utensils/tools/apparatus should be cleaned so that the water discharges into the grease separation device.

If possible, all equipment cleaning (e.g., floor mats, grease filters, grills and garbage cans) should be conducted indoors. Clean equipment in a mop sink-not in the food preparation sink. All mop water from floor cleaning should be disposed of in a mop sink or other drain plumbed to the grease separation device.

Outside Cleaning

Dry-sweep pavement areas (including "drive-through" lanes, parking lots, Dumpster and tallow bin areas) as frequently as possible. If using water for cleaning, use a mop and bucket and dispose of the wash water in a mop sink, floor drain or other drain plumbed to the sanitary sewer. Do not pour or sweep wash water into the street, gutter or storm drains. Use dry methods for spill cleanup. Use rags or absorbents such as cat litter to pick up free liquids or grease. Sweep up absorbent, seal in a plastic bag/container and dispose of it in the trash. Avoid washing Dumpsters or rendering/tallow bins with a hose. If a Dumpster or bin must be cleaned, contact the Dumpster or rendering companies to replace the dirty units. Check Dumpsters regularly for leaks and notify the

Case

Assaggio, an Italian restaurant located in Cary, N.C., operates one 50-gallon in-ground grease separation device that is coupled with an automatic grease separation device. With employee awareness to minimize the amounts of oil and grease discharged, this food service establishment has maintained compliance with the municipality's stringent FOG ordinance since opening in spring 1999.

Restaurant owner Vinney Doria gives credit to the success of his FOG management program to staff involvement and proper operation of control equipment. Employees are trained in dry clean-up upon hiring and then routinely during the course of their work. Keeping FOG out of the drains is made a part of the staff member's job.

Study

Pots, pans, serving ware and other grease-laden surfaces are scraped by hand prior to rinsing with hot water. The collected food waste is disposed of in the landfill. Further sanitizing is completed in a three-compartment sink followed by an automatic dishwasher. The dry clean-up and sanitation instructions are posted to remind employees of the establishment's FOG management procedures. Grease separation devices are visually inspected daily and maintained according to manufacturer's specifications.

Assaggio's management has demonstrated its drains are kept "fat-free" with best management practices that are based on employee participation and pollutant control.

vendor to replace leaking Dumpsters.

Food Donation

At least 10 million tons of food discards are disposed of annually in the United States. The U.S. Department of Agriculture estimates that one-quarter of all food produced in the United States is wasted. Food service providers can reduce the amount of edible waste disposed into the drains or landfills by donating leftover fresh or prepackaged foods to rescue organizations. These agencies help feed the hungry with donations from restaurants, supermarkets, schools, prisons, hospitals, food processors, hotels and community events. In addition to reducing disposal costs, donating food can improve public perception and help the community meet waste reduction goals. Furthermore, food donation can reap tax benefits for businesses. Donations to organizations classified as 501(c)(3) by the Internal Revenue Service, including a portion of the value of prepared food, may be tax deductible.

The Emerson Good Samaritan Food Donation Act (42 U.S.C. 1791) passed in October 1996 offers uniform protection to citizens, businesses and nonprofit organizations that in good faith donate, recover and distribute excess food. The Good Samaritan Law states that a person or nonprofit organization shall not be subject to civil or criminal liability arising from the nature, age, packaging or condition of apparently wholesome food or an apparently fit grocery product that the donor provides in good faith to a nonprofit organization for the ultimate distribution to needy individuals. For additional information on how to set up a food donation program and local acceptance agencies, please visit *http://www.secondharvest.org*.

3. FOG GENERATOR EDUCATION AND OUTREACH

For any environmental initiative to be successful, two areas must be addressed: human behavior and pollutant control. Most sources of oil and grease discharges can be reduced or even eliminated with effective education and preventive practices. This section provides the user with tools to help educate commercial, institutional and noncommercial FOG generators. These generators are very diverse; thus, outreach to these groups is not "one size fits all." This guidance will assist development and distribution of educational materials that are directed to the singular theme of "Keep Your Drains Fat-Free."

3.1 Noncommercial Generator Outreach Options

Noncommercial FOG generators typically are located in the following areas:

- single family dwellings
- subdivisions
- condominiums
- apartments
- mobile home parks

Education is the key to reducing FOG from these sources. Raising citizen awareness will help keep FOG out of the drains and reduce the number of SSOs. Individuals need to understand the impact they can make to create or prevent blockages from occurring, especially when it can happen in their neighborhood and homes. Providing materials with a consistent message helps to get and maintain the public's attention. Timing the distribution of the direct mailing(s) and other marketing materials is helpful in reinforcing with citizens the idea of keeping their drains fat-free. Publishing an article in the local newspaper on SSOs, which coincides with utility bill insert distribution, will promote the message and raise citizen awareness to avoid placing oil and grease down the drains.

Direct Mailing

- Utility bill inserts get the attention of the homeowner/tenant, especially the household billpayer. Include clear and concise information on the municipal sewer use ordinance, FOG "dos and don'ts", and phone numbers for assistance. Many areas require that the insert be in both Spanish and English. See Appendix C for a sample bilingual utility bill insert or click on *http://www.p2pays.org/ref/14/13903.pdf* for an electronic copy. Brochures are another effective means to provide FOG management information to citizens via direct mailings. The Water Environment Federation's "Fat-Free Sewer" brochure can be down loaded at *http://www.wef.org/publicinfo/factsheets/fatfree.jhtml*.

- Letters to homeowners/tenants in areas that have experienced an overflow are helpful to get the message across that property owners have contributed to creating the problem. Encourage the generator to partner with the municipality

"Greasey"

The Grease Goblin, aka "Greasey," was developed by the N.C. DPPEA for use by local governments and other interested parties dealing with oil and grease issues. "Greasey" was created as a caricature to represent the negative environmental impacts that can result

from FOG discharged into the sewer systems. The image has been adopted by other states and several municipalities to educate FOG generators on its proper management. The image is available to assist local governments and similar organizations to help "Keep Drains Fat-Free"!

To learn more about Greasey and how he can help your municipality, please visit http://ww.p2pays.org/food/main/.

to prevent sewer back-ups and overflows. Repeating the "dos and don'ts" is important to reinforce the idea of keeping drains fat-free. See Appendix C for sample letters.

Newspaper Articles
Publishing information on your municipality's FOG reduction program in local newspapers can also increase citizen awareness of proper disposal techniques for oil and grease. The newspaper article(s) should coincide with the direct mailing of any utility bill inserts or brochures. This publication should include the dos and don'ts for residential customers to follow when handling kitchen grease. Homeowners/renters need to be made aware of the consequences of allowing oil and grease down their drains. Appendix C has a local newspaper article on oil and grease and the associated problems with SSOs.

Community Events
Festivals and events that bring the public together are excellent opportunities to educate citizens on grease blockages from residential discharges. Providing multilingual materials with photos demonstrating proper oil and grease management are quick and effective ways to communicate with the general public. Marketing materials such as refrigerator magnets/ink pens are popular items to distribute with the message of keeping your drains fat free. The Grease Goblin logo is available from DPPEA [(800) 763-0136] for use on materials that promote keeping oil and grease out of the drains.

3.2 Commercial and Institutional Outreach Options

Many facilities/organizations fall into the commercial and institutional category, such as:

- Restaurants, bars, grills, delis
- Residential care facilities
- Food processors, butcher shops
- Retirement communities
- Nursing homes
- Day care facilities
- Churches
- Caterers
- Fraternal organizations
- Schools
- Country Clubs
- Food Stands
- Retail Sales Buildings
- Movie Theaters

Case Study

In 1999, the city of Raleigh launched a comprehensive outreach campaign to teach the public good sewer stewardship. The city passed an ordinance that made it unlawful to put grease down the drain into the sewer system. This grease prohibition is just one element in Raleigh's comprehensive effort to prevent and minimize sewer overflows.
The campaign spokesperson is "Neusie," a young fish who lives in the Neuse River. "Neusie" reminds Raleigh citizens that putting grease and other things that don't belong down the drain in the sewer system causes unsanitary and expensive back-ups into homes and overflows that pollute the streams and tributaries of the Neuse River – Neusie's home. More information on Raleigh's program can be accessed at *http://www.raleigh-nc.org/pubaffairs/cancan/index.htm.*

The owners/operators of these establishments are responsible for properly training employees on FOG management. The employees are then accountable for minimizing the amounts of oil and grease allowed into the municipal sanitary sewer collection system. Both groups need to understand why the accumulation of FOG is a problem that impacts water quality, human health and business operations, and how to prevent the problem from recurring. Effective communication is crucial to make generators aware of their contribution to SSOs and what they can do to assist in the eventual reduction of overflows.

Direct Mailing
Since this group may be affected by new/modified water quality requirements, targeted mailings and workshops are effective in providing regulatory and pollution prevention information. Mailings should be directed to the facility and its corporate management. Since many franchises have a corporate environmental manager who is responsible for ensuring regulatory compliance at all establishments, corporate and facility managers should be included in any mailing effort. Mailed surveys can help identify the facility's grease sources and control devices. Other materials to consider for a direct mailing to commercial/institutional generators include oil and grease information brochures, the sewer use ordinance, BMPs, and visual aids/posters. Any materials should be accompanied with explanatory remarks on purpose, use and benefits. Refer to Appendix C for examples of these materials.

Workshops
FOG workshops provide a forum for the municipality to present regulatory requirements, answer questions and supply information on achieving compliance. Speakers can include a variety of municipal, state and local representatives who explain the FOG problem, applicable regulations and compliance options. Sample invitation letters and agendas are in Appendix C. The table on the opposing page summarizes suggested speakers and discussion topics.

Video Clips
As part of the workshop, video presentations add reality to the problem of what happens when FOG accumulates in drains. Several municipalities, such as the town of Cary and the city of Lexington, have taped video footage of line cleaning, showing accumulation of FOG in collection systems. Food service providers often are surprised to see what the pipes look like when FOG builds up on their interior. Emphasis should be given to the short time in which a pipe becomes blocked and eventually bursts. A complete video is available from Louisville, Ky., that documents its FOG program with clips on line blockages, grease separation device cleaning, and employee BMPs. To view the video, go to "Other Video" under *http://www.p2pays.org/food/main/oil.htm* - or for a free copy, contact the Louisville/Jefferson County MSD at (502) 587-0603.

Web Information
Posting pertinent information on municipal Web sites is an easy and quick way for generators to access regulatory and other related data. Municipal sewer ordinances, federal/state regulatory information, contacts, program updates, presentations and links to other assistance providers are valuable resources to provide on your Web site. Where practical, the FOG Internet address should be published on any materials provided to FOG generators. Information should be organized for use by commercial/institutional establishments and the general public.

See for example the town of Cary's municipal oil and grease site at *http://townofcary.org/grease.* For additional Web assistance, visit *http://www.oracwa.org/Pages/intro.htm* to access the *Fats, Oil and Grease Best Management Practices Manual – Information, Pollution Prevention and Compliance Information For Publicly-Owned Treatment Plants.* This document was prepared for the Oregon Association of Clean Water.

FOG Workshop Suggested Speaker List

Speaker	Topic	Comments
Municipal Pretreatment Coordinator/Collection System Manager	Sewer use ordinance overview, BMPs, grease separation device cleaning requirements, financial/ environmental impacts of SSOs	Should provide written copies of ordinance and BMPs; correlation between employee behavior and blockages should be made clear to attendees
State Water Quality Official	State perspective of FOG problem and regulatory impacts of SSOs on municipalities/generators	Include total gallons from SSOs and costs to state
Environmental Health (Restaurant Inspector)	Health effects of FOG blockages and areas to look for potential FOG code violations	
Restaurant Association Representative	Provide support for members on how to comply with ordinance and work with regulators	Encourage use of BMPs
Technical Assistance Service Provider	Review BMPs and motivate attendees to educate and involve employees in effort	Provide promotional materials, tools and tips on compliance, dry clean-up
Case Study Restaurant	Demonstrate success with BMPS to stay in compliance	Preferably a local food service establishment that uses BMPs

4. TECHNOLOGY AND DESIGN CRITERIA

Current FOG pretreatment technology typically takes the form of smaller, metal, grease-handling devices found in the kitchen area of the facility; or large, in-ground, usually concrete, tankage found outside the facility. The device may be called a "grease trap" or "grease interceptor." These terms are often used interchangeably. However, to avoid confusion, in this document the term "grease separation device" will be used to identify those units commonly referred to as "grease trap" and "grease interceptor." The installation and use of a grease separation device that is properly designed and sized for the type and size of facility is an important measure in ensuring that the facility does not contribute to problems with the sanitary sewer system or experience back-ups into the facility itself.

4.1 How Grease Separation Devices Work

A grease separation device is a chamber designed for wastewater to pass through and allow free or emulsified oil to float to the top for retention as the remainder of the effluent passes through. (This concept is similar to a septic tank, but a septic tank is designed to collect solids on the bottom and scum on the top of the tank.) For the oil to float to the top, it is necessary to calm the water, as turbulence reduces separation. To assist in this ponding or calming process, the wastewater enters through an inlet baffle and may pass through additional baffles before exiting through the outlet baffle. Flow rate (volume of water per unit of time, e.g., "x" gallons per minute [GPM]) affects the time and turbulence in the grease separation device. Too fast a flow rate creates turbulence and does not allow the time necessary for separation. Thus, many of these installations are equipped with a flow control valve prior to the inlet baffle.

Grease separation devices must be designed to satisfy four basic criteria in order to ensure effective separation.

- **Time.** The separation device must provide sufficient retention time for emulsified grease and oil to separate and float to the surface of the chamber.
- **Temperature.** The separation device must provide adequate volume to allow the wastewater to cool sufficiently for emulsified grease to separate.
- **Turbulence.** Turbulence through the device must be controlled so that grease and solids are not suspended in the wastewater. Turbulence control is especially important during high discharge rates associated with draining a triple sink or dishwasher.
- **Tankage.** The grease separation device must provide sufficient storage capacity for accumulated grease and solids between cleanings.

The installation and use of a grease separation device that is properly designed and sized for the type and size of facility is an important measure in ensuring that the facility does not contribute to problems with the sanitary sewer system or experience back-ups into the facility itself.

4.2 Sizing the Grease Separation Device

Device installations are designed and sized based on anticipated flow rates and organic load for maximum efficiency. Specific gravity (density) of the grease affects the time necessary for separation. For example, the specific gravity of water is 1.0, thus the lower the specific gravity of the oil, the less time it takes to separate and float to the top of the tank. Also, the higher the flow rate, ratio of grease to water, suspended solids, and total grease volume to be retained between cleaning/emptying, the larger the grease separation device must be.

Appendix F outlines five methods for evaluating the proper size (capacity) of a grease separation device. The methods are based on distinct evaluation standards: standards based upon hydraulic retention, standards developed by the Environmental Protection Agency (EPA), and standards developed by the N.C. Division of Environmental Health (NCDEH). It is recommended that a facility be evaluated using each set of standards to establish a range of acceptable capacity needs.

The Uniform Plumbing Code also contains in its "Appendix H" recommended procedures for design, construction and installation of commercial kitchen grease separation devices. Field observations have shown that real world results of separation devices sized using solely Plumbing and Drainage Institute (PDI) sizing criteria may be less efficient than UPC criteria at preventing FOG pass-through than their device certification data may imply.

4.3 Interior Grease Separation Device Installation Options

Constraints to installing large exterior tanks are common in existing buildings. Often plumbing lines in the building are not segregated. Public sewer mains often are not easily accessible. Sometimes the existing slope of sewer service laterals and their proximity to the foundation or footing of the building prevents a large exterior grease separation device from being installed without difficulty. Many times multiple flex-space units are connected to a common centrally located sewer service that runs the length of the building. When these "hardship" conditions exist, and efforts to locate a properly sized grease separation device on the exterior of the building face a high level of difficulty, an alternative procedure exists to utilize smaller interior grease separation devices. This procedure is illustrated in *Appendix G: Suggested New Construction Flex Space Plumbing Configuration.*

The unit should be installed to permit regular inspection and removal of grease and oil. No equipment should be stored on top of or adjacent to the unit and the area should facilitate pumping and removal equipment. The unit must also be installed in ac-

Facilities That Should Have Grease Separation Devices

- Restaurants
- Food stands
- Schools/ institutions
- Child care facilities
- Delis
- Meat markets
- Grocery stores
- Bakeries
- Assisted living facilities
- Hospitals
- Cafeterias
- Theaters/ auditoriums
- Caterers
- Food processors
- Churches
- Food packing plants
- Entertainment clubs
- Fraternal organizations
- Correctional institutions
- Intensive housing
- Marinas
- Airports
- Amusement parks

cordance with the North Carolina plumbing code.

4.4 Tank Design and Construction Criteria

Athough there is currently no state program for approval of grease separation devices, all premanufactured tanks (septic and pump tanks) in North Carolina used in on-site wastewater systems are preapproved by the state. Grease separation devices for on-site systems are typically modified preapproved tanks. Each tank bears the manufacturer's serial number and the date manufactured. Public sewer systems may wish to utilize grease separation device specifications similar to these. It is recommended that system designers specify the use of a state-preapproved tank with modifications to allow for grease and oil separation and removal. Studies have shown that the use of solids retention filters may further enhance the performance of the grease separation device in keeping grease solids from escaping the tank.

Some of the minimum design criteria for premanufactured tanks include:

- 9" of freeboard in the tank
- 2" inlet and outlet difference
- 3" minimum wall thickness and reinforced with 6" x 6" #10 gauge welded wire
- Minimum 2:1 length/width ratio
- Interior baffle wall located two-thirds to three-quarters of the distance from the inlet end wall, vented at the top, and with adequate flow-through holes
- Outlet tee constructed of PVC, PE or equivalent, minimum class 160 pipe extending 50 percent of liquid depth
- Minimum concrete compressive strength of 3,500 psi
- Access opening over both compartments minimum 24" in diameter brought at least to finished grade. All covers should be cast iron or equivalent.
- Watertight per vacuum test or water tightness test
- Joints should be properly sealed to prevent infiltration or exfiltration.

Some of the structural criteria include:

- Minimum structural design at 150 lbs./ft2 (non-traffic installations)
- H-20 bridge load for vehicular traffic conditions
- Per ACI Building Code 318 (reinforced concrete design)
- Per ASTM C1227-93 Standards for Pre-cast Concrete Tanks
- Per ASTM C890- Structural Design Loading for Pre-cast Water & Wastewater Structures

NOTE: registered North Carolina professional engineers should seal all non-state- approved traffic-loaded tanks.

4.5 Automatic Grease Separators

These devices look similar to grease separation devices but function differently. These units

Other tank design guidance

- **A North Carolina professional engineer should specifically design cast-in-place and masonry tanks.**
- **Polyethylene or fiberglass tanks should also be able to withstand the appropriate loading (traffic or non-traffic) or perform under a vacuum test to simulate loading and include 12,000 psi ultimate tensile strength, 19,000 psi flexural strength, and 800,000 psi flexural modulus of elasticity. The user of the polyethylene or fiberglass tanks should seek warranty from the manufacturer.**

use devices such as belts, wheels or skimmers to actively remove FOG from a waste stream. Typical designs include a moving medium – such as a belt – entering and exiting a trapped volume of wastewater. The mechanism captures FOG, which is then deposited into a separate holding container. The FOG content in the trapped volume of wastewater is reduced prior to discharge into the wastewater collection system. These units can be effective under certain conditions, but are relatively sophisticated and require specific recommendations from the manufacturer. They may provide a viable alternative for facilities with overloaded grease separation devices that do not have the option of installing larger, more desirable grease separation devices.

4.6 Grease Separation Device Location and Plumbing

Grease separation devices range in size from 7-gallon units located inside the kitchen area to outdoor ground units with a more than 5,000 gallon capacity. Installation should be properly vented; normally the separation device is adequately vented back through the building plumbing (assuming freeboard is provided in the tank). Tanks should be located as close to the source as possible, but in a manner that facilitates the ease of cleaning and service without creating a nuisance. The tank should be located in an area that permits regular pumping and does not hinder the operation of a pump truck. Grease separation devices should be provided for all kitchen drains, located to allow frequent access for maintenance, and installed to facilitate proper cleaning.

Grease separation and removal should preferably be located outside in a dedicated vessel that is plumbed to receive kitchen wastes only (pot sinks, prep sinks, can wash, floor drains, dishwasher and conditional food grinder waste). Tanks should be located in a manner to allow for adequate cooling and settling of the influent in order to promote separation.

Only a facility's grease-laden waste – including wastes from all kitchen sinks, floor drains, can wash and dishwashers – should be plumbed to the grease separation device. Otherwise, suspended solids fill the unit and a larger tank is needed for the higher volume of wastewater. Some installations are designed with a solids strainer located prior to the grease separation device to prevent solids from interfering with grease separation.

4.7 Considerations for Food Service Facility Owners

It is important for a facility to weigh costs and benefits when evaluating grease separation device design and capacity need. While the initial capital investment may be less with a smaller capacity grease separation de-

Only a facility's grease-laden waste – including wastes from all kitchen sinks, floor drains, can wash and dishwashers – should be plumbed to the grease separation device.

vice, a facility runs the risk of paying more in pumping and maintenance fees, and possibly fines, should the separation device prove to be inefficient in meeting local FOG limits. Menu expansion, seating capacity expansion or menu changes impact the effectiveness of grease separation device collection, as do changes in facility management.

Recommendations:

- Plan for the worst-case scenario, or at the very least invest in a separation device as determined by the mid-range that results from the evaluation methods in Appendix F.
- Consider physical aspects of the building (size, parking spaces, number of seats, number of meals).
- Consider facility characteristics (menu, serving schedule, single service/full service).
- Assess future needs for expansion and growth.
- Evaluate effectiveness of facility management.
- Plumb grease separation device to receive kitchen wastes only. To minimize hydraulic load, it is recommended that a separate drain be plumbed for hand sinks, condensate lines, ice machine drainage or other non-grease-laden water.
- All grease separation devices must be fully accessible to allow for regular maintenance, cleaning and sampling.
- Grease separation devices should preferably be located outside in a dedicated vessel plumbed to receive kitchen wastes only (pot sinks, prep sinks, can wash, floor drains, dishwasher).
- Grease separation devices should be properly sized (see Appendix F) and appropriately designed (traffic or non-traffic rated tanks).
- The utility director, POTW director, pretreatment official and plumbing inspector should all review plumbing, site planning and utilities.

4.8 Considerations for Regulators

- Design criteria must be based on accepted engineering principles.
- POTW/utilities director should review all food service facility applications. Plans should include a site/utility plan showing the separate kitchen waste line noted "to receive kitchen wastes only," and a manufacturer's shop drawing of the device with a designated serial/model number.
- Utility/engineering staff should perform inspections to determine acceptable installation/construction procedures.
- Visit local tank manufacturers to better understand design and construction procedures.
- Pretreatment coordinators are encouraged to work with facilities located in areas not conducive to underground device installation or alternative tech nologies. These "hardship" cases usually are existing fa-

Plan for the worst-case scenario, or at the very least invest in a separation device as determined by the mid-range that results from the evaluation methods.

cilities located in downtown revitalization areas or historic districts.

Further Recommendations

- Food grinder usage is strongly discouraged. An additional 30 percent of wetted volume should be added to any adequately sized grease separation device that is to receive food grinder waste.
- In the event a manual or automatic grease separation device is used, a solids separator or strainer of sufficient design should be installed in-line prior to the wastewater entering the grease separation device as an integral part of the device.
- Developers of strip centers should consider "dedicated trunks" for the FOG of future food service facilities. For additional guidance, see *Appendix G: Suggested New Construction Flex Space Plumbing Configuration.*
- For existing facilities, a preliminary site evaluation can be conducted to determine the existence and capacity of existing oil and grease control device(s). Refer to *Appendix I: Site Evaluation Form* when performing the site evaluation.
- Use of a sanitary tee is intended to equally distribute inlet flow to the separation chamber of the grease separation device. Forcing the inlet flow in a lateral direction creates conditions in which more of the surface area in the separation chamber is utilized. This action reduces the potential for hydraulic short-circuiting to exist within the tank. See Appendix K for an illustration of the sanitary inlet tee configuration, Appendix M for an illustration of hydraulic short-circuiting, and Appendix N for an illustration of flow distribution using a two-way inlet tee.
- Use of a deflection device on the outlet tee of a grease separation device helps to prevent vacuuming action on the intake of the outlet tee where solids and grease can be discharged out of the grease separation device. See Appendix L for an illustration of the outlet tee design with grease and solids deflector.

POTW/utilities director should review all food service facility applications. Plans should include a site/utility plan showing the separate kitchen waste line noted "to receive kitchen wastes only," and a manufacturer's shop drawing of the device with a designated serial/model number.

5. FOG SAMPLING

5.1 Standard Operating Procedures

FOG sampling from a grease separation device presents unique and challenging conditions. Methods described herein represent an attempt to address specific site conditions. These guidelines attempt to adhere to principles and procedures described in *The Water Environment Federation's Standard Methods for the Examination of Water and Wastewater* and other guidance procedures published by EPA. Sample collection protocols were originally developed by those agencies to facilitate FOG sample collection in wide channel, weirs, flumes and other non-obstructed areas. Methods 5.2 and 5.3 illustrated herein are not to be used for purposes of compliance with EPA sampling protocols. All samples are to be collected from and should be representative of wastewater effluent emanating from a grease separation device experiencing maximum hydraulic loading at the time of sample collection. Sampling for FOG, for compliance purposes, is accomplished by collecting a grab sample(s) in a wide-mouth glass vessel. All samples intended for analysis should be acidified to pH<2.0 standard units with sulfuric acid and should be chilled with wet ice while in transport to the laboratory. Laboratory procedures for the receiving and storage of samples should be followed. Current EPA and state regulations do not provide for transfer of sample from collection vessel to storage/transport vessel. Only the grab sample jar method satisfies this requirement.

Other methods of FOG sample collection and equipment cleaning are presented as alternate grab sample procedures intended to approximate the grab sample jar method and should not be utilized for compliance purposes.

Some methods are presented herein; figures are for illustrative purposes and are not to scale.

5.1.1. Grab Sample Jar Method

This method is preferred over all others listed. When this method can be utilized, a wide-mouth container is required.

Equipment:The sample collection jar should be made of glass, stainless steel or Teflon and should be able to be capped. The liner of the cap should be Teflon, not paper or plastic. This procedure and equipment, although not specifically intended for grease separation devices, is described in detail in *Standard Methods for the Examination of Water and Wastewater*.

Preparation: Prior to sample collection, the jar should be detergent washed, double rinsed, followed by final acetone rinse and allowed to air dry. It should then be capped and stored until usage.

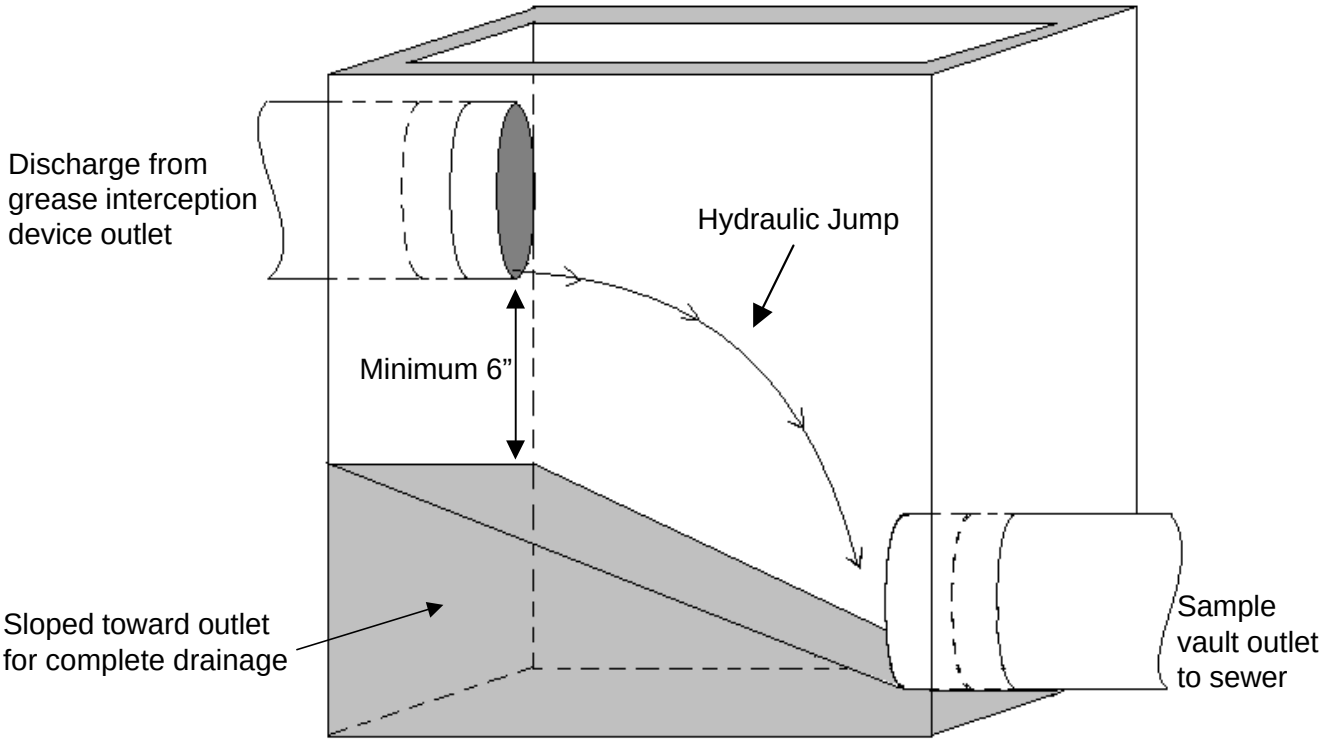
Procedure: Insert the sample collection jar mouth-first into the wastewater flow stream. If a hydraulic jump from the effluent pipe to an invert is present, place the sample collection jar open-mouthed under the effluent stream and collect the sample. As in all sampling activities, collect 1 liter of wastewater sample. The sample should be acidified to pH <2.0 standard units with sulfuric acid. The sample container jar should be large enough to collect this amount and be capable of being capped for transport to the laboratory. Do not transfer the collected sample to another holding container intended for later analysis. See Figures 5A-5C for illustrations.

Figure 5A: Sample Vault with Hydraulic Jump

Preferred FOG Sample Collection Procedure

Use where sewer main elevation and location

(Illustrative purposes only; designs may vary)



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Donald Smith
Town of Cary

Figure 5B: Grab Sample Jar Method 2
Sampling Vault Illustration

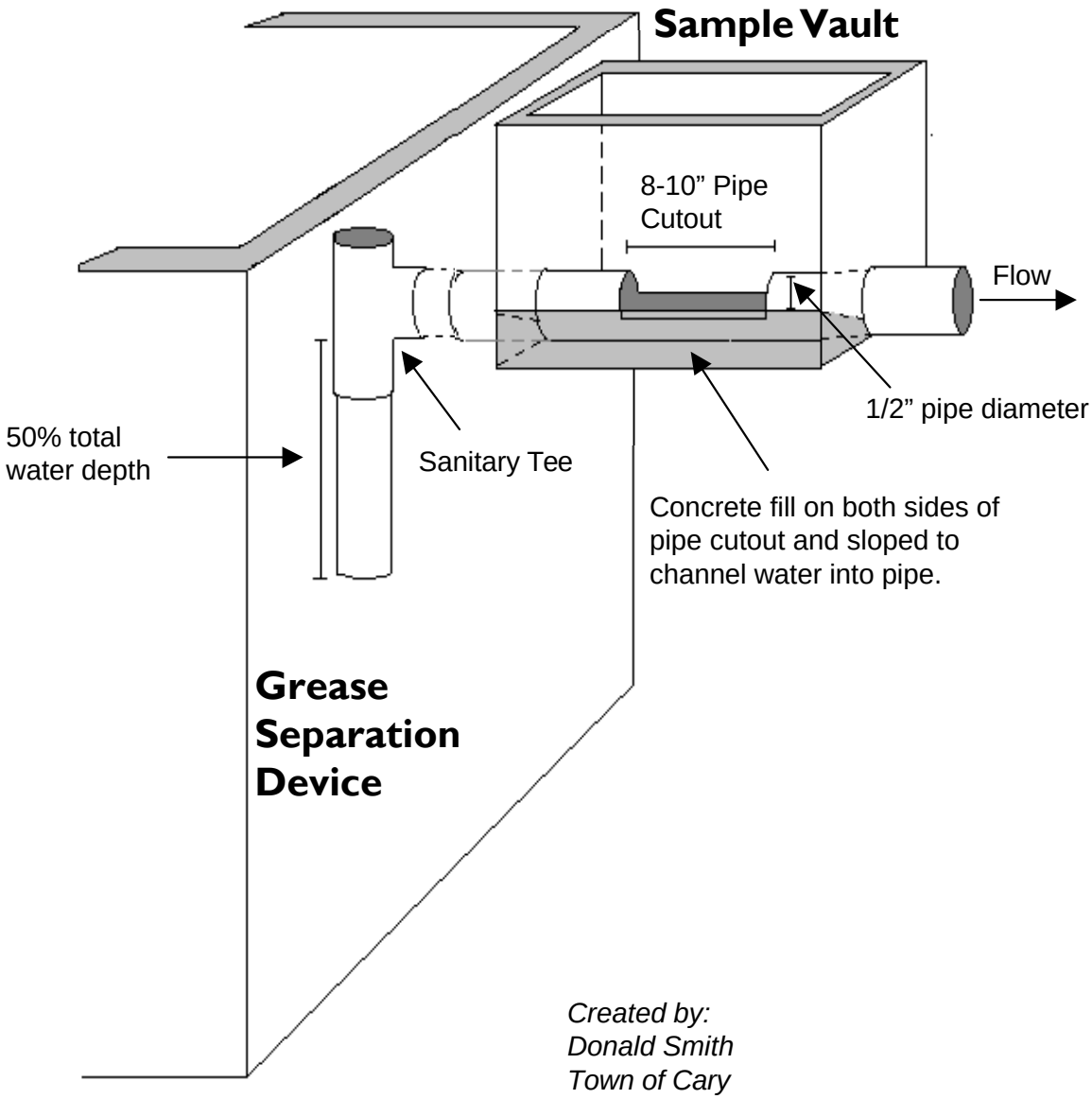

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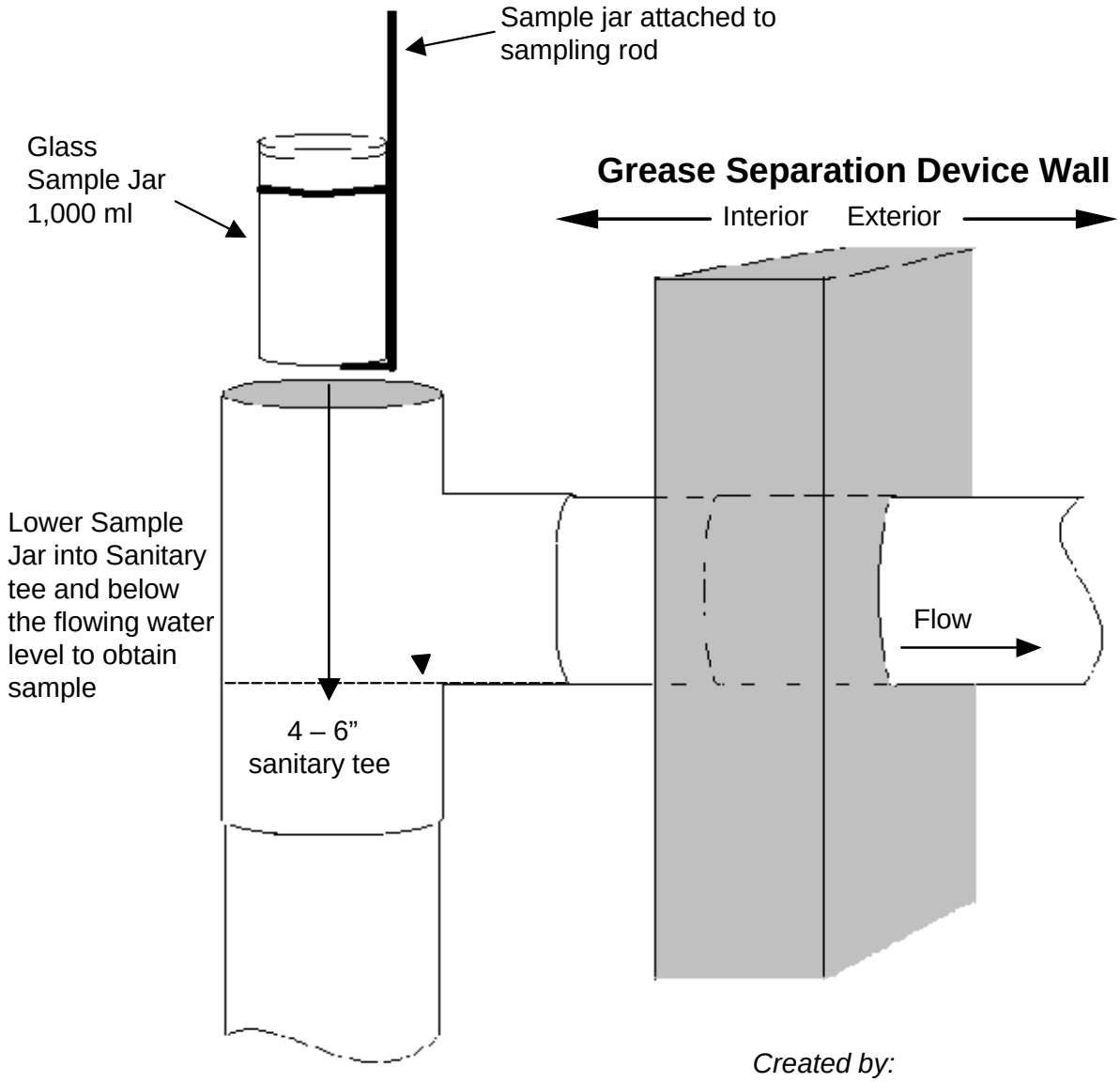
Figure 5C: Grab Sample Jar Method 3

Sanitary Tee Sample Collection Illustration

(Existing interceptor, where sample vault cannot be installed)



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Donald Smith
Town of Cary

5.2 Plunger Sample Method

The plunger sample is used when a grab sample cannot be obtained using the Grab Sample Jar Method.

Equipment: 2-inch diameter Stainless Steel Plunge Sampler

Preparation:

1. **Laboratory Cleaning**
   a. Cleaning
      - Submerge plunger sampler into hot soapy water and scrub using a nylon brush
      - Rinse sampler three times using tap water
      - Rinse a fourth and final time with deionized or distilled water

   b. Drying
      - Air dry
      - Dry with clean paper towel

   c. Storage
      - Place clean sampler into a clean plastic bag until needed

2. **Field Cleaning**
   a. Cleaning
      - Wipe down plunger sampler using a paper towel to remove any collected particles
      - Apply methanol to the inner and outer surfaces of the sampler cup and stem; wipe down plunger sampler with a clean wetted paper towel
      - Rinse sampler three times using deionized or distilled water

   b. Drying
      - Air dry
      - Dry with clean paper towel or cloth

   c. Storage
      - Place clean sampler into a clean plastic bag until needed

Procedure:

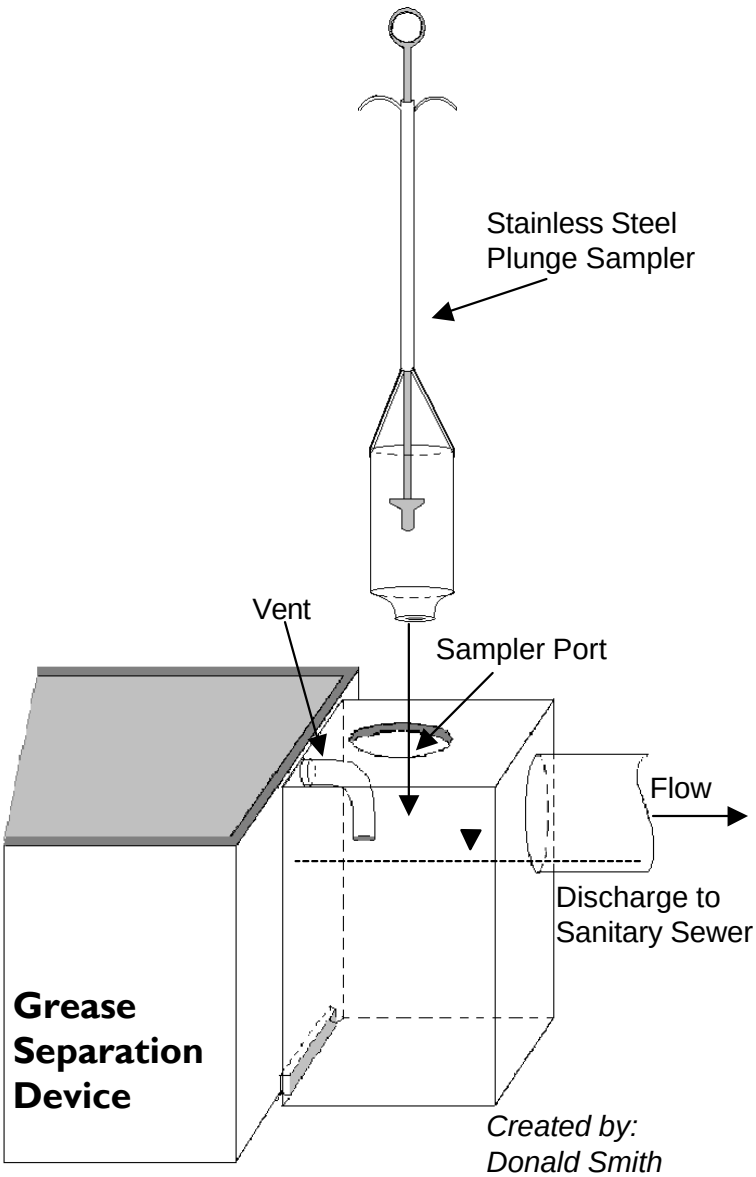
1. **Identify sampling site as candidate for plunger sampler**
   - Use only if sample cannot be obtained using Grab Sample Jar Method
   - Identify sampling point on grease separation device
   - In order to minimize particle disturbance, do not check for or determine solids or grease layer before sampling
   - Completely fill out all chain of custody forms and identification labels

2. **Sample**
   - Use a clean plunger sampler or clean the sampler at every site prior to obtaining sample.
   - Make every effort to minimize disruption of water at sampling point so as not to dislodge any grease that may have accumulated on sampling point walls.
   - Open the thumb-controlled stopper and submerge half of the total cup volume into the sample collection point. Close the thumb-controlled stopper.
   - Submerge the plunger sample cup and allow the sample to fill the cup from the top until full.
   - Remove the sampler from the sample point with the thumb-controlled stopper closed.
   - Open the thumb-controlled stopper and place sample into a designated cup for pH and temperature analysis.
   - Open the thumb-con trolled stopper and submerge half of the total cup volume. Close the thumb-controlled stopper.
   - Submerge the plunger sample cup and allow the sample to fill the cup from the top until full.
   - Remove the sampler from the sample point with the thumb-controlled stopper closed.
   - With a clean paper towel wipe any moisture or particles from the exterior of the plunger sample.
   - Place sampler over an open and pre-acidified clean glass sample jar and open the thumb-controlled stopper, thereby transferring collected sample to the transport container.
   - Make sure that the sampler does not come into contact with the interior walls of the sample jar.

- Repeat this sampling procedure until enough sample is collected for analysis. (1 liter)
- Place a sample identification label on sample jar with appropriate information.
- Place sample into a clean plastic bag and store on wet ice until relinquished for analysis.

Figure 5D: Plunger Sampler Illustration

Small separation devices and sanitary tees Plunge Sampler



5.3 Bulb Extraction Method

The Bulb Extraction Sampler is used when the Grab Sample Jar Method or the Plunger Sample Method cannot be used to obtain a FOG grab sample due to physical constraints.

Equipment: Stainless Steel Bulb Extraction Sampler

Preparation:

1. Laboratory Cleaning
   a. Cleaning
   - Remove bulb from sampler tube
   - Submerse sampler tube and bulb into hot soapy water and scrub using a nylon brush
   - Rinse sampler three times using tap water
   - Rinse a fourth and final time with deionized or distilled water

   b. Drying
   - Air dry
   - Dry with clean paper towel
   - Storage
   - Place clean sampler into a clean plastic bag until needed

1. **Field Cleaning** (between sample collection events)
   a. Cleaning
   - Wipe down interior and exterior of bulb extraction sampler using a paper towel to remove any collected particles.
   - Apply methanol to the inner and outer surfaces

of the bulb extraction sample bulb and tube.
- Wipe down outer surfaces of the bulb extrac tor using a clean paper towel; use a nylon brush to clean the inner surfaces of the sampler bulb and tube.
- Rinse interior and exterior of sampler bulb and tube three times using deionized or distilled water.

b. Drying
- Air dry
- Dry with clean paper towel

c. Storage
- Place clean sampler into a clean plastic bag until needed

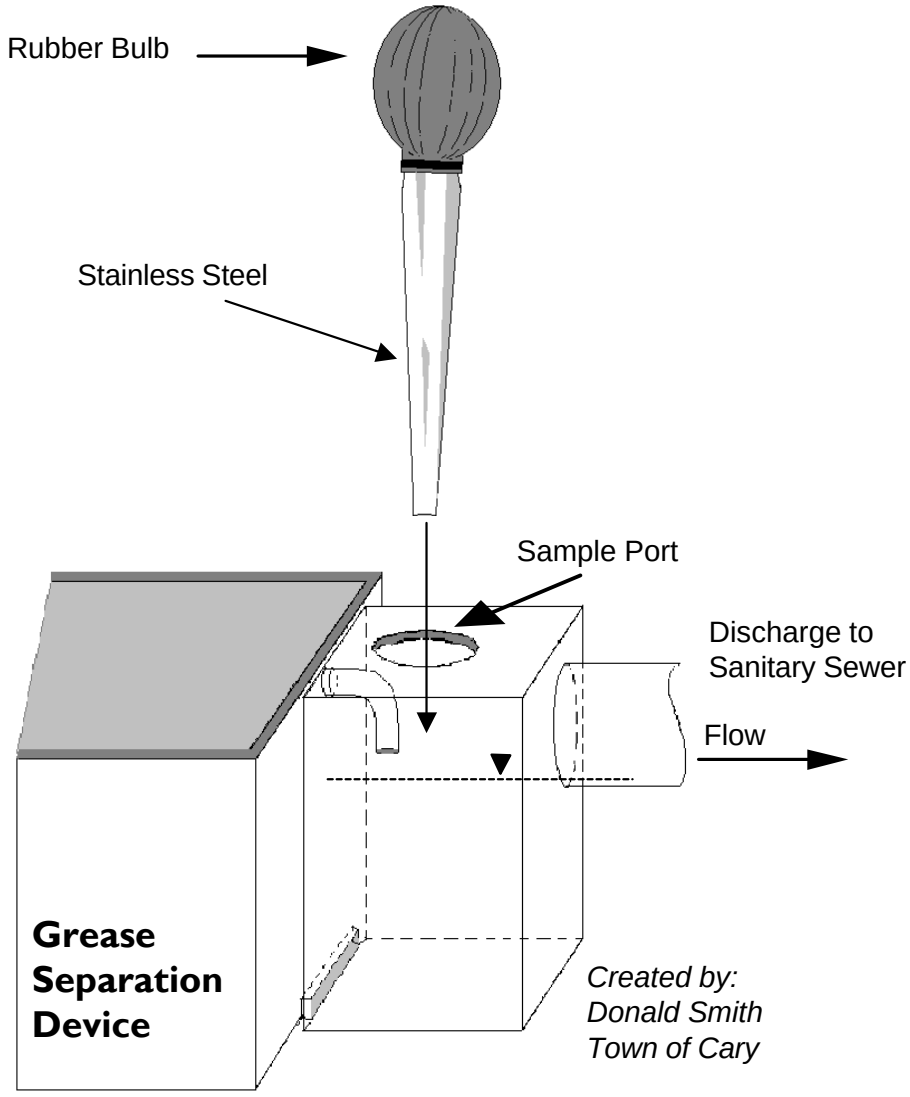
Procedure:

1. Identify sampling site as candidate for Bulb Extraction Sampler
   - Use only if sample can not be obtained using Grab Sample Jar Method or the Plunge Sample Method
   - Identify sampling point on grease separation device
   - Do not check solids or grease layer before sampling
   - Completely fill out all chain of custody forms and identification labels

2. Sample
   Use a clean bulb extraction sampler or clean the sampler at every site prior to obtaining sample.
   - Make every effort to minimize disruption of water at sampling point so as not to dislodge any grease that may have accumulated on sampling point walls.
   - Compress bulb on sampler prior to placing into sampling point.
   - Place collection port of sampler into sample and release compressed bulb, allowing sample to fill tube.
   - Release bulb and discharge sample into a designated cup for pH and temperature analysis.
   - Compress bulb on sampler prior to placing into sampling point.
   - Place collection port of sampler into sample and release compressed bulb, allowing sample to fill tube.

Figure 5E: Bulb Sample Method

Small interceptors

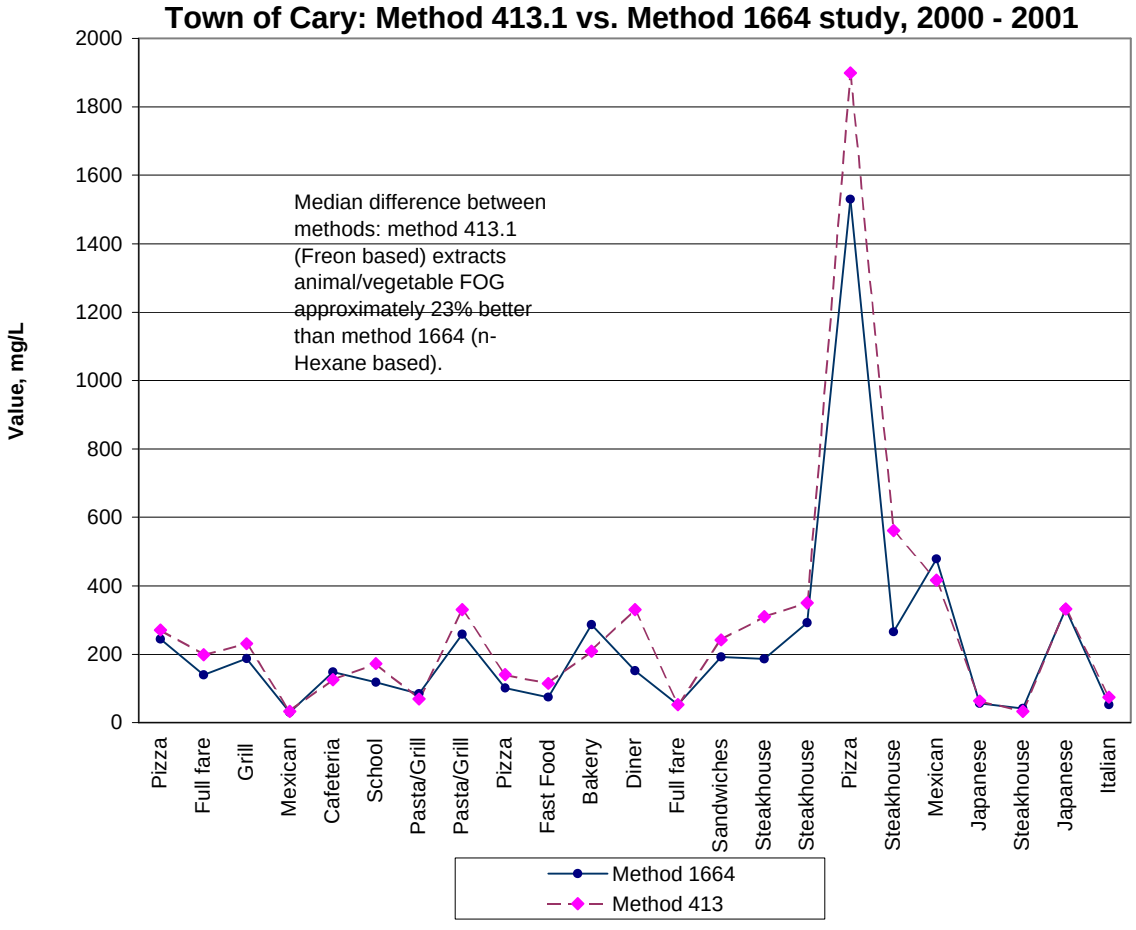


- Use a clean paper towel to remove any moisture or particles collected on the exterior of the bulb extraction sampler.
- Place sampler over an open pre-acidified clean glass sample jar.
- Compress bulb on sampler and discharge sample into the sample jar. Make sure sampler does not come in contact with interior walls of sample jar.
- Repeat sampling procedure until enough sample is collected for analysis.
- Place a sample identification label on sample jar with appropriate information.
- Place sample into a clean plastic bag and store on wet ice until relinquished for analysis.

5.4 Analyzing Samples

Until recently, the standard method for measuring FOG was EPA Method 413.1 or Method 5520 B, Standard Methods for the Examination of Water and Wastewater. This method uses Freon and is being phased out in order to meet the chlorofluorocarbon (CFC) phaseout required in the 1990 Clean Air Act Amendments. Much of the existing data on FOG limits for categorical industries is based on this method. The new EPA-approved method is Method 1664. This new method uses n-Hexane and has similar, but not exactly the same results, as n-Hexane values run about 23 percent lower than Freon values. (Results are based upon comparative analyses conducted by the Town of Cary as illustrated in Figure 5F). In addition, the n-Hexane method is more labor intensive, but the average price for analysis is similar.

Figure 5F



6. FOG EFFLUENT REGULATORY CONSIDERATIONS

A traditional tool of water quality regulation is the requirement that dischargers meet defined numerical effluent limits or be subject to enforcement actions. The N.C. DWQ Model Sewer Use Ordinance (*http://h2o.enr.state.nc.us/Pretreat/Files/files.html*) refers to a FOG value of 100 mg/L for domestic sewage, but does not specifically address commercial and institutional dischargers. In fact, a considerable difference of opinion exists as to the numerical concentration of FOG in effluent that may present problems for sanitary sewer systems. Moreover, the threshold "problem" concentration may depend on site-specific factors, including the following:

- Size of sewer line
- Pipe material
- Number of dischargers to the line
- Types of dischargers/ makeup of the waste stream
- Hardness of water
- Topography (slope)
- Age and condition of sewer collection/treatment systems
- Collection system maintenance/cleaning schedule
- Size and type of grease separation devices required
- Grease separation device maintenance/cleaning requirements, if any
- System permit requirements, if any (NPDES and collection system permits)
- Testing methodology (n-Hexane values run about 23 percent lower than freon values)
- Location of sampling point (If sampling point is other than at the device, any FOG target should be adjusted downward to account for dilution effects.)
- Experience of system with clogs and overflows
- Experience of similar systems with numerical limits
- Regulatory philosophy (focus on best available technology vs. focus on maintenance/performance)
- Enforcement resources (sufficient personnel for effluent sampling vs. personnel for maintenance inspections)
- Resources for system repair

The N.C. Pretreatment Coordinators Consortium Inc., in its attempt to recognize inherent sample collection variation, recommends a range of 150 to 200 mg/L [expressed as HEM (hexane extractable materials)].

As of this writing, relatively few local governments in North Carolina have adopted effluent limits for FOG dischargers, and these limits vary significantly. For example, Salisbury and Shelby have a 100 mg/L limit. Fayetteville and Raleigh, on the other hand, have limits of 300 mg/L. These systems report that they have chosen to shift the emphasis from sampling to a grease separation device maintenance strategy. Such municipalities rely on a performance standard rather than the numerical limit. This primarily takes the form of

The North Carolina Pretreatment Coordinators Consortium Inc., in its attempt to recognize inherent sample collection variation, recommends a range of 150 to 200 mg/L [expressed as HEM (hexane extractable materials)].

enforcement of grease separation device installation requirements and maintenance schedules. Rather than routinely sampling effluent, these programs perform periodic inspections of the grease separation devices to ensure that they are being adequately cleaned and maintained (see Appendix J for Site Inspection Template). Sampling may be used to set pumping frequency or test device performance or to support a variance request (see Appendix D).

There are advantages to each approach, and the Task Force did not form a consensus recommendation on which approach is preferable. However, the Task Force does recommend:

(1) that local governments electing to adopt FOG effluent limits ensure that such limits are technically supportable and take into account the site-specific considerations listed above; and

(2) that local governments consider adopting an action level for FOG rather than a single numerical limit, so that the local government's enforcement response can be linked to the degree by which the action level is exceeded and the number of exceedances that have occurred at a particular facility.

As state-required collection system permits are issued to local sewer systems, local governments must ensure that any effluent limit or enforcement approach is consistent with the permit requirements. See *http://h2o.enr.state.nc.us/ndpu/csps.doc* for more information on collection system permit requirements.

Sample Municipal FOG Requirements, June 2002

City	Limit (mg/L)	Sizing Requirements	Pumping Requirements	Education
Asheville	150	require all sources to have interceptor/trap	recommended monthly	workshops, meetings with restaurant managers and educational handouts
Raleigh	300	require all sources to have interceptor/trap	permit holders must pump every month for in-ground outside units and every 14 days for inside units; as needed for other cases	workshops, meetings with restaurant managers and educational handouts
Statesville	200	minimum 1,000 gallons	recommended monthly	meet with restaurant managers
Wilmington	200	must provide 12-minute detention time	monthly for all units	workshops, meetings with restaurant managers and educational handouts
Wilson	200	minimum 1,000 gallons	monthly for in-ground outside units; weekly for inside manual units	meet with restaurant managers

7. ENFORCEMENT

7.1 Enforcement Authority

FOG regulations may be included within a pretreatment or sewer use ordinance, or may be adopted in a separate Fats, Oils and Grease Control Ordinance. Authority to adopt and enforce such ordinances is found in whole or in part in N.C.G.S. 160A-174, 160A-175, 160A-185, 160A-193, 160A-312, 160A-314, 143-215.6A(j), and 143-215.6B.

7.2 Collection System Permit Requirements

In 1999 the N.C. General Assembly ratified House Bill (HB) 1160 (1999 N.C. Sessions Laws Chapter 329) which enacted clean water legislation to require that municipal and domestic wastewater collection systems obtain a comprehensive permit separate from the NPDES permit obtained for the sewage treatment plant. This program is among the first of its kind in the nation. Statute and bill information can be obtained at *http://www.ncga.state.nc.us.*

All collection systems are to be permitted over a five-year period, with 20 percent of the permits issued each year. Permits contain performance standards, operation and maintenance requirements, inspection requirements and recordkeeping, monitoring and reporting requirements. The wastewater system is subject to enforcement action by the N.C. Department of Environment and Natural Resources if it fails to meet the standards and conditions in the permit. A sample collection system permit is provided at *http://h2o.enr.state.nc.us/ndpu/csps.doc.*

The first round of permits was issued in 2001. Among the performance standards required to be met, the collection system permit specifies that the permittee must maintain an educational and enforcement program that requires the proper operation and maintenance of all grease separation devices and septic tanks connected to the wastewater collection system. Thus, local FOG regulation and enforcement will no longer be optional.

The permit supersedes the point system previously used to determine the state's enforcement options for sanitary sewer overflows. Instead, the evaluation of enforcement options after an SSO is to be determined based on criteria listed in the permit. With the advent of collection system permits, state enforcement against municipalities with SSOs is expected to be more stringent. The 1999 legislation also dramatically increased the potential civil penalties that may be assessed against the municipality for wastewater system violations. (G.S. 143-215.6A.)

7.3 Methods of Enforcement

The appropriate method of enforcement of local FOG regulations has been an area of divergent opinions. Various approaches to enforcement exist that municipalities may implement, including flat civil penalties, flexible civil penalties based on the severity and impact of the violation, criminal penalties, injunctive relief, the use of individual permits for FOG dischargers with specified limits, and many other options.

However, given that FOG regulatory and enforcement programs are still relatively new, many FOG dischargers still need to be educated about appropriate FOG management practices and about local FOG regulatory programs. Efforts to work with food service establishments to increase understanding of the need for proper FOG management and the requirements of the regulatory program can have long-term benefits. To serve this educational objective, municipalities may wish to consider an enforcement approach that allows some time period for educating food service establishments and bringing them into compliance before penalties are assessed. This could take the form of a grace period following the date of initial FOG regulations during which no monetary penalties will be imposed, or it may take the form of progressive enforcement, in which (i) minor, intermediate, and major violations are distinguished and subject to increasingly more severe enforcement responses, and (ii) enforcement responses are increasingly more severe for successive violations.

There are advantages to clearly delineating a local government's

Sample FOG Enforcement Matrix
(for illustrative purposes only)

	1st Occurrence	2nd Occurrence	3rd Occurrence	4th Occurrence	5th/ Subsequent Occurrence
Minor Violation For example, FOG concentration in excess of action level but less than 2x action level; pumping records not available or accessible; absence of sampling location; excessive solids accumulation; inadequate hydraulic retention time; monitoring and/or sampling hindrance (equipment-related)	**Tier I**	**Tier II**	**Tier III**	**Tier IV**	**Tier V**
Intermediate Violation For example, FOG concentration between 2x and 3x action level; violation of enforceable best management practices	**Tier II**	**Tier III**	**Tier IV**	**Tier V**	**Tier VI**
Major Violation For example, FOG concentration in excess of 3x action level; monitoring or sampling hindrance (willful intent); falsification of self-monitoring or maintenance information	**Tier V**	**Tier VI**	**Tier VI**	**Tier VI**	**Tier VI**
Sanitary Sewer Overflows For example, conditions resulting in failure of collection system, causing sewer overflow	**Tier VII**	**Tier VII**	**Tier VII**	**Tier VII**	**Tier VII**

Illustrative Example: Enforcement Tier levels

Tier I	No Civil Penalty; NTC
Tier II	$50; NOV
Tier III	$150; NOV
Tier IV	$300; NOV, E-BMP, PR
Tier V	$500; NOV, E-BMP, PR
Tier VI	$1,000; NOV, E-BMP, PR (possible NOS, followed by termination of service)
Tier VII	Civil Penalty. Increase penalty in relation to degree and extent of harm to environment, public health, private property or sewer system as warranted. Site remediation and cost recovery for SSO. NOS, followed by termination of service if warranted. Press release regarding spill. Include in annual wastewater performance report.

E-BMP
Enforceable Best Management Practice
NTC
Notice to Correct
NOV
Notice of Violation
NOS
Notice of Severance (utility services)
PR
Press Release/Annual Wastewater Report

enforcement responses for various violations so that dischargers understand in advance the consequences of their actions and so that enforcement actions in individual cases are not perceived to be arbitrary.

The municipality should carefully review the provisions of the collection system permit to ensure that any enforcement matrix or other FOG regulation is consistent therewith. Implementing progressive enforcement for users of the system in no way relieves the municipality of its own obligations under the permit, and the state will ultimately hold the municipality responsible for any violations. Contact the Non-Discharge Compliance and Enforcement Unit, Division of Water Quality, N.C. DENR for guidance on this point: *http://h2o.enr.state.nc.us/ndceu.*

7.4 Illustrative FOG Enforcement Matrix

The example on the preceding page demonstrates the use of progressive enforcement and is provided for illustrative purposes only. The Task Force reached no consensus on the specifics of penalty amounts.

Progressive enforcement may not be appropriate in the case of all types of violations. For example, violations resulting in sanitary sewer overflows may warrant maximum civil penalties upon the first violation, as well as other remedies such as cost recovery and site remediation requirements. It may be more appropriate to adopt criteria for determining the penalty for such violations according to the circumstances, such as the degree of harm caused. Note that the Clean Water Act of 1999 requires the wastewater system to issue a press release and publish a notice whenever a discharge of untreated wastewater occurs. The press release may include information as to the cause of the overflow and the responsible party, if this can be determined. The system is also required to provide an annual report to users or customers of the system that summarizes the performance of the system and any violations of its permits or violations of federal or state law, rules or regulations for the protection of water quality. The annual report may also include information regarding the cause of violations and the responsible parties. (See G.S. 143-215.1C).

7.5 Definitions

E-BMP: Enforceable Best Management Practice, such as pretreatment installation, signed cleanup procedures, documented training and stipulated corrective actions.

Exceedance of Action Level: Sample exceeds the FOG action level established by ordinance.

Excessive Solids Accumulation: An accumulation of solids in a grease separation device that exceeds 20 percent of working fluid depth, in any compartment of device, as measured from the static water level of said device.

Falsification of Maintenance, Pumping or Cleaning Reports: Willful alteration of grease separation device maintenance, pumping or cleaning records.

Falsification of Self-Monitoring Report Data: Willful alteration of wastewater reports generated as a component of required self-monitoring activities.

Hydraulic Retention or Residence Time (HRT): The time specified by ordinance that a grease separation device must provide to inflows of FOG-laden ware wash water during peak hydraulic loading.

Monitoring/Sampling Hindrance: Missing manhole, absence of sampling location or inaccessible location, missing or damaged sanitary tee, or any other condition or combination of conditions that cause or contribute to the hindrance of proper sample collection.

Records Not Available/Accessible: Failure to produce records of grease separation device maintenance (includes pumping or biological services) within time period specified by ordinance.

Sample: The collection of an aliquot of wastewater from a designated sampling point for the purposes of FOG analysis.

Sanitary Sewer Overflow (SSO): Discharge of wastewater from the sanitary sewer collection system.

8. DISPOSAL/MANAGEMENT CONSIDERATIONS

A successful FOG management program will consistently succeed in keeping FOG levels below the limits set by the local sewer system. To accomplish this, the kitchen manager should be familiar with, and receptive to, all the factors in reducing FOG levels. This document has already discussed ways of reducing the loads entering the treatment device, and the sizing and configuration of the grease separation device.

In this section, the term "management" will mean the relationship between the kitchen manager and the "service provider" or pumper. At this point in the overall strategy of a successful FOG program, a failure to adequately service the grease separation device device will doom the previous efforts.

By current definition, grease (or grease septage) is "material pumped from grease separation devices or other appurtenances used for the purpose of removing cooking oils, fats, grease and food debris from the waste flow generated from food handling, preparation and cleanup" (Article 9 of Chapter 130A N.C. General Statues, Septage Management, 130A-290. Definitions, (32) c.)

8.1 The Service Provider

As the "business" of grease management increases, so has the makeup of the service provider. While many pumpers service septic tanks as well as grease separation devices, the next generation of grease pumpers will be dedicated to this single source of waste. These firms will be trained to better facilitate a successful FOG management program. The kitchen manager should seek out these firms and form a contractual relationship with them. The following questions should be asked:

- Does the pumper hold the proper permits from state and local authorities?
- Does the pumper hold suitable insurance, including general liability, worker's compensation and pollution liability?
- Does the pumper have the adequate equipment and manpower to reliably service the grease separation device when called upon (even in emergency situations)?
- What kind of success does the pumper have? What are its references?
- Does the pumper have an adequate management plan for cases involving containment of spills and over flows?
- Where and how is the grease septage disposed of once it leaves the site?

The kitchen manager is the responsible party for the FOG program, so the relationship with the grease pumper is important. A proper management plan will also include certain recordkeeping that will satisfy the local sewer system and at the

At the present time, grease septage is disposed of at permitted (and consenting) wastewater treatment plants, permitted land-application sites, and composting facilities. Developing technology will enable better treatment of grease septage. As the sources and amounts of grease septage increase, the methods of disposal or recycling must become more efficient and better accepted.

same time give a schedule that can be followed and inspected by the kitchen manager.

8.2 What Kind of Records?

The FOG source (restaurant, institution, etc.) should first enter into a contract with the grease management firm. This document should spell out fees, duties, frequencies of service, and responsibilities of both parties.

There should be records of:

- Local codes and limits
- Size and type of treatment infrastructure (outside/inside grease separation device, disposal, kitchen drain age facilities, etc.)
- Loading history (or anticipated loading). How many gallons of grease septage are discharged per day and per peak hour?
- Service history. When was the grease separation device last pumped? When was the inside grease separation device last cleaned?
- Sampling history. What is the performance history of the site in meeting local codes?

Answers to questions like these an give an indication of management performance and/or whether the grease separation device needs to be enlarged, or the frequency of service increased. **Remember that the ultimate goal is to consistently succeed in keeping the FOG load below local limits. A history of performance is essential.**

8.3 What Kind of Service is Available?

A professional grease management firm should have the proper forms available to record all necessary information. These firms should also be able to coordinate these forms with those provided by the FOG source, if available. The professional grease management firm will join the FOG source in working with the local authorities when setting up the program and during sampling and inspections.

A professional grease management firm should offer (and require) a material manifest with the service contract. This allows the FOG source to know and record the service frequency, destination and disposal of the load. A material manifest gives the grease management firm a record of origin, type and amount as well as the previously mentioned information. These checks and balances offer performance standards and safeguards for both parties.

Biological approaches to controlling FOG can be compared to a natural process being artificially applied to a grease separation device. For more information on bioremediation refer to Chapter 10.

Another service the grease management firm may provide is emergency service (a 24-hour service) that includes the equipment and education to respond to accidental spills and overflows. New trends in grease management include odor control, vector control and off-site services for catering.

9. ADMINISTRATIVE FEES

Local governments adopting FOG programs may consider funding such programs in whole or in part through administrative fees assessed on FOG dischargers. The issue of whether regulatory services should be subsidized by all citizens through property taxes or by the persons who necessitate the regulation or require a higher level of service is a policy question for the elected governing body of the municipality. It is in the discretion of the governing body to decide whether to defray all or some of the cost of regulatory measures through fees. Local governments that choose to impose fees on FOG dischargers should consider the following principles.

Types of pretreatment fees. The N.C. Model Sewer Ordinance (revised January 1993) identifies types of fees that may be imposed on users of municipal wastewater collection and treatment systems to recover the costs of serving those users. These fees include:

- "user charges" based on flow, which are designed to recover the capital and operating costs of publicly-owned treatment works;
- surcharges on waste streams with high concentrations of particular pollutants designed to recover the additional treatment costs associated with those waste streams;
- "pretreatment program administration charges," which are designed to recover the costs of the municipality's pretreatment program itself, including such activities as monitoring, inspection and surveillance.

Relationship of fees to cost. The general rule is that if the system elects to impose pretreatment regulatory fees and charges on users, such fees and charges must be reasonably related to the actual costs, both direct and indirect, of the regulatory program. "Because the purpose of such a fee or charge is to place the cost of regulation on those being regulated, a rough limit to 'reasonableness' is the amount necessary to meet the full cost of the particular regulatory program." *Homebuilders v. City of Charlotte,* 336 N.C. 37, 46 (1994). So long as the ordinance under which the charges are made is regulatory in nature and the fees are not disproportionate to the cost of regulation, the charge is for a service rendered and not simply a revenue raising measure in the nature of a tax. Program costs and allocation of those costs through fees and charges should be determined according to generally accepted accounting principles.

Reasonable classifications. Schedules of fees and charges may vary among reasonable classifications of users, but should apply equally to all users within the classification.

Explanatory information. In establishing fees and charges, the municipality should undertake sufficient analysis to determine the costs of providing the pretreatment program and how the amount of fee relates to that cost. A major concern of the regulated community is a perceived reluctance on the part of municipalities to provide detailed information demonstrating the basis for administrative fees. Providing such information to affected parties can go a long way toward allaying concerns and avoiding possible challenges to fees. Therefore, the municipality may wish to make available a summary of program administration costs to be recovered through the particular fee – including information on how the amount of the fee is to be calculated – sufficient for affected parties to be able to determine that the fees proposed bear a reasonable relationship to the actual program costs. Of course, any documentation related to the municipal budget, fee schedules or the calculation of fees would be a matter of public record under G.S. Chapter 132.

10. CHEMICAL, BACTERIAL OR ENZYME ADDITIVES (BIOREMEDIATION)

FOG molecules are composed of long chain triglycerides and some glycerol. Shorter chain fatty acids are the first conversion steps caused by bacterial/enzyme degradation; i.e., the cleaving of the glycerol apart from the triglycerides. Some of the bacteria prefer the glycerol as a food source to the fatty acids that are present. Even within these groups, particular strains are better than others at degrading oil and grease molecules. If a species of bacteria does not secrete the necessary enzyme to break down the oil and grease molecules, the bacterium cannot use the oil and grease as a food source. As the glycerol is preferred over the shorter chain fatty acids by the bacteria, fatty acid concentration (including acetic and proprionic acids) may accumulate and lower the pH to a point where the bacterium cannot survive. These shorter chain fatty acids are smaller and more water-soluble than the long chain triglycerides from which they were formed. These can be flushed out of a grease separation device lacking sufficient hydraulic retention time. When they get out into the sanitary sewer system they can recombine into insoluble molecules that can once again begin adhering to the interior walls of the sanitary sewer collection system.

Bioremediation is a technology that may have the capability to provide adequate FOG removal, provided certain conditions are present. Biological approaches to controlling FOG can be compared to a natural process being artificially applied to a grease separation device. Ultimate conversion of the oil and grease molecules to carbon dioxide and water are claims frequently made by the proponents of bioremediation. FOG degradation may occur if conditions in the grease separation device are maintained in an environment conducive to bacterial growth. This may be hard to consistently achieve. High levels of bacteria are added throughout the day to keep the enzyme (working component) concentration high. Hydraulic retention time (HRT) is one of the most important considerations that must be evaluated before attempting to utilize this approach. Free-floating oils that get retained in a grease separation device may have enough time to be degraded by bacteria/enzymes if they do not encounter conditions in the grease separation device that suppress their action. Too long of an HRT will result in anaerobic conditions within the separation device, leading to septicity. Under these conditions the bacteria begin pulling the oxygen out of available chemicals, carbohydrates, proteins and the oil itself, resulting in the formation of objectionable odors and corrosive conditions within the grease separation device. The FOG fraction that remains in the water (chemically emulsified by detergents) will be flushed out of the separation device without sufficient treatment. When this fraction

Bioremediation is a technology that may have the capability to provide adequate FOG removal, provided certain conditions are present. Biological approaches to controlling FOG can be compared to a natural process being artificially applied to a grease separation device.

enters the sanitary sewer system it can recombine into insoluble molecules that can once again begin adhering to the interior walls of the sanitary sewer collection system.

Bioremediation may be used successfully in the interior pipes of a food service facility where blockages may be experienced. This approach may reduce blockages on a sewer service lateral feeding a grease separation device that is sited far from the source. Where excessive amounts of grease are generated, bioremediation may complement the treatment capability of an existing grease separation device, again where sufficient HRT exists. A combination of treatment options and activities that include grease separation device pumping and cleaning, enzymatic treatment and use of best management practices by the owners and operators of food service establishments will minimize the presence of FOG in the effluent.

While these products may have merit, more information must be provided by the industry. Third-party testing can provide a path to accurate and fair evaluations of products such as bioremediation. Evaluations should include testing, certification and listing by an independent, American National Standards Institute (ANSI) accredited third-party certifier. Independent evaluators test products and designs and provide data from which objective judgments about technologies can be made.

Third-party certification and product listing provide a means to make sure product manufacturers and engineers are accountable for internationally accepted standards of design, application, operation and maintenance. Without the needed industry standards and only little industry information to support claims, third-party testing on a case-by-case basis is the best method for properly evaluating these and similar products to accurately determine credibility.

A combination of treatment options and activities that include grease separation device pumping and cleaning, enzymatic treatment and use of best management practices by the owners and operators of food service establishments will minimize the presence of FOG in the effluent.

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APPENDIX B: RESOURCE ACKNOWLEDGEMENT

1. *Fats, Oil, and Grease Best Management Practices Manual – In formation, Pollution Prevention, and Compliance Information For Publicly-Owned Treatment Plants,* Brown and Caldwell. Funded in part by the Oregon Department of Environmental Quality through its Pollution Prevention Incentives for States grant awarded by the Environmental Protection Agency.

2. Tennessee Oil and Grease Control Guidance Document by the Tennessee Department of Environment and Conservation. April 2002

APPENDIX C: BMP/EDUCATION FACT SHEETS FOR FOG GENERATORS

A FACT SHEET FOR

Best Management Practices for Fats, Oils, and Grease

Residual fats, oils, and grease (FOG) are by-products that food service establishments must constantly manage. Typically, FOG enter a facility's plumbing system from ware washing, floor cleaning, and equipment sanitation. Sanitary sewer systems are neither designed nor equipped to handle the FOG that accumulates on the interior of the municipal sewer collection system pipes. Over 30% of North Carolina's 1999 sanitary sewer overflows were the result of pipe blockages from FOG accumulation from residential, institutional and commercial sources. The best way to manage FOG is to keep the material out of the plumbing systems. The following are suggestions for proper FOG management.

Dry Clean-Up

Practice dry cleanup. Remove food waste with "dry" methods such as scraping, wiping, or sweeping before using "wet" methods that use water. Wet methods typically wash the water and waste materials into the drains where it eventually collects on the interior walls of the drainage pipes. Do not pour grease, fats or oils from cooking down the drain and do not use the sinks to dispose of food scraps. Likewise it is important to educate kitchen staff not to remove drain screens as this may allow paper or plastic cups, straws, and other utensils to enter the plumbing system during clean up. The success of dry clean up is dependent upon the behavior of the employee and availability of the tools for removal of food waste before washing. To practice dry clean up:

- Use rubber scrapers to remove fats, oils and grease from cookware, utensils, chafing dishes, and serving ware.
- Use food grade paper to soak up oil and grease under fryer baskets.
- Use paper towels to wipe down work areas. Cloth towels will accumulate grease that will eventually end up in your drains from towel washing/rinsing.

Spill Prevention

Preventing spills reduces the amounts of waste on food preparation and serving areas that will require clean up. A dry workplace is safer for employees in avoiding slip, trips, and falls. For spill prevention:

- Empty containers before they are full to avoid spills.
- Use a cover to transport interceptor contents to rendering barrel.
- Provide employees with the proper tools (ladles, ample containers, etc.) to transport materials without spilling.

Maintenance

Maintenance is key to avoiding FOG blockages. For whatever method or technology is used to collect, filter and store FOG, ensure that equipment is regularly maintained. All staff should be aware of and trained to perform correct cleaning procedures, particularly for under-sink interceptors that are prone to break down due to improper maintenance. A daily and weekly maintenance schedule is highly recommended.

- Contract with a management company to professionally clean large hood filters. Small hoods can be hand-cleaned with spray detergents and wiped down with cloths for cleaning. Hood filters can be effectively cleaned by routinely spraying with hot water with little or no detergents over the mop sink that should be connected to a grease trap. After hot water rinse (separately trapped), filter panels can go into the dishwasher. For hoods to operate properly in the removal of grease-laden vapors, the ventilation system will also need to be balanced with sufficient make-up air.

NORTH CAROLINA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF POLLUTION PREVENTION AND ENVIRONMENTAL ASSISTANCE AND
DIVISION OF ENVIRONMENTAL HEALTH

NCDENR
Division of Environmental Health

NORTH CAROLINA PRETREATMENT CONSORTIUM

- Skim/filter fryer grease daily and change oil when necessary. Use a test kit provided by your grocery distributor rather than simply a "guess" to determine when to change oil. This extends the life of both the fryer and the oil. Build-up of carbon deposits on the bottom of the fryer act as an insulator that forces the fryer to heat longer, thus causing the oil to break down sooner.
- Collect fryer oil in an oil rendering tank for disposal or transport it to a bulk oil rendering tank instead of discharging it into a grease interceptor or waste drain.
- Cleaning intervals depend upon the type of food establishment involved. Some facilities require monthly or once every two months cleaning. Establishments that operate a large number of fryers or handle a large amount of fried foods such as chicken, along with ethnic food establishments may need at least monthly cleanings. Full-cleaning of grease traps (removing all liquids and solids and scraping the walls) is a worthwhile investment. Remember, sugars, starches and other organics accumulate from the bottom up. If sediment is allowed to accumulate in the trap, it will need to be pumped more frequently.
- Develop a rotation system if multiple fryers are in use. Designate a single fryer for products that are particularly high in deposits, and change that one more often.

Oil & Grease Collection/Recycling & Food Donations

FOG are commodities that if handled properly can be treated as a valuable resource.

- Begin thinking of oil and grease as a valuable commodity. Some rendering companies will offer services free-of-charge and others will give a rebate on the materials collected. Note that these companies must be properly permitted by the Division of Waste Management, Solid Waste Section at 919.733.0692, in order to remove FOG from a facility. A list of grease collectors can be found in the *Directory of Markets for Recyclable Materials* at www.p2pays.org/DMRM or by calling DPPEA at 1.800.763.0136.
- Use 25-gallon rendering barrels with covers for onsite collection of oil and grease other than from fryers. Educate kitchen staff on the importance of keeping outside barrels covered at all times. During storms, uncovered or partially covered barrels allow storm water to enter the barrel resulting in oil running onto the ground and possibly into storm drains, and can "contaminate" an otherwise useful by-product.
- Use a 3-compartment sink for ware washing. Begin with a hot pre-wash, then a scouring sink with detergent, then a rinse sink.
- Make sure all drain screens are installed.
- Prior to washing and rinsing use a hot water ONLY (no detergent) prerinse that is separately trapped to remove non-emulsified oils and greases from ware washing. Wash and rinse steps should also be trapped.
- Empty grill top scrap baskets or scrap boxes and hoods into the rendering barrel.
- Easy does it! Instruct staff to be conservative about their use of fats, oils and grease in food preparation and serving.
- Ensure that edible food is not flushed down your drains. Edible food waste may be donated to a local food bank. Inedible food waste can be collected by a local garbage feeder who will use food discards for feeding livestock. Food donation is a win-win situation. It helps restaurants reduce disposal costs and it puts the food in the hands of those who can use it. Check the *Directory of Markets for Recyclable Materials* for a list of food waste collectors.

Grease Traps

- For grease traps to be effective, the units must be properly sized, constructed, and installed in a location to provide an adequate retention time for settling and accumulation of the FOG. If the units are too close to the FOG discharge and do not have enough volume to allow amassing of the FOG, the emulsified oils will pass through the unit without being captured. For information on properly locating, constructing, and sizing grease traps, contact your local county and city representatives and examine EPA guidance documents.
- Ensure all grease-bearing drains discharge to the grease trap. These include mop sinks, woks, wash sinks, prep sinks, utility sinks, pulpers, dishwashers, prerinse sinks, can washes, and floor drains in food preparation areas such as those near a fryer or tilt/steam kettle. No toilet wastes should be plumbed to the grease trap.
- If these suggested best management practices do not adequately reduce FOG levels, the operator may consider installing a second grease trap with flow-through venting. This system should help reduce grease effluent substantially.

Consumer Tip

Buyer beware! When choosing a method of managing your oil and grease, ensure that it does what the vendor says it will do. Some technologies or "miracle cures" don't eliminate the problem but result in grease accumulations further down the sewer line. "Out of sight" is not "out of mind." Check the vendor's references.

The **Grease Goblin** is the mascot for DPPEA's Oil and Grease Management Program. He serves as a reminder to keep grease out of sinks and drains before it becomes a nuisance.

This is a publication by the NORTH CAROLINA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES' DIVISION OF POLLUTION PREVENTION AND ENVIRONMENTAL ASSISTANCE, 1639 MAIL SERVICE CENTER, RALEIGH NC 27699-1639.

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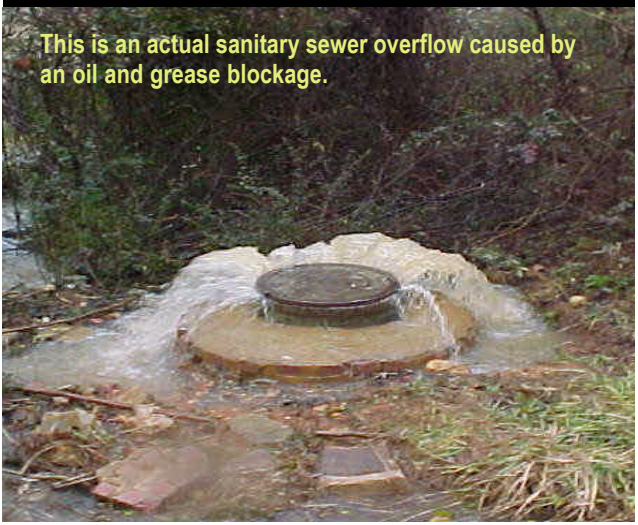
MUNICIPAL SEWER USE ORDINANCE

Each year, there are more than 15,000 sewer overflows in North Carolina. Many of these overflows are directly related to the improper disposal of oil and grease in kitchen drains. Grease congeals on sewer pipes, which causes wastewater to flow back into homes and businesses or directly into waterways.



This is an actual sanitary sewer overflow caused by an oil and grease blockage.

Discharging oil and grease into municipal sewer pipes is 100 percent preventable by taking the steps shown on the flip side.

For further information on Wilmington's municipal sewer use ordinance, contact the Environmental Services Division at (910) 343-3910 or by fax at (910) 341-4657.

Remember YOU can make a difference!

BEWARE OF THE

Grease Goblin

LAST SEEN:
Loitering in Sinks and Drains

WANTED FOR:
Causing Sewer Overflows

DID YOU KNOW...

Most sanitary sewer backups occur between your home and the town's sewer main?

You can help prevent a costly and unsanitary overflow by following a few simple steps:

DO

- ✓ Scrape excess grease in a container and dispose of it in the garbage.
- ✓ Place food scraps in waste containers or garbage bags for disposal with solid wastes, or start a compost pile; promote use of scraping ware prior to washing.
- ✓ Place a wastebasket in the bathroom to dispose of solid wastes. Disposable diapers, condoms, and personal hygiene products do not belong in the sewer system.
- ✓ Promote the concept of "3 R's": Reduce, Reuse, Recycle.

DO NOT

- ⊘ Pour grease, fats, and oils from cooking down the drain.
- ⊘ Use the toilet as a wastebasket.
- ⊘ Use the sewer as a means of disposing food scraps.

The Grease Goblin and associated materials are provided by the N.C. Division of Pollution Prevention and Environmental Assistance (DPPEA) located in the Department of Environment and Natural Resources (DENR). Samples of materials using the Grease Goblin image must be provided to DPPEA.

City Of Raleigh

North Carolina

Please Help the City Prevent Sewer Back-ups and Overflows!

Have you ever experienced a sanitary sewer back-up or overflow? Luckily, most sewer back-ups and overflows can be prevented with a progressive preventive maintenance program. All of us can help to prevent them by wisely using the City Of Raleigh's sanitary sewer system. The City is "recruiting" customer partners who are willing to join our efforts to prevent sewer back-ups and overflows.

Sewer back-ups and overflows are frequently caused by improper materials such as fats, oils and grease being placed into the sewer system by the City's customers. Since fats, oils and grease are lighter than water, they tend to accumulate at the top and sides of sewer pipes and can build up until a blockage occurs. If a blockage happens, the sewer backs up or overflows resulting in property and environmental damage.

The City of Raleigh's Sewer Use Ordinance requires that restaurants should install and maintain grease traps and/or interceptors to prevent grease from entering the sewer system. However, there are many more residential kitchens than there are restaurants in Raleigh. By reducing the amount of fats, oils and grease that enter the sewer system from homes, you can help to protect the environment by preventing sewer back-ups and overflows.

Sanitary sewer systems are designed to handle three things: used water, human body waste, and toilet paper. **You** can do some simple things that will help the City protect water quality and maintain the sewer system in Raleigh.

DO NOT:

- Pour grease, fats and oils from cooking down the drain.
- Use the toilet as a wastebasket.
- Use the sewer as a means to dispose of food scraps.

DO:

- Collect grease in a container and dispose of it in the garbage
- Place food scraps in waste containers or garbage bags for disposal with solid waste, or start a compost pile.
- Place a wastebasket in the bathroom to dispose of solid waste. Disposable diapers, condoms and personal hygiene products do not belong in the sewer system.

These suggestions can save you money too! Most sewer back-ups occur between the house and the City's sewer main, where the property owner is responsible for correcting the problem. Avoiding blockages means avoiding plumbing bills. When the blockage occurs in the City's sewer main, the City will correct the problem. Please call the Public Utilities Operations Division at 250-2737, to report a sewer back-up or overflow. After hours call the after-hours emergency number, 829-1930.

Thank you for your help!

City Of Wilmington
Oil and Grease Awareness

Did you know that cooking grease is the main cause of most residential pipeline and City collection system blockages? These blockages can result in sewer spills throughout the City.

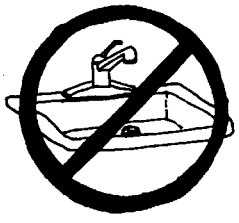
Cooking grease coats the inside walls of sewer pipes, similar to the way fatty foods can clog your arteries. The grease that clings to the inside of the pipes builds up over time and acts as a host for other materials to cling to, restricting the size of the pipe even more. Eventually the pipe becomes completely clogged and sewer will back up either in the homeowner's yard or through a manhole into the City streets and possibly to streams.

By doing the following, you can help prevent costly sewer spills and reduce environmental impacts associated with spills.

- All cooking oils (including salad oil, frying oil, bacon fat, marinades) need to be poured into a container. The container can be an old milk carton, frozen juice container or other non recyclable container and disposed of in the garbage. You may use cat litter or used coffee grounds to absorb the liquid in the container.

- Dry wipe all pots and dishes. Use a paper towel or napkin to remove greasy leftovers from pots and dishes prior to washing in the sink or dishwasher

- Place leftover foods, fat trimmings from meat etc in the trash can instead of the garbage disposal
- Whenever meat is drained in a colander, place the colander over newspaper instead of the sink, then throw the newspaper away
- NEVER dump motor oil or other lubricants down the drain. Take them to a collection point



For more information, contact Environmental Services, Pretreatment Office 343-3910.
Or visit our website at www.ci.wilmington.nc.us under What's New

OWASA

ORANGE WATER & SEWER AUTHORITY

Quality Service Since 1977

IMPORTANT INFORMATION
CONCERNING USE OF PUBLIC SEWERS

Community meeting at 9:30 a.m. on Wednesday, March 14th regarding proper disposal of fats, grease and oil

Community Room, OWASA Operations Center, 400 Jones Ferry Road, Carrboro

February 26, 2001

Dear Designer or Builder:

We're writing to invite you to meet with us at 9:30 A.M. on Wednesday, March 14th to discuss OWASA's new policies regarding the safe disposal of fats, grease and oil. This meeting will be in the Community Room on the bottom floor of our Operations Center at 400 Jones Ferry Road, as shown on the enclosed map.

As you may already know, we are working to reduce the amount of fat, oil and grease that enters the public sewer system. In sewer lines, grease hardens and can cause untreated wastewater to overflow from a manhole or possibly in a business or home. The proper disposal of grease, oil and fats is therefore very important in protecting the natural environment.

Therefore, we have prepared some new policies for existing and new businesses regarding disposal of grease, oil and fats. Some key points in our new policies include:

- Businesses that produce waste grease must have or add a grease interception system that works effectively. In the future, we will periodically contact businesses to review their records of grease removal and to inspect grease interception systems.

- It is essential for businesses to regularly have grease traps cleaned out, at least every 30 days, so that that they will work properly in minimizing the amount of grease that goes into the public sewer system.

- Because building and site conditions may limit grease interception improvements at existing businesses, we have flexibility in allowing some exceptions to our standards for grease interception systems in new buildings.

While much of the March 14th meeting will relate to existing businesses, this meeting may be of interest to you if you involved in the design or construction of commercial space that may be used by restaurants and other businesses that produce waste grease.

400 Jones Ferry Road
PO Box 366
Carrboro, NC 27510-0366

Voice (919) 968-4421
FAX (919) 968-4464
www.owasa.org

Notice

To: Owners/ Managers/ Operators of Food Service Establishments in the Burlington area.

Subject: Informational Workshop; Fat Oil and Grease Management at Food Service Establishments

In July of 1999, the General Assembly enacted the Clean Water Act of 1999. This act increases the civil penalties and reporting requirements imposed on municipalities experiencing sewer overflows due to blockages in sewer lines. Sewer Overflows of 1000 gallons or more now require Public Notice for the affected areas and are subject to civil penalties up to **$ 25,000** for each event. Violations of the City of Burlington's Sewer Use Ordinance are subject to fines of not less than **$50.00 and not more than $10,000** per violation. In 1999, 61% of sewer overflows in the City of Burlington were due to Fat, Oil and Grease accumulation. This has necessitated the need for a Fats, Oil and Grease Program to minimize or eliminate these types of sewer overflows.

On October 26, 2000 the City of Burlington in co-operation with the NC Division of Pollution Prevention and Environmental Assistance are holding a Fats , Oil and Grease (F.O.G.) Workshop for the Food Service Establishments in the Burlington Area. The workshop will be held at 9:30am- 10:30am and again at 2:30pm - 3:30 pm in the Kernodle Senior Citizen Center at 1535 South Mebane Street.

This workshop is designed to inform Food Service Establishments of the City of Burlington's F.O.G. program and to assist in the management and proper disposal of fats, oils and greases generated during food preparation, serving activities and cleanup.

It would be to the advantage of every Food Service Establishment that is connected to the City of Burlington' Wastewater Collection System to attend one of these workshops. The scope of Burlington's F.O.G. program will rely heavily on the co-operation and voluntary participation in this endeavor.

Enclosed is postage paid, addressed postcard to indicate which workshop you plan to attend. Please return this postcard by September 30, 2000.

Sincerely,

Stephen R. Shoaf
Director of Utilities
City of Burlington

SEE FLYER ON REVERSE

TOWN OF CARY

RESTAURANT OIL AND GREASE WORKSHOP

You Are Invited to A Free Workshop!

The Town of Cary in cooperation with the NC Division of Pollution Prevention and Environmental Assistance is holding an Oil and Grease Workshop for Cary Restaurant Operators.

The program is designed to assist Food Service Establishments in managing and properly disposing of oil and grease and to provide information on other waste diversion opportunities.

- ✓ Strategies for achieving the Town of Cary discharge limits for oil and grease
- ✓ How to remove grease from your wastewater
- ✓ How to identify companies to handle grease from your traps
- ✓How to correctly size and maintain your grease trap
- ✓How to avoid fines for grease discharges

Town of Cary Council Chambers

318 N. Academy Street, Cary

Tuesday October 19, 1999

10:00am – 12:00 noon

Town of Cary

DPPEA

NC Division of Pollution Prevention and Environmental Assistance

For Further Information Contact: DPPEA (919) 715-6507 or (919) 715-6513

Grease-clogged lines give city a headache

By Stephanie Creech, Daily Times Staff Writer

Sewer lines clogged with grease were responsible for eight wastewater spills involving a total of 7,750 gallons of raw sewage within the city of Wilson last year.

Since Jan. 1, two sewage spills in Wilson reported to state officials were caused by grease-clogged lines.

The latest was last week when about 3,000 gallons of sewage spilled into a tributary of Toisnot Swamp at Toisnot Mobile Home Park. A 12-inch line was blocked.

The city of Wilson wants to reduce the number of spills caused by grease. But doing so will require the help of residents and owners of food service businesses because excess fat, oil and grease are often improperly dumped down the kitchen sink.

"They turn on hot water and wash the grease out of the sink but when it cools back down it builds up on the pipes," said Jimmy Pridgen, city wastewater pretreatment coordinator.

The grease not only collects on the inside of sewer pipes. It also collects on the system's pumps, lift stations and other equipment used to move raw sewage from homes and businesses to the city's treatment plant.

Clogged pipes can cause waste to back up into houses or force it out through manholes into ditches and eventually into surface waters.

The North Carolina Department of Environment and Natural Resources has more than 15,000 sewer spills reported to it annually. And many of those overflows are caused by people improperly disposing of oil and grease.

When it comes to residents, the city has difficulty determining where the grease is coming from because most often whole neighborhoods tie into sewer lines.

"There is really nothing we can do but public education," Pridgen said. "When we have stoppages the state wants to know what we are doing to prevent people from doing it again."

The city is sending out utility bill inserts reminding people not to dump oil and grease down drains. Information will also be aired on Channel 8, the city's government access channel on cable television.

But the city does have some recourse when it comes to food service businesses improperly disposing of oil and grease.

"We do cite food service establishments when we have them," Pridgen said. "All food service businesses in Wilson are issued a special-use permit and have to meet certain requirements. They are subject to fines if we have a stoppage in the system and if we can determine they are the ones (responsible)."

The business has to pay for clearing the line and any associated costs.

The city uses cameras to trace where the grease is coming from inside of the lines.

"We've been out before and popped manholes," Pridgen said.

Popping manholes allows city crews to trace the extent of the grease buildup and determine where the grease is coming from.

"Food service businesses have the biggest potential on a daily basis to give us a problem," Pridgen said.

The city started its wastewater pretreatment program in 1995. The program also involves monitoring what wastewater local industries put into the city's system.

Each sewage overflow puts Wilson at risk of being fined by the state for lack of prevention. The state now has the authority to fine the city up to $25,000 per day for sewage spills.

The city must notify the state anytime wastewater from an overflow reaches state waters. This requirement also includes the city's stormwater collection system.

The city must also notify the state if 1,000 gallons or more of untreated wastewater is spilled. If 1,000 gallons or more of untreated wastewater enters state waters the city must issue a press release.

You may reach Stephanie Creech at creech@wilsondaily.com.

Town/City of _____
Variance to grease separation device maintenance schedule

A variance to the scheduled maintenance requirement of the Town/City of _____ Fats, Oils and Grease Control Ordinance (Sec. _ _ _ _) is to provide specific changes to the scheduling of grease separation device maintenance and servicing. Said variance is intended to give food service establishments an avenue to provide substantial evidence to reducing maintenance of the grease separation device. Said variance only applies to the scheduling of grease separation device servicing. All other requirements of the Town/City of _____ Sewer Use Ordinance, FOG Control Ordinance, and any other requirements remain in effect.

Food service establishments shall provide a written explanation for the need to vary from the FOG Control Ordinance. All establishments requesting a variance shall agree to conform to the variance study procedures. The Town/City of _____ has the right to discontinue the variance study at any time the grease separation device discharge adversely affects the sanitary sewer collection system and treatment works.

Fees associated with the request for variance study will include a variance request fee of $____, which includes estimated reimbursement costs associated with the study. All fees are non-refundable and shall be paid in advance. Reimbursement of the Town/City of _____ personnel shall be at a rate of $_____ per hour, and any additional costs incurred through the analysis of wastewater.

If the following occurs, at any time after a variance is granted, the facility shall revert back to requirements set forth by the Town/City of _____ FOG Control Ordinance:

- Grease separation device FOG concentrations exceeding limits set by Town/City of _____ FOG Control Ordinance.
- Grease separation device discharge adversely affects the sewer collection system and treatment works.
- Solids accumulation is greater than 20 percent of the total water depth from the grease separation device's interior floor to the static or working water level, at any point within the grease separation device.
- FOG accumulation is greater than or equal to three (3) inches at any point within the grease separation device.
- Facility significantly increases food service production or seating capacity.
- Facility employs the use of a garbage disposal or food pulper that is connected to the grease separation device.
- Facility causes or contributes to a sanitary sewer blockage or overflow.

All food service establishments requesting variance to the FOG Control Ordinance shall conform to the following conditions and schedules.

1. Applicant shall provide the Town/City of _____ written explanation as to the need of variance.
2. Applicant agrees that any request for variance is considered and implemented under the discretion of the Town/City of _____ and can be denied for any reason.
3. Variance request fee shall be paid in full by check to the amount of $_____ dollars before variance study is started.
4. Applicant shall conform to the pumping requirements set by the Town/City of _____ during the variance study. Failure to follow pumping requirements will result in variance study discontinuation.
5. Applicant agrees to the pumping schedule after variance study is completed, even in the event the Town/City of _____ requires a service schedule greater than once every 30 days.
6. Applicant shall contact the Town/City of _____ Pretreatment Section two working days prior to the scheduled grease separation device cleaning.
7. Facilities that desire the use of biological or chemical treatment shall provide the Town/City of _____ all information supplied by the manufacturer of type, solution makeup, dosing schedule and service agreements. All facilities using biological or chemical treatment shall be required to maintain a grease separation device service schedule set by the Town/City of _____ FOG Control Ordinance or Town/City of _____ Variance Study.
8. During the variance study all limits and conditions of the FOG Control Ordinance apply. All violations of the FOG Control Ordinance will be addressed during and after the variance study.
9. The Town/City of _____ will not be responsible for any FOG discharges, odor or blockages during or after the variance study.

Town/City of_____
Procedure for Variance Study

1. Applicant shall submit to the Town/City of _____ Public Works and Utilities Department Pretreatment Section a written explanation as to the need of a service schedule variance to the Fats, Oils and Grease (FOG) Control Ordinance. This letter shall include a copy of a current menu, total customer seating capacity, and grease separation device size.
2. After submission of request to the Town/City of _____, the Pretreatment Section will review all information submitted and will contact the facility by mail accepting or denying the variance request.
3. The facility shall schedule with a service company and the Town/City of _____ a time during normal business hours (Mon – Fri) to have the subject grease separation device cleaned. It is the responsibility of the food establishment to have the grease separation device totally pumped and sufficiently cleaned by a servicing company. Variance study cannot be conducted unless the grease separation device is properly cleaned.

4. Applicant shall contact the Town/City of _____ Pretreatment Section two working days prior to the scheduled grease separation device cleaning.
5. Once the grease separation device is cleaned properly and refilled with water from the facility, **pretreatment staff will conduct a visual inspection of the grease separation device and verify that all components of the grease separation device are in place and are in proper working order. If the grease separation device is determined to be adequately designed and installed said staff will collect, within 72 hours of initial pumping, a baseline FOG sample from the grease separation device's effluent sampling point. Baseline grease and solids levels will be measured in all compartments.
6. Two weeks after initial sampling, Pretreatment staff will obtain a second effluent FOG sample, and measure grease and solids levels in all compartments of the subject grease separation device.
7. Two weeks after second sampling, Pretreatment staff will obtain a third effluent FOG sample, and measure grease and solids levels in all compartments.
8. Additional monitoring events may be required if deemed necessary by the Town/City of _____. Variance studies shall not exceed a period of 90 days.
9. After a minimum of three site samples are collected and all sampling results are obtained, the Town/City of _____ will analyze all data. After all data is reviewed by the Town/City of _____, The Town will submit in writing the results of the variance study to the applicant requesting said study.

The Town/City of _____ will not be responsible for any FOG discharge, odor or blockages occurring during or after the variance study. At no time during the variance study shall the grease separation device be pumped, except by direct approval of the Town/City of _____. Hydraulic flow at a minimum shall consist of all prerinse, one, two and three compartment wash sinks filled to 75 percent capacity and being drained simultaneously plus any dish or glass wash machine or other drainage fixture unit being operated at maximum rated performance levels.

** Pretreatment staff shall consist of Town/City of _____ employees or individuals authorized by the Town/City of _____.

APPENDIX E: FOG DISPOSAL/MANAGEMENT SAMPLE FORMS

GREASE SEPARATION DEVICE MANAGEMENT SCHEDULE

DATE:

SERVICE EVENT: (Pumpout, Sampling, Special Event)

Signature of: _____ Kitchen Manager

_____ Service Provider or Inspector

Record of Service:

Pumpout:

Total Gallons Removed: _____

Description of Service: _____

_____

_____

Sampling:

Time of Sampling: _____

Method of Sampling: _____

Special Event: (Non-Routine Inspection, Emergency Service Required, Spill) Procedures Required, Notes, Preventive Steps Taken

_____

_____

_____

Suggestions for Maintenance/Management: _____

_____

_____

_____

Original: File
Copy 1: Local Authority
Copy 2: Service Provider

SAMPLE MANIFEST DOCUMENT

GREASE RELIEF INC.
111 Recycle Road, Yourtown, NC 12345

WASTE MANIFEST

Source: ABC Food Service
One Main Street
Anytown, NC 27512

Tel:_____ Manager:_____

Waste Hauler: Grease Relief Inc. *NC Permit #*_____
111 Recycle Road
Yourtown, NC 27602

Tel:_____ Driver:_____

Destination of Discharge Green Grass Farms
Rt. 1 Box 234
Deep Roots, NC 27170

LAS Permit #:_____
Permit Operator:_____

WASTE INFORMATION
Size of grease separation device_____
Amount pumped and removed from site_____
Other services performed (cleaned solids filter, inspected & cleaned baffle tees, added deodorizer, checked vent)

I certify the materials described above and the service described are correct and are not subject to federal regulations as hazardous waste

Site Manager:_____ (Print)

_____ (Signature)

APPENDIX F: GREASE SEPARATION DEVICE SIZING OPTIONS

Method 1. Evaluation Based upon 20-25 Minute Hydraulic Retention

Grease Separation Device Sizing Table

Maximum, worst-case hydraulic loading conditions typified below for new construction projects. Grease interceptor type not specified in this table. Size of device is listed as wetted holding volume (gallons).

Kitchen Drainage Fixtures →	***using 1½" drain pipe gallons***	***2" drain pipe gallons***
One prerinse sink and dishwasher	300	500
One 2- or 3-compartment pot sink	300	500
One 2- or 3-compartment pot sink (and) one 1-compartment prep sink	500	750
One 3-compartment pot sink (and) one 2-compartment prep sink	750	1,000
One 3-compartment pot sink (and) one 2-compartment prep sink (and) one prerinse sink	1,000	1,500
One 3-compartment pot sink (and) one 2-compartment prep sink (and) one prerinse sink (and) dishwasher (and) one utility sink	2,000	3,000
One 3-compartment pot sinks (and) one 3-compartment prep sinks (and) one prerinse sink (and) dishwasher (and) one utility sink	2,000	3,000
One or more 3-compartment pot sinks (and) one or more 3-compartment prep sinks (and) one or more prerinse sinks (and) dishwasher(s) (and) one or more utility sinks	3,000	4,000

- Drain outlet size, as provided by sink or drainage fixture manufacturer
- Other configurations can be considered
- If food grinder is used, add 30 percent to each size listed.
- Hood-cleaning wash water should be collected in buckets and transferred to waste oil rendering/collection barrel. It should not be discharged into grease interceptor. Check with rendering service contractor prior to commencement of this activity to determine if such procedure is acceptable with rendering service provider.
- If bona fide hardship exists, use of interior grease separation device (using hot water prerinse procedure) may be considered.

Methods 2 & 3. Evaluations Based Upon EPA Standards for On-site Wastewater Systems

The most commonly used numerical limit is 100 mg/L. This limit of 100 mg/L does not appear to be based upon any empirical evidence but rather, is based on general correlations and an industry consensus that this level prevents the build-up of oil and grease in the collection system. Numeric values listed in this document are indicative of technology-based criteria.

Standards have been developed for sizing grease separation devices. EPA-1 procedure is provided for determining grease separation device size for restaurants and EPA-2 is for hospitals, nursing homes and other commercial kitchens with varied seating capacity. These design models were developed to achieve the necessary reduction for grease and oils for on-site wastewater systems specific to the on-site food service operations.

EPA-1 Procedure for Restaurants
Minimum of 750 gallons
(# of seats) **x** (gallons) **x** (storage factor) **x** (1/2 # of hours open) **x** (loading factor) **=** grease separation device volume (gallons)

Loading Factor
Minimum = .5 other highways
Maximum = 1.25 interstate freeways
1.0 for other freeways and recreational freeways, 0.8 is provided for main highways

Storage Factor
Minimum = 1.7
Maximum = 2.5

Gallons
Wastewater gallons per meal, usually 5 gallons

Example: For a restaurant with a 50-seat dining area, an 8-hour per day operation, with 5 gallons of wastewater per meal, a storage capacity factor of 2.0, and a loading factor of 1.0, the size of the grease trap is calculated as follows:

(50) **x** (5) **x** (2.0) **x** (1.0) **x** (8/2) **=** 2,000 gallons

Based on precast tank manufacturing in North Carolina, thousand gallon increments are typical; therefore, a minimum 2,000-gallon tank size would be recommended.

EPA-2 Procedure for Hospitals, Nursing Homes and other type commercial kitchens with varied seating
Minimum of 750 gallons

(# of meals served a day) **x** (gallons) **x** (storage factor) **x** (loading factor) **=** grease separation device volume (gallons)

Loading Factor	**Storage Factor**	**Gallons**
Food Grinder & Dishwasher = 1.25 W/O Food Grinder = 1.0 W/O Dishwasher = .75 W/O Food Grinder & Dishwasher = .5	Minimum = 1.7 Maximum = 2.5	Wastewater gallons per meal, usually 4.5 gal

Example: 100-person rest home
(330 [100 patients **+**10 staff **x** 3 meals/day]) **x** (4.5) **x** (1.25 [w/ food grinder & dish-washer]) **x** (2.0 [typical storage factor]) **=** 3,712 gallons

Based on precast tank manufacturing in North Carolina, thousand gallon increments are typical; therefore, a minimum 3,000-gallon tank size would be recommended.

Method 4. Evaluation Based upon NCDEH Standards

Facility	**Grease tank size**
salad only or subs	500 gallon
Take-out grilled foods	1,000 to 1,500 gallon depending on size of facility
take-out deep fried foods	1,500 to 2,000 gallon depending on size of facility
pasta and pizza facilities	1,500 to 2,000 gallon depending on size of facility
sit-down full menu restaurants<100 seats	1,500 to 2,000 gallon depending on size of facility
sit-down full menu restaurants>100 seats	2,000 to 3,000 gallon depending on size of facility

Method 5. Limited Facility Design Guideline

This formula is for single fixture only with limited menu, ware washing, etc.

A single fixture is considered a utensil wash sink, prep sink, culinary sink or other fixture where wastewater is discharged through a single outlet that contains fats, grease or oils.

Step 1	Determine the cubic contents of the fixture by multiplying length x width x depth	Number of compartment times 24" long by 24" wide by 14 " deep.Cubic contents 3 x 24 x 24 x 14 = 24,192 cubic inches
Step 2	Determine the capacity in gallons 1 gallon = 231 cubic in.	Contents in gallons: 24,192 ¸ 231= 104.7 gallons
Step 3	Determine actual drainage load.The fixture is usually filled to about 75 percent of capacity with wastewater. The items to be washed displace about 25 percent of the fixture content. Actual drainage load = 75 percent of fixture capacity.	Actual Load: .75 x 104.73 gals. = 78.55 gallons
Step 4	For design considerations, it is good practice to calculate the flow rate in GPM equal to or greater than 75 percent of the fixture capacity.	Calculated flow rate for design capacity in GPM on 75 percent of fixture capacity: 75 percent of fixture capacity = **78.55 gals** Flow Rate = 78.55 GPM
Step 5	Select the grease separation device that matches the calculated design flow rate.	For 75 percent fixture capacity = 78.55 GPM

Where a pre-wash sink is installed for dish machines, the pre-wash sink should be considered as a single fixture to include a grease separation device with a design capacity of 45 GPM. This device should also include a solid strainer on the inlet side in order to prevent solid accumulation within the device.

Method 6. Uniform Plumbing Code Procedure

Table H-1
Sizing of Grease Separation Devices

Number of meals per peak hour (1)	X	Waste flow rate (2)	X	Retention time (3)	X	Storage factor (4)	=	Grease separation device size (liquid capacity)

1. Meals Served at Peak Hour

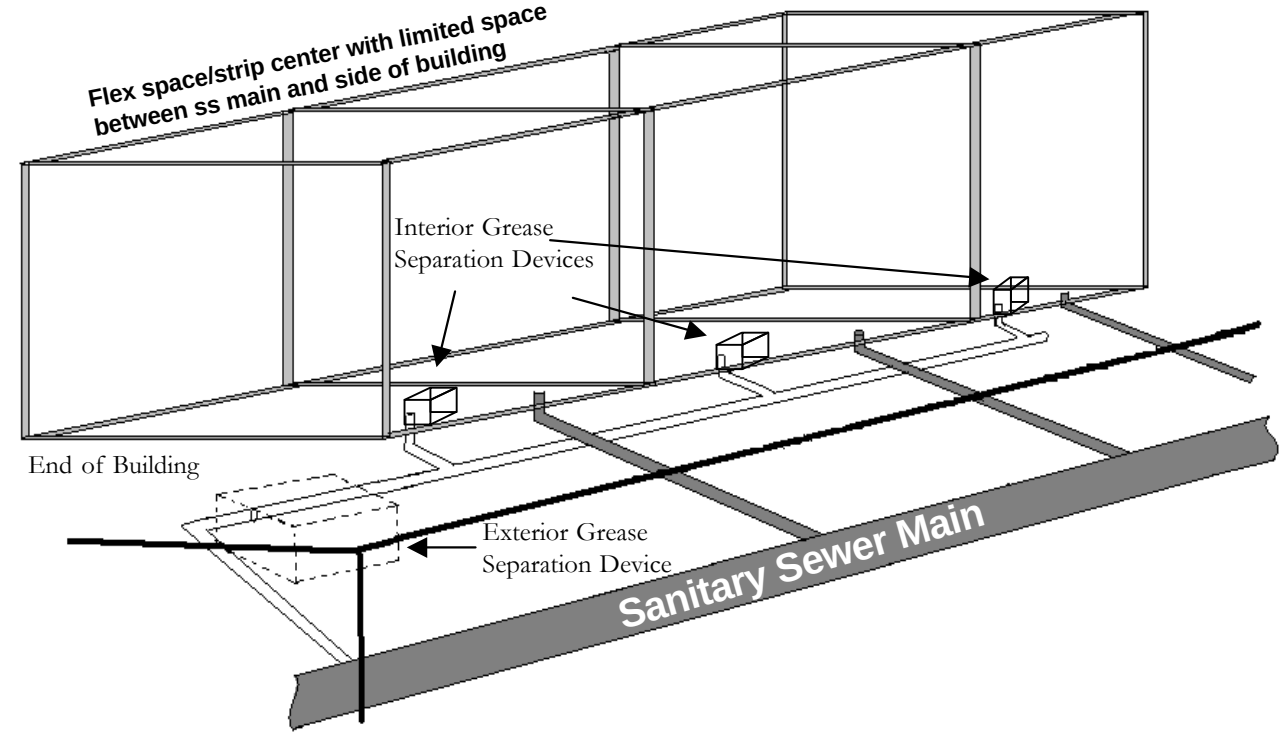
2. Waste Flow Rate
   - With dishwashing machine…… 6 gallon (22.7 L) flow
   - Without dishwashing machine…… 5 gallon (18.9 L) flow
   - Single service kitchen…… 2 gallon (7.6 L) flow
   - Food waste disposer…… 1 gallon (3.8 L) flow

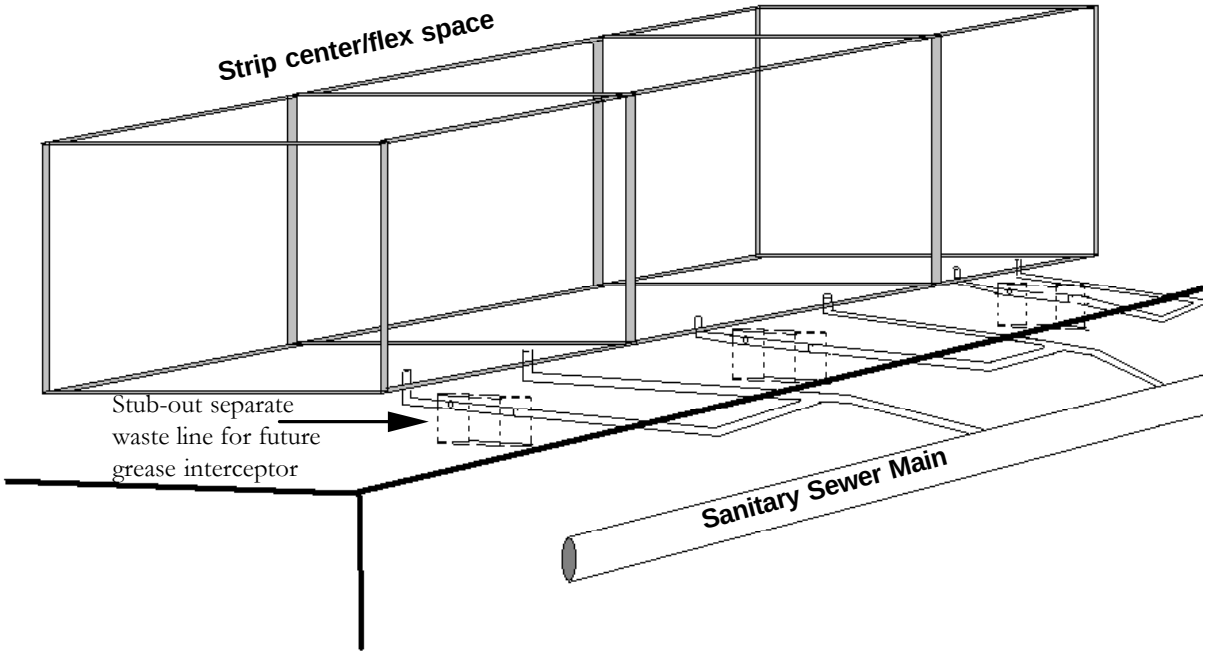
3. Retention Times
   - Commercial kitchen waste
   - Dishwasher…….. 2.5 hours
   - Single service kitchen
   - Single serving…….. 1.5 hours

4. Storage Factors
   - Fully equipped commercial kitchen……. 8 hour operation: 1
   - ……16 hour operation: 2
   - …… …24 hour operation: 3
   - Single Service Kitchen…….. 1.5

Ref: Uniform Plumbing Code Appendix H. Recommended Procedures for Design, Construction and Installation of Commercial Kitchen Grease separation devices, Pg.227.

APPENDIX G: SUGGESTED NEW CONSTRUCTION FLEX SPACE PLUMBING CONFIGURATION





APPENDIX H: CONDITIONAL USAGE- MANUAL OR AUTOMATIC GREASE RECOVERY DEVICE

POST AT WASH STATION
CITY OF_____

HOT WATER ONLY PRERINSE WASH PROCEDURES

In an effort to control the discharge of fats, oils and greases (FOG) in food service facilities where appropriately sized grease separation devices cannot be installed, the City of _____ authorizes the usage of a hot water-only prerinse wash procedure. This procedure, while it is recognized as a second choice over the preferred hydraulic retention an exterior in-ground provides, promotes enhanced FOG removal by isolation from detergents and other chemical emulsifiers in the prerinse process.

STATEMENT

(Facility name)_____ located at _____is hereby authorized by the City of _____ to use the Hot Water Only Prerinse Wash Procedure in lieu of exterior grease separation device. This procedure is applicable to this site only and is not transferable to any other location, facility, or ownership.

WARE WASHING PROCEDURES USING 3 or 4 COMPARTMENT SINK

1. Thoroughly scrape all dishes, other utensils and ware into solid waste container prior to prerinse.
2. Thoroughly prerinse all dishes and cookware in a designated prerinse compartment using hot water only. No detergent is to be used in this step. This sink shall be plumbed discreetly and individually to the manual or automatic interior grease separation device with solids strainer.

3. After prerinsing, dishes and cookware should be washed in accordance with state restaurant sanitation rules prescribing washing, rinsing and sanitizing. Care must be taken not to transfer detergent from the wash sink back into the prerinse sink.

Note: N.C. DEH's hot water heater requirements may need to be altered to adhere to sanitation requirements. Check with _____ County Department of Environmental Services at _____.

For more information contact the City of _____ at: _____

STATEMENT

I (Print Name)_____, understand and hereby agree to follow the Hot Water Only Pre-rinse Wash Procedure, and agree to train operator(s) of wash station(s) to follow and adhere to said procedure. As person in charge of (Facility)_____, I understand and agree that it is my responsibility to control the discharge of fats, oils and greases to the City of _____ collection and treatment system.

(Signature)_____ (Date)_____

Hot Water Only Prerinse Wash Procedure
Sample Point Illustration

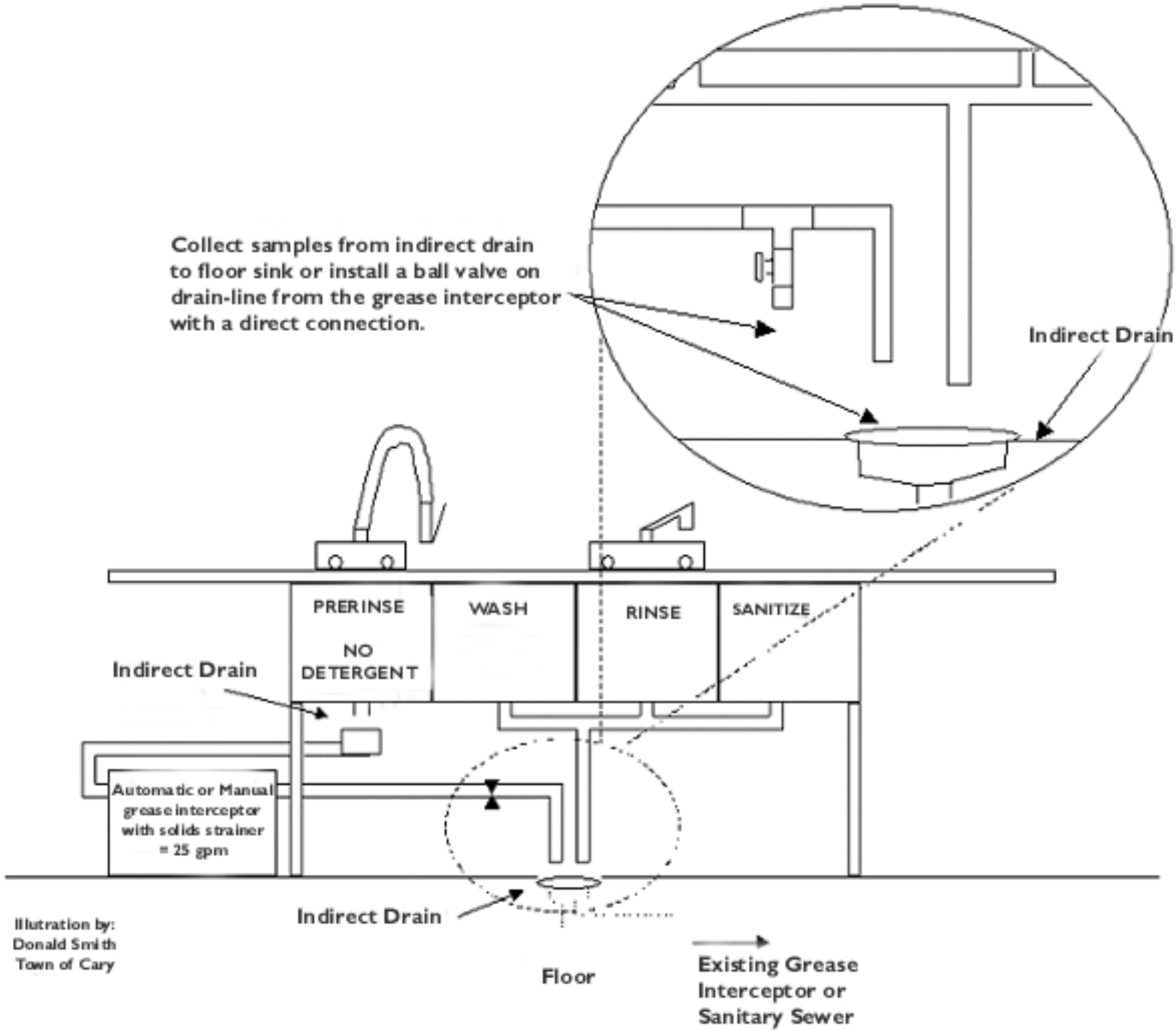


Illustration by:
Donald Smith
Town of Cary

APPENDIX I: GREASE SEPARATION DEVICE PRELIMINARY SITE EVALUATION PRE-EXISTING FACILITIES

City/Town/Authority of _____

Date: _____

Site Location: _____
_____
_____

Site Inspector: _____

Owner/Operator Information

Name: _____

Address: _____
_____
_____

Phone: _____

Site Evaluation

Food type: _____
_____

Hours of operation: (actual/proposed): _____

Grease interceptor location (actual/proposed): _____

Grease interceptor type: in-floor, in-ground, specialty: _____

Observation / Comments:

_____
_____

Site Requirements

_____
_____

Site Layout (sketch on back of this page)

APPENDIX J: SITE FOG INSPECTION FORM

Town / City of _____
Grease Inspection Form

Site Information

Company (SU): _____ ID/Permit #: _____
Location: _____
_____
_____
Phone: (___)_____
Contact name: _____ Title: _____
Phone: (___)_____
Date of Inspection: _____
Time of Inspection: _____
Inspected by: _____

Inspector accompanied by: _____
_____

Interceptor Inspection

Last date of Inspection: _____

1. Interceptor location: _____
2. Interceptor type: _____
3. Interceptor size: _____ gallons
   Trap: _____lb»_____gpm
4. Access manholes in place: Y / N
5. Sample tee / sample point on interceptor: Y / N

6.

	1st Compartment	2nd Compartment	3rd Compartment	4th Compartment
Grease Cap =>	in / ft	in / ft	in / ft	in / ft
Solids Depth =>	in / ft	in / ft	in / ft	in / ft

Observations/Comments: _____

Interceptor Sampling

Interceptor Sampled: Y / N Date: _____ Time: _____
Sample ID: _____ Sample Type: Grab / Composite
PH: _____ Temp: _____

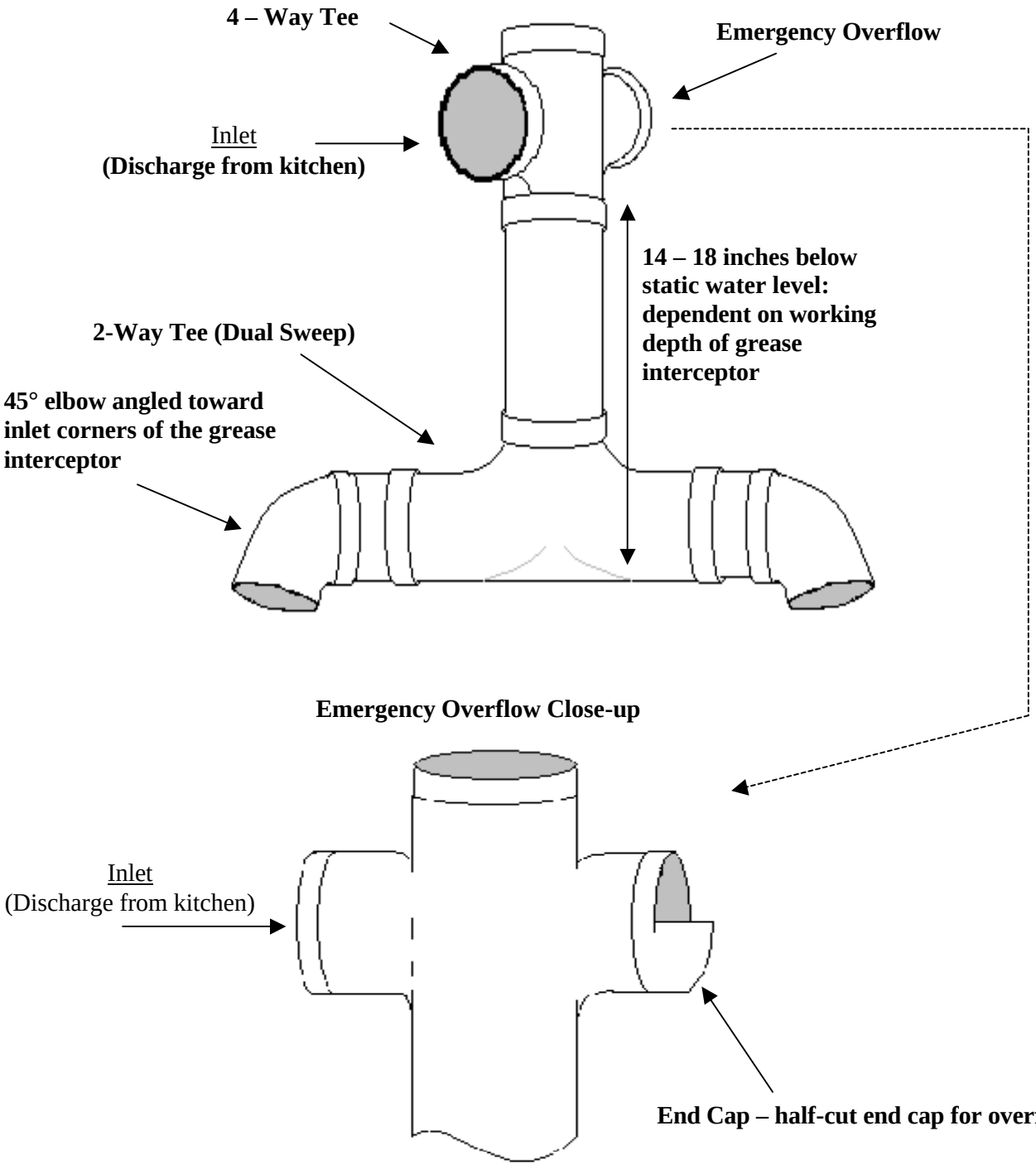
Fats/Grease/Oil Removal

1. Contracted company (grease removal): _____
2. Date of last service (grease removal): _____
3. Pumping frequency: _____
4. Records kept of interceptor service: Y / N

Date Serviced	Service Co.	G&O(ft/in)	Solids(ft/in)	Ticket/Invoice #	Comments

Violation: Y / N Type: _____
Cause of Violation: _____

Inlet flow distribution tee for use in 500 gallon and greater grease interceptors

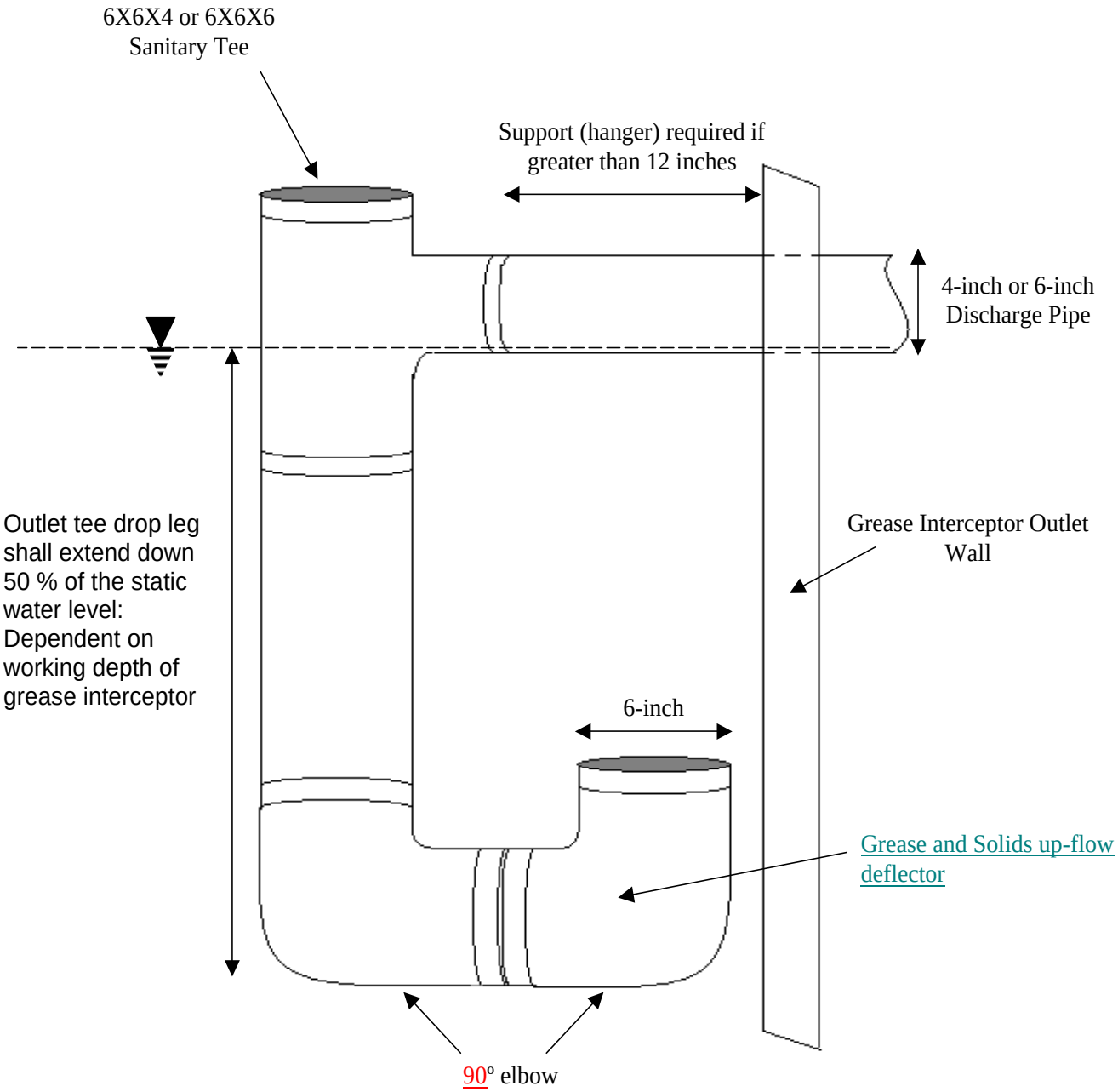


Note: Drawing not to scale

Created by:
Donald Smith
Town of Cary

APPENDIX L: OUTLET TEE DESIGN WITH GREASE AND SOLIDS UP-FLOW DEFLECTOR

Outlet tee design for use 500 gallon and greater grease separation devices



Note: Drawing not to scale

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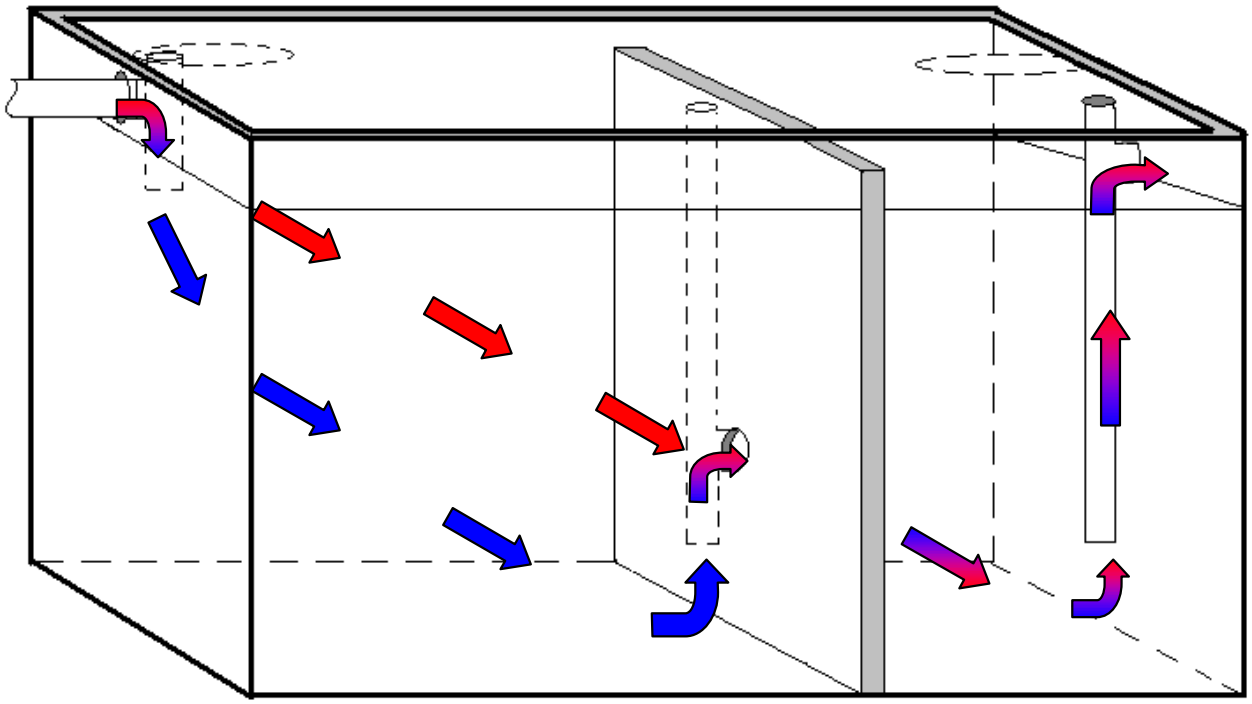
Donald Smith
Town of Cary

APPENDIX M: GREASE SEPARATION DEVICE - HYDRAULIC SHORT CIRCUITING



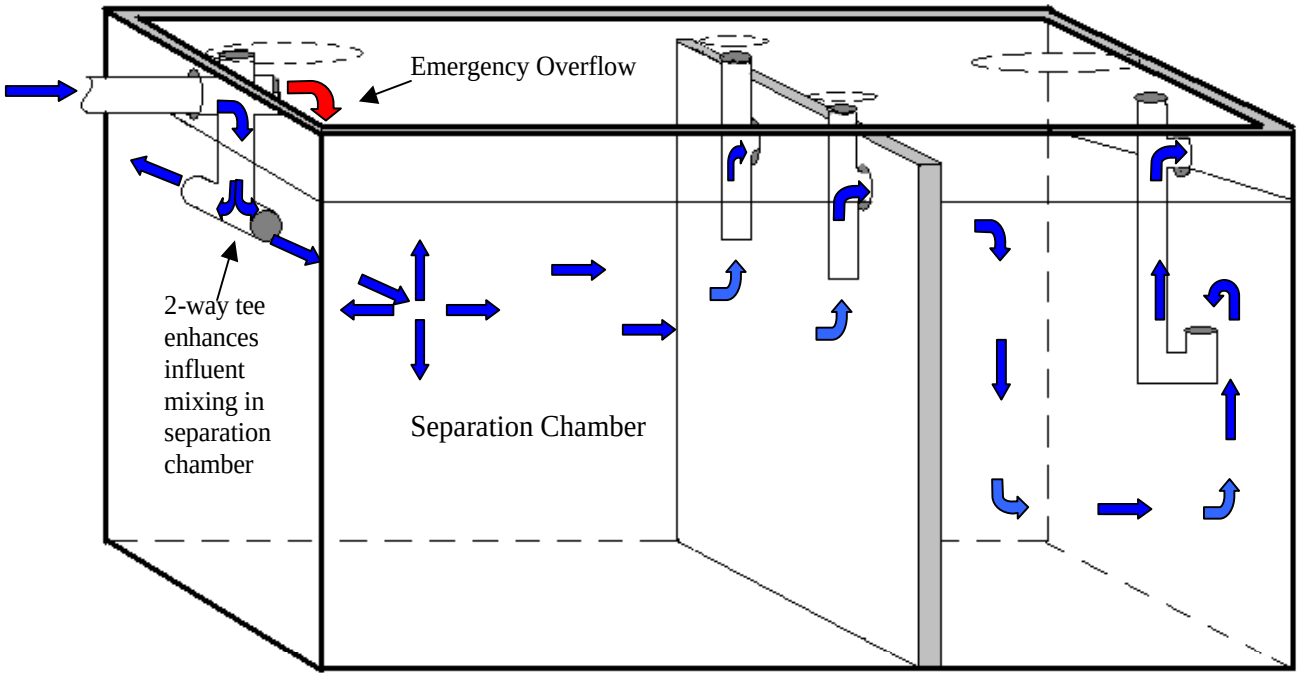
Grease separation device with inlet tee and baffle wall tee

Grease separation device without tees

Created by:
Donald Smith
Town of Cary

A **common grease separation device problem** is routinely presented by the predominance of grease interceptors lacking inlet tees. Without the inlet tee in place, influent flows are not diverted into the full space of the first compartment. This hydraulic principal is called plug or piston flow. No mixing occurs in the first compartment. Hardly any of the available volume of the compartment is utilized, as a defined column of inlet water moves from the inlet tee to the outlet tee, even in the presence of an interior baffle. Chemically emulsified oil globules are surrounded by detergent molecules, thereby reducing their size and dramatically slowing their rise rate. Also, food particles are coated in oil and grease and may be less prone to settle quickly. Hydraulic retention in these types of traps can be less than one minute.

APPENDIX N: GREASE SEPARATION DEVICE WITH ENHANCED DESIGN AND FLOW DISTRIBUTION



Created by:
Donald Smith
Town of Cary

The hydraulics of mixing in a tank rely on the utilization of all available volume within the tank. The inlet tee design that forces the influent flow in a lateral, slightly downward direction increases the travel time a particle must take on its path to the outlet tee. That increase in time is achieved by more complete influent mixing within the first compartment. Located in the ground, the soil and tank wall thickness act to insulate the contents of the tank. This action creates thermodynamic conditions in the tank that promote the formation of hydraulic channeling in the absence of forced mixing. Oil globules are offered a better chance to separate if the hydraulic residence or retention time (HRT) is increased. Forcing the water to take a longer path to the outlet assures a longer HRT. The longer HRT also promotes better solids settling in the first compartment.