

FOG Program DATA Needs

Using DATA to Justify Developing or Maintaining a FOG Program

2020 Edition



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Clayton Brown works part time for the Pollution Prevention Resource Center in Seattle and as a consultant to the wastewater industry. Prior to that, Clayton worked for nearly 30 years for Clean water services in Washington County, Oregon. He spent his last 22 years as the Source Control Manager.

During his final year at Clean Water Services, Clayton's Source Control Division managed permits for 52 significant Industrial Users, of which 39 were Categorical Industrial Users. The remaining SIUs were mostly food manufacturing processors which were considered Significant either due to flow or loading. The Division managed over 80 Industrial Stormwater NPDES Permits under a contract with the Oregon Department of Environmental Quality and managed over 180 non-significant industrial discharge permits under a local program.



The Source Control Division also oversaw over 2,400 food service establishments under the fats, oils and grease (FOG) Abatement Program, inspected almost 200 dental offices, and managed over 30 Ecological Businesses under the EcoBiz green business program for automotive shops and landscaping firms. Clayton has facilitated utilities across the Pacific Northwest in developing or amending FOG discharge program requirements and is a subject matter expert.

Clayton's favorite roll though, is that of GRANDPA!

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Establishing the Need for a FOG Program

Many small-community Public Works personnel recognize the community has a FOG problem, often through anecdotal information.

How can you quantify the damage caused by FOG? How can you quantify the cost of FOG-related collection system and treatment plant operation and maintenance? How can you quantify the extra cost to treat excess FOG at the wastewater treatment plant? This is information covered in this presentation.

Data Needed for FOG Cost-Benefit Analysis

One of the first questions to ask, is "What data do I need?" This will be covered.

- How do you collect the data?
- Who best to collect data?
- Will you need an environmental laboratory that can analyze for polar FOG?
- How will photographs and videos be stored and accessed?
- Are they important pieces of information that can add to the business case?
- Where and how will you store data? Can it be easily analyzed?

Treatment Plant Operational Costs

- What is the estimated operational cost to treat one pound of COD?
- WERF estimates that one pound of FOG equals 1/2 pound of COD
- Case studies show that an average restaurant, with one fixture protected by a wellmaintained interceptor, captures 1/10th the FOG of a restaurant with all fixtures and drains connected to a well-maintained interceptor.
- How many restaurants in the Jurisdiction have all fixtures and drains protected by an interceptor?

FOG itself has no measurable 5-day carbonaceous biochemical oxygen demand (cBOD5) as it separates from water and is not readily available for microbiological attack. If a value is desired it best be established using the chemical oxygen demand (COD) test. WERF estimates that one pound of FOG equals approximately 0.5 pound COD. A study in New Zealand by Keith Davis ("An Opinion and Some Facts – Treatment in 'Grease Converters' using Bio-additives", September 2013) determined that one pound of FOG was equivalent to approximately 0.6 pound COD.



What does it cost for your wastewater treatment plant to treat one pound of COD? If you use BOD for cost calculations, typically COD values should run higher than BOD values as COD measures all organics that can be oxidized chemically, and BOD measures all organics that can be oxidized biologically. For purposes of this exercise, let's estimate that one pound of FOG is equivalent to 0.4 pounds of BOD.

For estimating the amount of FOG entering the wastewater treatment plant, we will be using several case studies from the Portland metro area in Oregon. The metro area municipalities and sewer districts have been using the Preferred Pumper Program since 2006, where pumpers report the amount of FOG cleaned out of grease interceptors at each service. In January 2013, the Oregon Department of Consumer and Business Services' Building Codes Division changed the Oregon Plumbing Specialty Code to require all FSEs connect all fixtures and drains in the kitchen and food service areas to a grease interceptor. Many restaurants completed retrofits to connect all fixtures and drains to interceptors, and in tracking the FOG removed before and after the retrofits, we found the following: on average, FSEs with all fixtures and drains (except restroom drains and fixtures) connected to an appropriately sized grease interceptor capture 10 times the FOG as they captured under the old code.

Knowing how many FSEs were in our service district, and knowing the pump-out pounds of FOG from each FSE, and knowing how many FSEs were in compliance with the "new" code, we could estimate the pound load of FOG entering our wastewater treatment plants. We had a surcharge value for COD for industrial users which we used to calculate the cost to treat the excess FOG loading being received at the treatment plants

High FOG loading can lead to increased maintenance costs for grease and scum sweeps and scum pumps.

High FOG loading can also create problems in the aeration basins.

Foaming in Aeration Basin and Secondary Clarifiers

Nocardioform and *Microthrix parvicella* filaments known to cause foaming and these grow due to high amounts of fats, oils, and grease (FOG) present in the wastewater. Septicity helps convert fats, oils, and grease to unsaturated forms, which are easier for these organisms to assimilate. These organisms are hydrophobic and at high concentrations they want to float to the surface. Nocardioforms use fats, oils, and greases to produce a low-density fatty cell wall which causes them to float. In aerobic conditions they also generate biosurfactants to help them stay suspended at the surface of a wastewater system. Filamentous foaming is a major cause of problems in wastewater treatment plants all over the world.

- How many lineal feet of collection system are being cleaned in excess of the normal cleaning cycle (usually once every three to five years)?
- What is the City's cost per foot to clean lines?
- Is traffic control necessary, and if so, what is the cost?
- Where is the FOG disposed of, and what is the cost per pound?
- What is your municipality's typical collection cleaning frequency? Do you clean all sanitary sewer lines once every three years? Once every four years?



Do you have segments of line that you clean more often than your routine maintenance frequency? Some jurisdictions call these lines "Friday Specials" because they are cleaned routinely before the weekend to prevent after-hours call-outs. You need to identify all of the FOG or Friday Special line segments cleaned regularly, and note the cleaning frequency for each line segment. Add up the lineal feet of lines cleaned per year in excess of normal line cleaning.

How much does it cost the City to clean sanitary sewer lines per lineal foot? This cost should include staff time and equipment costs. Fully loaded per hour staffing costs include administrative overhead, and benefits such as medical insurance, retirement, and paid time off. Equipment costs should be calculated as though the City was renting the equipment. If your municipality does not have a process established for calculating these costs, a good way to estimate the cost is to call a company that provides sanitary line cleaning and have them explain how they bid these types of jobs. Most cities I've worked with typically undervalue the cost for this service.

Another potential cost for line cleaning is traffic control. Does the City provide staff to manage traffic control? How much would this task cost if the City were to hire a professional company to provide this service? Companies like ROW Traffic Control, Flagger Force and Roadway Construction Service can be contacted to get an idea of the costs for traffic control.

Once the FOG has been captured and removed from the sanitary sewer system, what does the City do with it? Does it go into a solids drying bed? Is it mixed with municipal biosolids? Is it disposed in a local landfill? Cost of transport and disposal needs to be captured and included in your FOG cost calculations.

"FOG Lines"

Does the municipality have "FOG lines"? In the sewer district where I worked, the public works staff called these Fog lines "Friday Specials" because if they weren't cleaned on Friday, they would most likely back up and cause a weekend overtime call-out for the staff.

Some municipalities call these FOG-impacted lines "Hot Lines". What ever they are called, these lines require extra maintenance... what our Public Works Director



called "non-routine chronic line maintenance". In our service district, we tried to clean all sanitary sewer lines once every three years. Some of the "Friday Specials" were cleaned every two weeks!

How does the City recover costs for emergency line cleaning? The information above should be used in this calculation, with the addition of overtime and stand-by pay for staff. The City should also factor in the call-out costs for equipment.

Most private contractors charge customers for equipment based on "Shop-to-shop" figures. In other words, they charge an hourly rate for equipment from the time the equipment leaves the shop or yard until it is cleaned, serviced and returned to the yard or shop, ready for the next job. To be accurate, the City should also charge "shop-to-shop" fees for emergency call-outs. Traffic control and FOG disposal costs must also be factored into this calculation.





Many larger jurisdictions have the ability to map conveyance systems using GIS. This is a map showing FOG lines that have food service establishments (FSEs) connected to or within upstream proximity to the line segments.

For smaller municipalities, paper maps can be used to identify and catalog these FOG lines. Many small cities I've worked with have public works staff that know where these FOG lines are based on their experience. This anecdotal information is very valuable when putting this type of information onto collection system maps, and it provides documentation for the decision makers within the City.

Lift Station Maintenance Costs

For municipalities that have lift or pump stations, the maintenance crews will tell you that pump stations make good interceptors.

- How many pump stations are impacted by FOG?
- What is the cost to clean FOG from a pump station?
- How many air relief valves are being impacted by FOG?
- What is the cost to clean the air relief valves?
- What is the efficiency loss for failure to clean air relief valves?
- Is excess energy being used due to FOG impacts?

Now, let's discuss lift or pump stations. Pump stations make wonderful grease interceptors! Does your City have pump stations? How many do you have?

One small town in Washington, with a population of about 2,400 has four pump stations in the downtown area, surrounded by about 75 FSEs. When the community was evaluating the need for a



FOG program, their Operations manager included pump station maintenance in the FOG cost calculations, as this municipality was cleaning some stations every two weeks, and some every month. What is the cost per pump station to remove excess FOG?

Do your pressure lines have air relief valves? How many? What is the cost to clean each valve when it becomes impacted with FOG?

An indication of FOG impact on a pump station and pressure line is an increase in pump cycle times with no increase in flow. If the pump station has an independent electric meter, another indication of FOG impact is an increase in electricity use over time. FOG-impacted air relief valves cause air to become trapped in the high parts of the pressure line, and when the pumps turn on, they must compact the air in order to move the water, casing a decrease in pumping efficiency. Failure to properly clean and maintain FOG-impacted air relief valves could result in a pump station overflow, allowing sanitary sewage to be discharged to the environment.

Tracking Staff Costs

From experience, I know it can be very difficult to accurately track the time staff spend dealing with FOG issues. Some jurisdictions have developed project codes to track staff time. This can greatly benefit program managers and operation supervisors, but it can also be a burden on employees who may spend extra time completing time cards.



How granular should you be? How much detail is needed to try justifying a FOG program? It's important to find the right balance between detail and generality.

Estimating Cost for FOG Program Development and Implementation

- How many Food Service Establishments (FSEs) are in the City?
- How many FSEs have been thoroughly inspected?
- What data has been input for each FSE?

Have you already compiled a list of the food service establishments (FSEs) in your service area? Typically, FSEs include all facilities where food can be prepared and served, including restaurants, coffee, yogurt and ice cream shops, schools, care homes, hospitals, churches, jails, deli and grocery stores, retirement centers and company cafeterias. If you don't already have an FSE inventory, the easiest place to start is with your local Health Department, which licenses all restaurants and eateries where food is consumed on premises. The Department of Agriculture licenses grocery stores and facilities where food is prepared but consumed off-site. Facilities such as care homes, retirement centers, churches and company cafeterias may need to be identified by city staff.



Once you have started a list of FSEs, an initial inspection should be completed. This initial inspection will be the most thorough inspection completed, as this is when the City gathers thorough facility and contact information for each physical FSE location. Information includes (but is not limited to) the physical address, FSE name, type of FSE, estimate of FOG loading (very high, high, medium or low), a list of all fixtures and drains, which fixtures and drains are protected by an interceptor, the interceptor dimensions, interceptor brand and model, maintenance frequency, property owner and contact information, FSE owner and contact information, FSE on-site manager and contact information, the connection point into the public sewer and whether that sewer line segment is a FOG line.

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- How many FSEs are in your service area?
- How many FSE inspections can be completed in one day?
- How many Full Time Employees (FTE) will be needed to initiate the program?
- How many FTE will be needed to maintain the program?

These questions need to be answered, even if it is just an estimate. FTE needs really depend on the time interval projected to complete the initial survey of FSEs.

Examples of Municipal Program Costs

- City of Vancouver, Washington has approximately 800 FSEs and has two full time FOG inspectors
- Washington County, Oregon has approximately 2,400 FSEs and has one full-time and five parttime FOG inspectors
- City of Portland has approximately 4,100 FSEs and three full-time inspectors and a program manger



- Friday Harbor, Washington has about 75 FSEs and one part-time inspector
- Wilsonville, Oregon has 99 FSEs and one full-time industrial pretreatment inspector who is also responsible for the FOG program

Here we give you some examples of staff needs by several jurisdictions. Many smaller municipalities have assigned FOG inspection to an existing staff person from Public Works or Operations.

Determining Appropriate Staffing Level

- Initial FSE inspection setting up FOG Program estimate 3-4 hr/FSE
- Efficient FOG program maintenance inspections estimate 1 hr/FSE
- Include travel time
- Include inspection data entry time
- Include pump-out data review time
- Estimate that 10% FSEs will need re-inspection more frequently than once per year

Based on our experience in the Portland metro area, FOG inspectors can complete one to two initial FSE inspections per day, including travel time and data entry. Some facilities, such as malls and sports arenas may take several days to thoroughly inspect. For example, the Moda Center, a sports complex in Portland, Oregon has more than 70 food vendors, and more than 40 grease interceptors. In some cases, an initial inspection of an FSE may entail dye-testing drains to verify connection to an interceptor, or to identify drains that bypass the interceptor.

FOG Program maintenance inspections typically take much less time than the initial inspection. For an FSE with all fixtures and drains connected to an appropriately sized and maintained interceptor, an inspector may only need to look at the interceptor to verify the maintenance schedule, and verify that no FOG bypass is occurring.

We recommend that the Fog inspector periodically inspect the actual pump-out of the interceptor at each FSE. Insepctors in Vancouver, Washington observe every pump-out, while inspectors in Washington County try to observe a pump-out at each FSE annually, so the schedule and amount of actual pump-out inspections can vary by municipality. The pump-out inspections encourage the pumpers to maintain the interceptors properly, and also allow the municipal inspector to build a relationship with the pumping community.

FOG Program Development

- Put legal authority into place
- Identify all stakeholders
- Identify all "moving parts" of the program
- Implement, gather data, analyze, repeat

Any regulatory program has an orderly timeline for development and implementation. The City must have the legal authority to implement a regulatory program, and that's what a FOG Program is. Once the legal authority is in place, program development can commence.





Identify the stakeholders that will be involved in the planning process. Ideally, your stakeholder list will include the City staff, and outside stakeholders that will be impacted by this FOG program. Stakeholders may include the FSE community, the Chamber of Commerce, pumpers, plumbers, building and health department officials. Often times once the planning and public meeting process begins, other stakeholders will express interest in getting involved.

Data Needed

FSE Data (partial list)

- Physical Address (and GIS data or latitude/longitude)
- Potential FOG Loading of FSE (very high, high, medium, low)
- Proximity of FSE to a FOG-impacted sanitary sewer line (FOG line)
- Type(s) of FOG pretreatment
- Interceptor maintenance history
- Fixtures and drains connected to interceptor
- Contact information for FSE
- Landlord or property manager contact information

This list includes the basic information needed for each FSE. The primary "tag" for each FSE should be the physical address of the facility, not the FSE name, as restaurants and eateries come and go. Since the building has been constructed as an FSE, the address is a more permanent "tag" than the name. Tax lot information is good (tax map and tax lot number) if an FSE is built on leased property, as this information can help a municipality find the actual owner of the land the FSE is sitting on. Latitude and longitude can help "pin" the FSE to a map, or GIS X-Y coordinates if the municipality uses GIS mapping.

Estimate the potential FOG loading from the FSE, as this data will assist the City in triaging efforts dealing with impacts to FOG lines. There are tools and FOG calculators available to assist the FOG inspector in this task.

What type(s) of FOG pretreatment does the FSE have? If possible, identify the interceptor by make and model, and measure the dimensions of the interceptor, logging this data into the FOG data management system.

Find out the maintenance history of the interceptor(s). If the FSE is a "self-cleaner" check their maintenance log, or require a log be kept if they don't have one. Check pumper invoices for past services on the interceptor, and record these maintenance dates in the FOG data management system for future reference.

Utility Data (partial list)

- Which collection system line segments are impacted by FOG?
- What is the cleaning frequency for these FOG lines?
- Does the frequency exceed the established line cleaning frequency for the normal collection system?
- What is the cost per line segment to keep these FOG lines cleared?



- Are there pump stations impacted by FOG?
- How often are these stations cleaned?
- What is the cost per cleaning?

Identify all collection system line segments impacted by FOG, and calculate the lineal footage.

Identify the normal line cleaning frequency, and indicate what the cleaning frequency is for each FOG line segment.

Identify the FOG line segment cleaning cost, including extra costs such as disposal of FOG and traffic control.

Identify all pump stations impacted by FOG and the cleaning frequency, and cost per cleaning.

Stakeholder Involvement Costs

- Have you identified the stakeholders?
- Have meetings been scheduled to discuss the FOG Program with stakeholders?
- Has the business case been presented to the municipal leadership?

One sewer district spent one year meeting with stakeholders in monthly meetings. Four staff members from the District were involved, three part time and one full time during this year.

Developing an effective FOG Abatement Program may require meetings with stakeholders. You'll need to identify those stakeholders, and ideally you should identify at which step in the program development process you will bring them into the discussion. For example, it may not be necessary to involve the pumpers in the regulatory structure development process, but will be important to bring them into the discussion when the FOG Program is being implemented.

Having a written plan of stakeholder involvement, and a draft schedule of such involvement is an important piece of the presentation to municipal decision makers.

Cost-Benefit Analysis

- Existing costs to municipality if no FOG program is implemented
- Cost to develop and implement FOG program
- Cost to maintain a well-managed FOG program
- Proposed savings due to well-managed FOG program
- Does cost for FOG Program outweigh existing costs without Program?

When presenting your business case, show the existing FOG costs as the "Status quo" costs, or as one of my mentors called it, the "do-nothing costs".

Every municipality and sewer district will have a different cost objective and calculations. We are just presenting guidance on primary items to be considered when building your business case, and giving ideas on information and planning that will benefit you in your presentation to municipal decision makers.

