

# How to do Stormwater Sampling

## A guide for industrial facilities



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# Introduction

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*The purpose of this guide is to help those who operate facilities do their own sampling.*

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The Industrial Stormwater General Permit requires that your facility conduct at least quarterly sampling of stormwater and report the sampling results to Ecology. These requirements are outlined in the permit under Section S4. General Sampling Requirements. This guide supports the sampling portion of the general permit but does not substitute for it.

The purpose of this guide is to help those who operate facilities do their own sampling by describing the steps and procedures to be followed. This guidance will lead you to be able to sample in a way that will provide you and Ecology with meaningful results.

Sources of pollutants that may enter surface water, sediments, or ground water can be identified by sampling stormwater discharges. The results of sampling will be helpful when developing your Stormwater Pollution Prevention Plan (SWPPP),

determining if your existing plan is adequate, and when implementing or assessing best management practices (BMPs).

Some effort is required up front to prepare for sampling in a way that will meet requirements and provide useful data. What follows is a step-by-step procedure of what you need to do to gather and report data that will represent the quality of stormwater leaving your facility. The steps are organized to guide you through the stormwater sampling process from start to finish.

*This guidance is an update to "How to do Stormwater Sampling" which was originally developed by Ecology's Environmental Assessment Program in 2002. The update was made in accordance with the new Industrial Stormwater General Permit which became effective on January 1, 2010.*





# Advance Planning for Stormwater Sampling

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## Deciding what to Sample

Before beginning your sampling, you'll need to determine the specific pollutants (water quality parameters) you are required to sample and test for. All facilities must monitor for turbidity, pH, zinc, copper, and the presence of a visible oil sheen. Your parameters are based on:

- ◆ The standard set of parameters for all facilities, (turbidity, pH, zinc, copper and visible oil sheen).
- ◆ The industrial activities at your site, often classified by your facility's Standard Industrial Code (SIC Code).
- ◆ Whether your facility discharges to an impaired (303 (d) listed) water body.
- ◆ Any requirements that apply to facilities that discharge to water bodies with a water cleanup plan or Total Maximum Daily Load (TMDL).

Ecology has listed the required parameters for your facility on your Discharge Monitoring Report (DMR) form.

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## Visible oil sheen, zinc, copper, turbidity, and pH

If there is a visible oil sheen at the point of discharge from your facility, you need to make note of it on your DMR form. A rainbow colored sheen on the surface of stormwater may indicate the presence of oil. However, not all sheens on the water are oil sheens. Some sheens result from natural processes, such as rotting vegetation or the bacterial breakdown of iron. How do you tell the difference between an oil sheen and a naturally occurring sheen? Try to break up the sheen with a stick. An oil sheen will swirl, elongate, and reform. A sheen resulting from a natural process will typically break up into irregular platelets that do not reform and have a mirror-like appearance.

Turbidity can be measured directly in the field using a handheld meter, or sampled and analyzed in the lab. You must measure pH in the field using either a calibrated pH meter or pH paper rather than sending it to a lab. This is due to the short holding time for pH. You can get pH paper from a distributor of scientific/laboratory supplies or through the same laboratory that will be doing your sample analysis. Zinc, copper, and other parameters required by the permit (other than turbidity and pH) are measured by sending bottled samples to a laboratory for analysis.



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*All facilities must monitor for turbidity, pH, zinc, copper, and a visible oil sheen.*

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*This is an example of an oil sheen at a storm drain*

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## Selecting a laboratory to test your sample

Having identified the parameters you will need tested, the next step is to select a laboratory to perform the tests. You are required to select a lab accredited by Ecology. The lab must be accredited for each analytical method required by the permit for each parameter. Accreditation assures Ecology that the lab is able to do quality testing using the analytical methods specified under Monitoring Requirements in your permit. You can search for an accredited lab on Ecology's website: [www.ecy.wa.gov/programs/eap/labs/search.html](http://www.ecy.wa.gov/programs/eap/labs/search.html)

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*Contact the lab well ahead of time.*

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Ask questions -  
your lab can  
help you.

## Contacting the lab in advance

You should contact the lab well ahead of time. They will be providing you with the sampling bottles you'll need. For some water quality parameters, such as Total Petroleum Hydrocarbons (TPH), it is not only desirable but necessary to collect the sample directly into a specially-cleaned container, so you will need to have bottles from the lab on hand before you sample. You can also ask your lab to send narrow-range pH paper (with a resolution not greater than  $\pm 0.5$  SU) along with your sample bottles.

Please note that not all facilities are required to collect TPH samples. Refer to page 26 of the permit for a list of industrial activities for which the permit requires TPH samples.

Discuss with the lab the analytical methods they will use, as specified in the sample parameter tables included in S5. A and S5. B of the general permit (pages 24 and 25). The lab will provide you helpful information and explanations that go beyond the scope of this guide. If you must meet effluent limits listed in "S5.C, Stormwater Discharges Subject to Effluent Limitation Guidelines" you should carefully review them with the lab.

## Typical Sampling Information

Parameter	Bottle Type	Minimum Sample Required	Holding Time	Preservation
Turbidity	500 mL wide-mouthed poly	100 mL	48 hours	Cool to 4° C
Total Zinc	1 liter (L) bottle cleaned according to protocol	500 mL	6 months	HNO <sub>3</sub> to pH<2 Cool to 4° C
Copper, Total Recoverable	500 mL HDPE	Dependent on the lab	6 months	HNO <sub>3</sub> to pH<2

## Issues you may want to cover with the lab include:

◆ **Confirmation that the lab is accredited** for the testing methods the permit requires.

◆ **The type and size of bottle** that will be supplied for each water quality parameter to be sampled and tested.

◆ **How full** to fill the bottle.

◆ **Any safety concerns** with materials supplied by the lab.

◆ **What you need to know about preserving your samples:** Make a note of the parameters for which bottles will have preservative inside. For some tests, a preservative is necessary. The preservative is a substance that stabilizes certain chemicals at the time of sampling so that a valid test can be done later. It is critical that you use the correct bottles because tests requiring preservative will not be valid without the correct preservative. In some cases, the wrong preservative will interfere with a test. It is important not to lose the preservative that comes in the bottles supplied by the lab. The table to the left provides information for preserving zinc, turbidity, and copper samples.

◆ **The kind of labels** the lab will supply for the bottles and how the labels should be filled out. The labels or tags you use to identify the samples you take must be waterproof, and if you write on them, the writing must be waterproof also.

◆ **Get a Chain of Custody (COC) form** from the lab and go over how to complete these before sampling the first time.

◆ **A description of forms** or other paperwork to submit to the lab with the samples and how to fill them out.

◆ **Whether the lab will supply pH paper** as well as sample bottles, tags or labels for the bottles, and blank forms.

◆ **How bottles** and other supplies from the lab will be delivered to you.

◆ **The holding times** for each water quality parameter to be sampled and tested. A holding time is the maximum time allowed between taking the sample and doing the lab analysis. If you exceed holding time, the sample analysis is not acceptable.

◆ **How and when you will deliver samples to the lab.** Plan with the lab how you will get the samples to them in time to begin analysis before the parameter with the shortest holding time reaches that holding time. The fastest way to deliver samples to the lab may be in person, but it may be possible to ship samples (cooled in picnic coolers) and still meet holding times. If you deliver samples in person, you can pick up bottles and supplies for the next quarter at the same time. The table (*page 3*) shows typical sampling information for the three water quality parameters that must be monitored under the Industrial Stormwater General Permit. The information you obtain from your lab may differ from this. In many cases, the preservatives listed in the table come pre-measured in the sampling bottles and there is no need to check pH. Ask your lab about this.

◆ **How to read the lab reports for the sample results.** Sampling requirements tend to use scientific words and units of measure. Temperature is measured in degrees Celsius, “C”. Typical United States thermometers measure temperature in Fahrenheit, “F,” and 4° C is about 39° F. For your purposes, “Cooling to 4° C” means putting the samples on crushed ice or packed with blue ice in an ice chest so they will be kept just above freezing. Metric units are used to measure weight, volume and distance. Liquid volumes use liters, “L” and milliliters, “mL,” not “quarts” and “cups”. Chemicals have their own scientific notation. Nitric acid for example is HNO<sub>3</sub>. Be sure to have the lab explain any words or expressions that you do not understand.

## Deciding How You Will Take The Sample

Section S4.B.1(d) on page 22 of the Industrial Stormwater General Permit states that a grab, time-proportionate, or flow proportionate sample may be taken. A grab sample is a single sample “grabbed” by filling up a container, either by hand or with the container attached to a pole. It is the simplest type of sample to collect and it is expected that most permit holders will choose to collect grab samples. Ecology provides standard operating procedures (SOP) for obtaining grab samples, along with other sampling guidance, at <http://www.ecy.wa.gov/programs/eap/quality.html>.

As we will discuss in the next section, Total Petroleum Hydrocarbons (TPH) samples must be collected as grab samples. Some permit holders may choose to better represent water quality parameters other than TPH by collecting time-proportionate or flow-proportionate samples. These samples consist of a number of subsamples taken at intervals rather than a single grab sample. Time-proportionate or flow-proportionate sampling can accurately define pollutant loading during various times of discharge throughout a storm event and determine whether or not higher pollution is occurring during first flush of the storm.

A time-proportionate sample is one made up of a number of small samples (subsamples) of equal volume collected at regular time intervals combined into a single large sample. A flow-proportionate sample is one made up of a number of subsamples where each subsample is collected in such a way as to represent a given amount of stormwater discharge. Time-proportionate and flow-proportionate samples provide the advantage of including a number of smaller samples (subsamples) in the sample so that the stormwater discharge is better

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*Practice sampling before you do the real thing.*

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represented than with a grab sample. Time-proportionate and flow proportionate samples can be collected either by hand or with automated equipment. Automated equipment can provide unstaffed sample collection outside of normal business hours. Additional information regarding requirements for automated stormwater sampling is available online at [http://www.ecy.wa.gov/programs/eap/qa/Agency/ECY\\_SOP\\_Automated\\_Sampling\\_v1\\_0.pdf](http://www.ecy.wa.gov/programs/eap/qa/Agency/ECY_SOP_Automated_Sampling_v1_0.pdf). Collecting time-proportionate or flow-proportionate samples by hand is somewhat difficult and collecting them with automated equipment involves additional expenses, such as the installation of a flow meter for automated sampling.

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### **Collecting total petroleum hydrocarbons (TPH) samples**

In addition to the requirement for all permit holders to monitor for a visible oil sheen, the general permit requires that facilities with the following industrial activities and Standard Industrial Classification (SIC) codes collect TPH samples: Primary Metals(33xx), Metals Mining (10xx), Automobile Salvage and Scrap Recycling (5015and 5093), Metals Fabricating (34xx), Hazardous Waste Treatment, Storage and Disposal Facilities and Dangerous Waste Recyclers subject to the provisions of Resource Conservation and Recovery Act (RCRA) Subtitle C. Because of the particular way TPH samples must be collected, this requirement may govern your overall approach to sampling.

For some parameters other than TPH, it is possible to sample in difficult situations by filling a container and transferring it to the sample bottle to be sent to the lab. TPH samples, however, must be collected from the stormwater source directly. The sample cannot be transferred from another container because oil and grease tends to stick to the inside surfaces of containers. Since you must sample directly into the TPH bot-

tle (grab sample), taking grab samples may be the easiest way to collect additional samples for the other parameters. Take samples by collecting stormwater directly from the discharge into the bottles supplied by the lab, filling each bottle one after another.

Because TPH samples cannot be transferred between containers, a sample cannot be formed from separate grab samples combined together. If more than one TPH sample is desired from a sampling site during a storm event, additional TPH grab samples must be collected and analyzed separately.

Because TPH samples must be collected directly and not through the tubing of an automatic sampler, those using automatic samplers will still have to grab TPH samples by hand. This is also true for facilities that must sample for fecal coliform.

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### **Determining which discharges to sample**

The first step in selecting sampling points is to consider the areas draining your facility. The site map in your SWPPP should show the drainage areas. Areas of particular concern are those where raw materials or finished product are exposed to rainfall and/or runoff, and areas where leaking fluids such as petroleum products and hydraulic fluids have the potential to enter stormwater runoff.

The next step is to determine where the runoff from each drainage area is discharged from your facility. If there are separate drainage areas with separate discharge points, stormwater sampled at one discharge sampling point may not represent the facility's stormwater quality overall.

Section S4.B.2 on page 22 of the Industrial Stormwater General Permit describes the requirements for selecting sampling points:

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*Total Petroleum Hydrocarbons (TPH) samples must be collected directly into the bottle you send to the lab.*

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#### S4.B.2. Sample Location(s)

◆ The Permittee shall designate sampling location(s) at the point(s) where it discharges stormwater associated with industrial activity offsite.

◆ The Permittee is not required to sample onsite discharges to ground (e.g., infiltration, etc.) or sanitary sewer discharges under this permit, unless specifically required by Ecology (*Condition G12, page 45*).

◆ The Permittee shall sample each distinct point of discharge offsite except as otherwise exempt from monitoring as a “substantially identical outfall” per S3.B.5.b (*pages 20 and 21*). The Permittee is required to monitor only one of the “substantially identical outfalls” if two or more outfalls discharge substantially identical effluents (based on similar industrial activities and site conditions).

◆ The exception to sampling each point of discharge in S4.B.2.c (*page 22*) does not apply to any point of discharge subject to numeric effluent limitations as described in Conditions S5.C (*page 27*), S6.C (*pages 30 and 31*), and S6.D (*pages 32 and 33*).

As a general matter, your stormwater discharge samples will be taken where your facility’s stormwater is discharged offsite. If your facility discharges stormwater collected over areas that are used for similar activities and have similar site conditions, and there is reason to believe pollutant types will be similar in such areas, a single sampling point can be used to represent several discharge points. The Industrial Stormwater General Permit allows you to sample at only one outfall when multiple outfalls at your facility have similar industrial activities, best management practices (BMPs), exposed materials, and impervious surfaces that could affect stormwater percolation into the

ground. Outfalls that have these similar characteristics are called “substantially identical outfalls,” and you are required to monitor only one of the “substantially identical outfalls” rather than all of them. Refer to Condition S3.B.5 on pages 20 and 21 of the permit for how to determine if the “substantially identical outfall” exception applies to some of your discharge points, and be sure that your SWPPP includes documentation of how sampling locations were chosen.

If your facility has multiple discharge points from areas with different industrial activities, BMPs, exposed materials, or impervious surfaces, the discharge points would not be considered substantially identical outfalls, and therefore you would need to sample all of the outfalls. For example, if one portion of the site is used to store raw materials and discharges separately from another portion of the site where vehicle maintenance (e.g., fueling, lubrication, etc.) takes place, the stormwater discharge points would not be substantially identical and both discharge points would need to be sampled.

Making a determination of whether some of your discharge points can be considered “substantially identical outfalls” would require careful consideration of Condition S3.B.5.b of the Industrial Stormwater General Permit. If you determine that some of your discharge points do not need to be sampled, the Sampling Plan in your SWPPP needs to include documentation of why each discharge point is not sampled per Condition S4.B.2.c, including:

- a) The location of which discharge points the Permittee does not sample because the pollutant concentrations are substantially identical to a discharge point being sampled.
- b) General industrial activities conducted in the drainage area of each discharge point.

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*Take time to get ready for sampling.*

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*Manhole access can be a good sample point if it can be accessed safely and the stormwater is solely from your facility. Do not climb into the manhole. Use a sample bottle attached to a pole to take the sample.*

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*Base flow here refers to any water in the ditch that is not a direct result of stormwater runoff. Ground water seepage into the ditch, for example, would add base flow.*

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c) Best management practices conducted in the drainage area of each outfall.

d) Exposed materials located in the drainage area of each discharge point that are likely to be significant contributors of pollutants to stormwater discharges.

e) Impervious surfaces in the drainage area that could affect the percolation of stormwater runoff into the ground (e.g., asphalt, crushed rock, grass, etc.).

f) Reasons why the Permittee expects the discharge points to discharge substantially identical effluents.

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### Selecting sampling points

◆ Pipes discharging your facility's stormwater offsite.

◆ Ditches carrying your facility's stormwater offsite.

◆ Manhole access to storm sewers carrying your facility's stormwater, so you can lower a sample bottle attached to a pole into the manhole. In general, manhole access on your property may be simpler and safer than access off property and more readily verifiable as carrying only your facility's stormwater.

These three types of sampling points are usually not too difficult to access and the flow within them tends to be fast enough, with enough turbulence, to allow you to collect well mixed, representative samples. In some cases, portions of industrial stormwater runoff leave a site as sheet flow. Specific approaches to sampling of pipes, ditches, manholes, grated storm drains, and sheet flow will be covered in the final section of this guide manual.

Make sure your sampling points will provide for sampling only the stormwater that comes from your facility. If the stormwater in a pipe (storm sewer) contains other discharges, move your sampling point upstream to a

point where the flow is from your facility only. Also check to see that there is no base flow in the storm sewer during dry periods. Report in your SWPPP the presence of any base flow and measure or estimate its flow rate. If it is not possible to sample only flow from your facility, document the reason for this and provide information concerning the source of the flow you are sampling.

If possible, the stormwater your facility samples should not be a mixture of your facility's stormwater with other water. Some examples of situations where a sample would be of a mixture of water sources, and you should not sample are listed below:

### Examples of mixed water sources situations in which you should not sample:

◆ **A ditch** that carries additional stormwater from properties upstream. In this case, the stormwater from your facility is mixed with other water and you should find a location or locations where only your facility's stormwater can be sampled.

◆ **A stormwater sewer** or pipe (culvert) discharges to a creek or other receiving water, the pipe being partially submerged where it discharges into the receiving water. In this case, this final discharge point will not be able to be used as a sampling point because the stormwater flow is mixed with the receiving water.

◆ **A manhole** that carries stormwater, not only from your facility but from other stormwater sources as well. If you are grabbing a sample from a manhole but from the point where a storm sewer from your facility ends at a municipal manhole, make sure that the flow in that pipe is entirely from your facility, that the pipe is not submerged or partly submerged and that you are otherwise not prevented from collecting stormwater from your facility only. If you are not sure that a storm sewer carries only flow from your facility, the

municipality may have storm sewer plans to help you determine this. Contact the municipality beforehand to discuss sampling from the manhole and associated safety issues, particularly for manholes in areas with vehicular traffic.

It is important to sample flow from only your facility if possible because otherwise it cannot be determined what the sample actually represents. If you discharge stormwater to a stormwater conveyance system that includes stormwater from other sources, you need to sample before your stormwater commingles with stormwater from other sources. However, if stormwater runs onto your property in an uncontrolled fashion (for example, sheet flow) from adjacent property, into areas of industrial activity on your site so that it becomes a part of the stormwater discharge from your site, this should be included in your sample of stormwater discharge. If you are concerned about this offsite source, you may want to sample that stormwater where it enters your property. If the results show significant pollution, you may want to provide Ecology with a narrative description of the contributing site and sample results to document the relative contribution of the other property or upstream source.

It is a good idea to observe the sampling point(s) you have chosen during actual stormwater runoff conditions to see how readily stormwater can be sampled there. Keep in mind that changing tides and flow conditions in receiving waters, including flood stages may occur during storm events. This may cause a pipe that is discharging your facility's stormwater to become submerged or partly submerged, preventing you from sampling during some conditions.

## Obtaining supplies for sampling

The supplies you will want to have on hand before sampling include:

- ◆ Sampling bottles from the lab, including a few extra of each type.
- ◆ When needed, a pole to hold sample bottles and filament strapping tape.
- ◆ Powder-free disposable nitrile or latex gloves. These are sold by medical and laboratory suppliers. Do not use powdered gloves as the powder may contain metals that could contaminate metals samples such as zinc.
- ◆ Foul-weather gear.
- ◆ One or more coolers, depending on the number of samples to be stored and transported or shipped.
- ◆ A bound notebook to serve as a field book for keeping records concerning sampling. Notebooks with waterproof pages are available for these field notes at office supply stores. The information to be included in the notes will be described in the "Keeping Records" section of this guide. You may find it helpful to create a standardized form containing the information in this as well.





# Planning Just Prior to Stormwater Sampling

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*Sample during the first 12 hours of a stormwater discharge*

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Now that the bulk of the planning for sampling is complete, there are a few things to keep in mind before deciding to actually begin sampling.

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## Being prepared

It is important to assemble everything that will be needed for the sampling event ahead of time because opportunities to sample during storm events often come with little advance notice. Complete the identification tags and Lab Services Required form. Place the tags, lab form, field notebook, permanent ink pen, meter, and pH paper in the cooler with the sample bottles. Have resealable plastic bags or other means on hand to keep the pH paper dry. If you are using a turbidity meter or pH meter, be prepared to protect them from the rain. Have foul-weather gear ready and available. It will be necessary to keep sufficient ice onsite or plan to purchase ice that day.

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## Choosing when to sample

The permit requires that you sample the discharge from each designated location at least once per quarter:

◆ 1st Quarter =  
*January, February, and March*

◆ 2nd Quarter =  
*April, May, and June*

◆ 3rd Quarter =  
*July, August, and September*

◆ 4th Quarter =  
*October, November, and December*

You will need to sample the “first fall storm event” each year. The permit defines the “first fall storm event” as the first time after October 1st that precipitation occurs and results in a stormwater discharge from the facility. Please note that you are not required to sample storm events that outside of normal business hours or in unsafe conditions.

Collect samples within the first 12 hours of stormwater discharge. If you





are not able to collect a sample within the first 12 hours, collect the sample as soon as possible. In the sampling records, keep documentation explaining why you could not collect samples within the first 12 hours.

If your facility is located in an area that is covered by a standing snow pack for days at a time during a year of normal precipitation, you may alternatively sample a snowmelt event during the winter or spring quarter.

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### **Check weather forecasts**

Keeping up with the weather forecast and planning so that sampling can be carried out on short notice are the keys to successful sampling.

Local forecasts, including televised satellite and radar images can give an indication of the expected intensity of coming storms. The National Weather Service is an excellent source of information on upcoming storms. It also includes local current radar and satellite images. Their website is: <http://www.wrh.noaa.gov/index.php>.

A number of commercial websites, such as <http://www.weather.com/> and <http://www.accuweather.com/> also provide weather information and forecasts.

When evaluating a weather forecast, consider indications of expected intensity, for example “90% chance” rather than “30% chance” and “rain” rather than “showers.” Over the telephone, National Weather Service personnel can often provide estimates of anticipated rainfall amounts. In addition to intensity, consider the predicted duration of the storm. It will be very helpful to spend time observing rain events at your site with attention to how rain intensity relates to stormwater discharges from your site, before you begin sampling.

Once the decision has been made to attempt to sample a storm event, the personnel who will be sampling should be notified and they should prepare to sample. If it does rain, they should be at the sampling sites before stormwater begins discharging so they can document the time of discharge and be ready to sample.

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*Take notes!  
Writing down  
your observations  
at the time of  
sampling is  
important.*

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# Conducting Sampling at Your Facility

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*Have your sampling kit ready to go.*

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After you have selected a storm event and it begins raining, the personnel conducting the sampling should prepare their equipment and go to the sampling site(s). They will be collecting grab samples at the sampling site(s), placing the samples in picnic coolers containing ice, and keeping notes in a field book. Sampling for the first time may require working out some difficulties, but after performing these duties once, future sampling will not be as difficult.

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## Checklist for sampling

Because stormwater sampling is not a daily part of the workload of a facility, it is a good idea to keep a checklist of things to have prepared before sampling and to do during sampling. You can make the checklist by jotting down the things you did for the first sampling event to remember for subsequent sampling events. If necessary, update this checklist based on the experience you gain with each sampling event.

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## How to fill sample bottles

This section and an illustrated appendix at the end of this guide describe how to collect a sample properly. Collecting a grab sample can be as simple as holding a bottle under the stormwater falling from a pipe and filling the bottle properly. Still, the person doing the sampling must use care in applying the principles outlined below so that the sample will be representative of the water being sampled. Additional information regarding grab sampling is available in Ecology's standard operating procedures (SOPs) for grab sampling online at [http://www.ecy.wa.gov/programs/eap/qa/Agency/ECY\\_SOP\\_GrabSampling\\_v1\\_0.pdf](http://www.ecy.wa.gov/programs/eap/qa/Agency/ECY_SOP_GrabSampling_v1_0.pdf).

## Simple principles of good grab sample collection:

- ◆ **Wear disposable powder-free gloves** when sampling.
- ◆ **Grab samples with the stormwater entering directly into bottles** supplied by your lab rather than by transferring the samples from a container that may not be clean. Metal contamination of ordinary containers is common and household detergents often contain phosphorus, a tested parameter for some industries. Again, transferring the sample from another container is not an option for TPH samples under any circumstances.
- ◆ **When holding the sample bottle** your lab has provided, keep your hands away from the opening in order to prevent contaminating the sample.
- ◆ **Always hold the bottle with its opening facing upstream** (into the flow of water) so that the water enters directly into the bottle and does not first flow over the bottle or your hands.
- ◆ **Sample where the water has a moderate flow** and, if possible, some turbulence, so that the stormwater discharge will be well-mixed and the sample will be representative. Sampling in still water should be avoided. Include in your field book a note about the sample location and how briskly the water appears to be moving.
- ◆ **Sample from a central portion of the stormwater flow**, avoiding touching the bottom of channels or pipes so as not to stir up solid particles.
- ◆ **Do not rinse or overfill the bottles.** The bottles supplied by your lab for some parameters (ammonia and phosphorus) will include small

amounts of liquid preservative (generally a few drops). Fill the bottle to about ½ inch of the top (not quite full) to ensure that no preservative is lost.

◆ **As soon as the sample is collected**, cap the bottle and label it. It is important that the bottles are labeled correctly so that the lab will be able to identify samples by sample site and ensure proper preservation for each parameter. It is a good idea to place sample bottles in reclosable bags. Place the samples in a picnic cooler partially filled with ice. Plan to maintain ice in the picnic cooler until the samples arrive at the lab. Remember to make certain that the samples will be delivered to the lab soon enough for the lab to meet holding times.

#### **TPH sampling raises additional concerns:**

◆ **Oil and grease floats on water** so TPH sampling requires special attention. TPH samples must be collected directly into the sample bottles supplied by the lab because oil and grease tends to stick to the sides of containers. Do not rinse the sampling bottles beforehand or pour the sample from another container. Do not fill the bottle completely and do not pour out some of the sample if the bottle is overfilled by mistake. If you do overfill a bottle, use a new bottle instead to collect your sample. Because you only get one try at filling a TPH bottle, it is a good idea to have plenty of extra bottles on hand.

◆ **TPH samples should be collected** as the stormwater falls from a pipe or from a running, turbulent stream of flow when possible so the source will be well mixed. When the samples must be collected from a water surface, the person holding the bottle should plunge it below the surface in a sweeping arc and then bring it upwards through the water surface again, so the water surface is broken twice by the mouth of the bottle. Be

sure to note in your field book how you collected your samples as this is especially important for the TPH sample.

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#### **Keeping records**

Section S9 on page 37 of the general permit specifies requirements for reporting and recordkeeping. In order to comply with the requirement that lab reports include sampling date and sampling location, you will need to supply this information to the lab when submitting samples. You can do this by using the sample location as the field station identification on your labels or sample tags.

You should purchase a notebook for use in the field. Water resistant “rite in the rain” notebooks serve the purpose well.

Section S4.B3 on page 22 of the permit requires that you record the date, exact place, method, time of sampling or measurement, and the name of the individual who performed the sampling or measurement (the section also specifies some requirements for lab recordkeeping). Record following information for each stormwater sample taken and make it available for Ecology review:

- a) Sample date.
- b) Sample time.
- c) A notation describing if the Permittee collected the sample within the first 12 hours of stormwater discharge events.
- d) An explanation of why the Permittee could not collect a sample within the first 12 hours of a stormwater discharge event, if it was not possible.
- e) Sample location (using SWPPP identifying number).
- f) Method of sampling, and method of sample preservation, if applicable.
- g) Name of the individual who performed the sampling.

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*Take notes! Writing down your observations at the time of sampling is important.*

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*Get the best sample you can.*

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Although not required, it would also be beneficial to record the following information:

- ◆ Weather preceding the sampling event:
  - how many days/weeks/months since last significant rainfall.
  - estimate of time it began raining.
  - estimate of time that discharge began at the sampling point.
  - amount (inches) and/or intensity of precipitation.
  - whether discharge includes ice or snowmelt runoff.
- ◆ How you collected the sample, example, “from a ditch by hand” or “from a manhole with the bottles on a pole”.
- ◆ The number and types (parameters) of samples collected.
- ◆ Field measurement results, such as pH or visible oil sheen.
- ◆ Any unusual circumstances that may affect the sample results.

Entries in the field book should be made with ink. If you make an error in the field book, cross it out rather than whiting out or erasing. Number the pages of the field book consecutively. To ensure that the bound field book is a complete record, do not rip pages from it.

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**When the sampled storm doesn't meet the required criteria**

There may be times when, despite your best efforts, you are unable to collect grab samples during the first 12 hours of a storm event. When this happens, the general permit states that the permittee must still collect and submit a stormwater sampling result, and must include an explanation with the sampling records (e.g., record in field notebook).





# Special Sampling Considerations

Safety should be the primary consideration in sampling. Samples should never be collected in a way that compromises the safety of the sampler. In cases where there is a physical hazard, such as a trip hazard or when sampling near deep water bodies, samplers should work in pairs. Do not wade in water where the estimated depth in feet times the velocity in feet per second is equal to or greater than 8, as swift currents can lead to drowning accidents. Be aware of the slip hazard common near the banks of water bodies and decide whether a bank is too steep to negotiate safely. Safety comes down to individual judgment. Never put yourself in a position you consider to be unsafe. Collecting grab samples of stormwater is basically a simple process but an important one since getting good results depends on proper sampling. Samples can be collected easily in some locations, but not all stormwater discharges are as readily sampled as the flow in a ditch or from a pipe falling into a receiving water. Below are some situations you may encounter and suggested approaches for handling them. Because TPH samples must be collected directly into the bottle supplied by the lab we will consider only methods for collecting samples directly by hand or with a bottle attached to a pole. When sampling in these or other situations, keep in mind the steps outlined in the section, *How to Fill Sample Bottles*. Additional information is available in Ecology's standard operating procedures (SOPs) for stormwater sampling available online at <http://www.ecy.wa.gov/programs/eap/quality.html>.

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## Sampling as stormwater discharges from a pipe into a receiving water

If stormwater is being discharged from your facility through a pipe into a ditch, creek, or other receiving water, it can be readily sampled as it falls from the pipe before it reaches the receiving water if the discharge pipe is safely accessible and not submerged. Hold the bottles with the bottle opening facing upstream into the flow and be sure not to overfill them. You may need to fasten the collection bottles to a pole to reach the pipe. Attaching a bottle to a pole is described in the section below, *Sampling from a Manhole*.

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## Sampling from a manhole

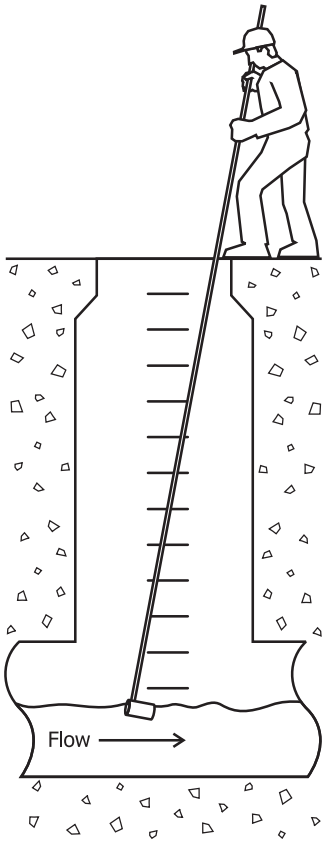
When sampling from the manhole of a municipal storm sewer, remember to contact the municipality beforehand. Be sure to discuss safety concerns when talking to the municipality about sampling. Open a manhole with a hook or pick axe, exercising care not to drop the manhole cover on hands or feet. **You should not, under any circumstances, enter the manhole unless trained to safely enter confined spaces**, but you can sample the flow in a manhole from above ground by taping the sampling bottles, one at a time, to a pole and lowering the pole into the manhole.

Each bottle can be fastened to the pole by holding the bottle against it and wrapping tape tightly around the bottom and the top of the bottle as you hold the bottle firmly to the pole. Filament strapping tape works well for this purpose as it is waterproof and strong. If the flow in the storm sewer is shallow, the bottle may have to be positioned horizontally with the bottle's opening somewhat higher than its bottom. When sampling in a manhole, be

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*Don't take risks.  
Know how to  
sample safely.*

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When sampling from a manhole, use a pole to safely sample from above ground. Avoid touching the sides of the manhole or pipes with the bottle to prevent contamination. Place the opening of the bottle upstream so that the flow enters the bottle directly.

careful not to scrape the bottle against the sides of the pipe to avoid picking up extras solids in your sample.

Collecting into bottles for TPH samples with a pole is done by plunging the bottle on the pole below the water surface and back upwards. This must be done as a single motion and only once. Because you only get one try at getting a good TPH grab sample, it may take some practice and extra bottles to collect the amount of sample you need without overflowing the bottle.

Collecting samples, other than TPH, into bottles with preservative can be done by quickly plunging the pole into the flow repeating if necessary until the bottle is most but not all of the way full. If you overflow the bottle, remove it, tape a clean bottle to the pole, and try again. Be sure, when collecting samples with a pole, to follow clean principles by keeping the pole downstream of the bottle while sampling.

### Sampling from a drainage ditch or swale

If a drainage ditch carries stormwater flow from your facility offsite, and if it carries no flow other than the flow from your facility, you can sample the water in the ditch simply by placing the bottle where the flow is free, with the bottle opening facing upstream. If you cannot reach a freely flowing portion of the ditch by hand, you may need to attach the bottles, one at a time, to a pole for sampling. Follow the procedure outlined in the section, *How to Fill Sample Bottles*.

If the flow is carried in a small ditch or swale, you can install a barrier device in the channel or deepen a small area so you can gain enough depth of flow to sample directly into the bottles. Make sure to allow for sufficient time after disturbing the bottom so that the solids resulting from muddying the water will not become part of your sample.

### Sampling sheet flow

It is not always possible to sample stormwater runoff in locations such as ditches or pipes where the flow is concentrated. Sometimes the permittee has no choice but to select sample locations for which sheet flow is sampled before it becomes concentrated. Approaches to sampling sheet flow are described below and illustrated in the figures that follow.

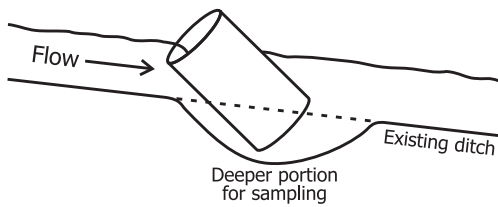
In some cases, a stormwater discharge from a facility is not concentrated at any point and leaves the property in the form of sheet flow as it runs off a work area or driveway or grassy area. In this case the flow may be too shallow for the collection bottle to be filled with sample. It is often possible to find a way to collect the stormwater runoff in these situations.

One way to concentrate sheet flow is to install a barrier device or trough, gutter, or ditch to intercept and concentrate stormwater flow. As with other sample sites, the flow should be moving and somewhat turbulent so the samples will be well-mixed. Be sure that any excavation you do does not expose the stormwater to be sampled to newly worked soil surfaces that the runoff may erode, increasing the solids in your samples. You may want to consider lining the trough, gutter, or ditch with plastic. Be sure not to introduce materials such as metals that include zinc that may contaminate the samples. Sheet flow on paved areas can be concentrated and collected by constructing small bumps, similar to speed bumps.

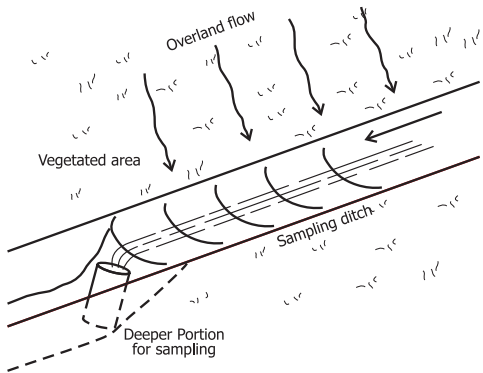
Another way to collect samples from sheet flow is to use a special peristaltic hand pump to pump samples from shallow surface flows. This method is of limited use for collecting the samples required by the general permit as it cannot be used to collect TPH samples.

Roger Bannerman of the Wisconsin Department of Natural Resources has developed simple devices to grab samples of sheet flow from paved areas, rooftops, and lawns. Though the devices are intended to be used for simple, automatic sampling, pouring a container of collected sample into other sample bottles, the ways in which they intercept and concentrate flows can be adopted for direct grab sampling.

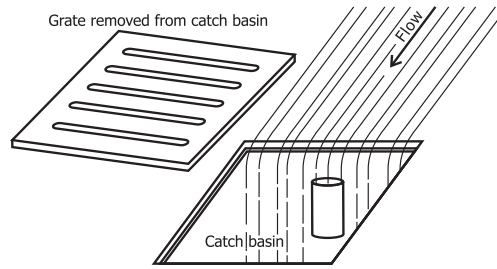
The following figures illustrate the methods of sampling sheet flow discussed above:



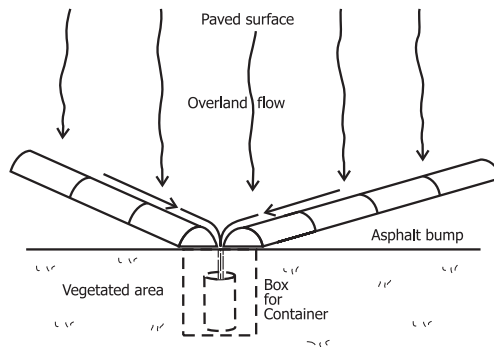
*Deepening an existing ditch can allow samples to be collected directly into bottles in some cases. Be careful not to stir up solids from the sides or bottom of the ditch.*



*Overland flow from vegetated areas can be sampled by constructing a shallow ditch to intercept the runoff and a deepened area to place bottles to catch the runoff.*



*Runoff entering a catch basin can sometimes be collected directly into bottles by removing the grate and allowing the runoff to fall into the bottles.*



*Overland flow on paved areas can be sampled by constructing asphalt or concrete bumps to collect and concentrate the flow. A box positioned below ground surface in the paved area or the edge of an unpaved area can provide a place to collect samples directly into bottles. Please note that dirt and other debris can often build up along the bumps and in the “v” so, you may want to clean the area prior to taking the sample.*

### Sampling from a stormwater detention pond or other BMP

When stormwater from a facility discharges after flowing through a detention pond or other treatment system, sample as the stormwater flows out at the discharge point. Ponds may hold stormwater for a time before discharge begins. Sample within the first 12 hours from when the pond begins to discharge.

# Ecology Wants to Hear from You

If you have suggestions on how Ecology can improve this guidance document, have developed innovative sampling techniques, or just want to comment on stormwater sampling, please contact the appropriate permit administrator for your county:

◆ *City of Seattle, Kitsap, Pierce, or Thurston County*

**Josh Klimek**  
360-407-7451  
jokl461@ecy.wa.gov

◆ *Island, King, or San Juan County*

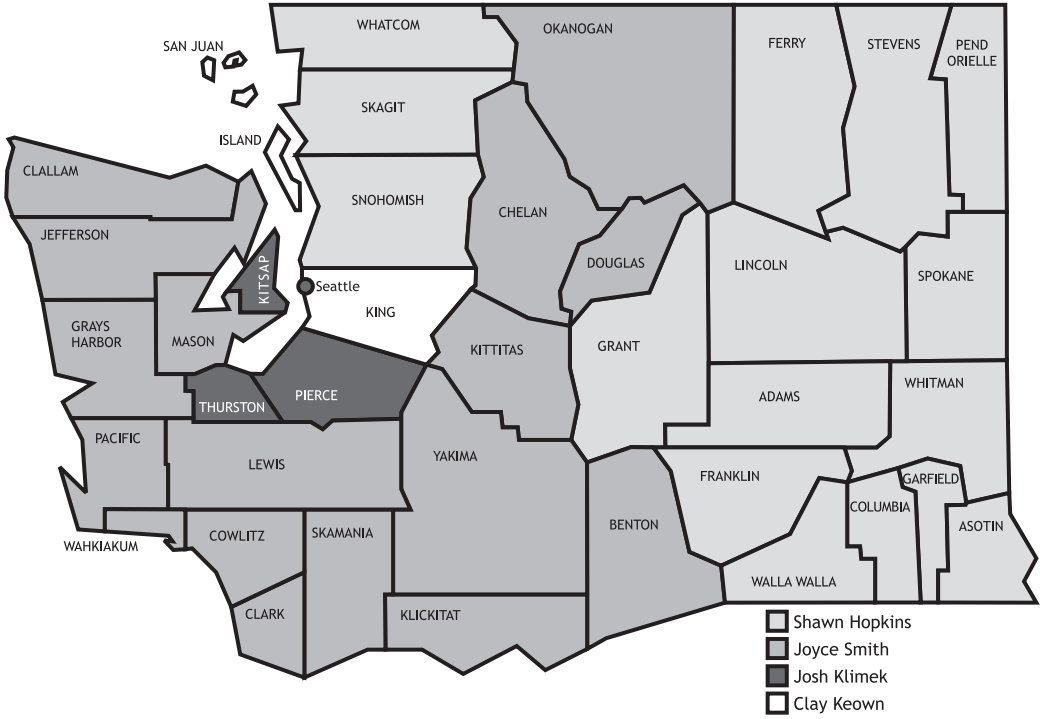
**Clay Keown**  
360-407-6048  
ckeo461@ecy.wa.gov

◆ *Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Skagit, Snohomish, Spokane, Stevens, Walla Walla, Whatcom, or Whitman County*

**Shawn Hopkins**  
360-407-6437  
shop461@ecy.wa.gov

◆ *Benton, Chelan, Clallam, Clark, Cowlitz, Douglas, Grays Harbor, Jefferson, Kittitas, Klickitat, Lewis, Mason, Okanogan, Pacific, Skamania, Wahkiakum, or Yakima County*

**Joyce Smith**  
360-407-6858  
josm461@ecy.wa.gov





# Appendix - Proper and Improper Methods of Sampling



*DO always wear gloves when taking samples.*



*DO NOT touch openings of bottles. Keep bottles clean to prevent contamination.*



*DO NOT sample in stagnant areas with little flow. DO NOT stir up bottom sediments or allow foreign materials to enter the sample bottle. (DO be careful to grab a clean sample in cases where stormwater runoff is shallow.) If the runoff is so shallow that it is not possible to sample without the sample being contaminated in the process, then find an alternative way to sample.*



*DO NOT allow bottle lids to touch ground. Keep lids clean to prevent contamination.*



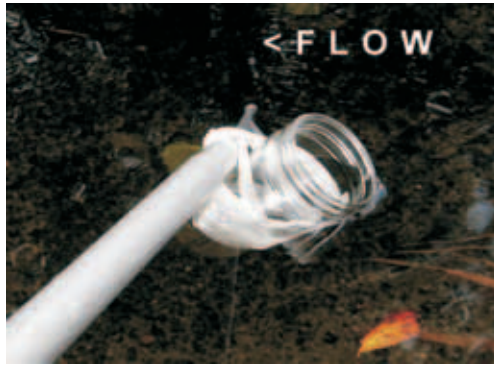
*DO attach a bottle to a pole for sampling in manholes or when a hand sample would be in stagnant water. A boathook is used in this example and the bottle is attached to it with filament strapping tape.*



*If the water is too shallow to sample with the bottle upright on the pole, try taping it on sideways, but tilted up slightly.*



**DO NOT** sample with the bottle opening facing downstream, when using a pole or sampling by hand. Water flowing past your container, pole, or hand and into the container can be contaminated by such contact.



**DO** sample with the opening of the bottle facing upstream, into the flow so the water will enter directly into the bottle. This is true when sampling either by hand or with a pole. **DO** sample water that is rapidly flowing rather than stagnant.



**DO NOT** allow water to overfill the bottle, particularly not for sample bottles with preservative. TPH samples should be collected from water falling into the bottle when possible, or otherwise in a single swoop.



**DO** collect samples without overfilling the bottles.

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