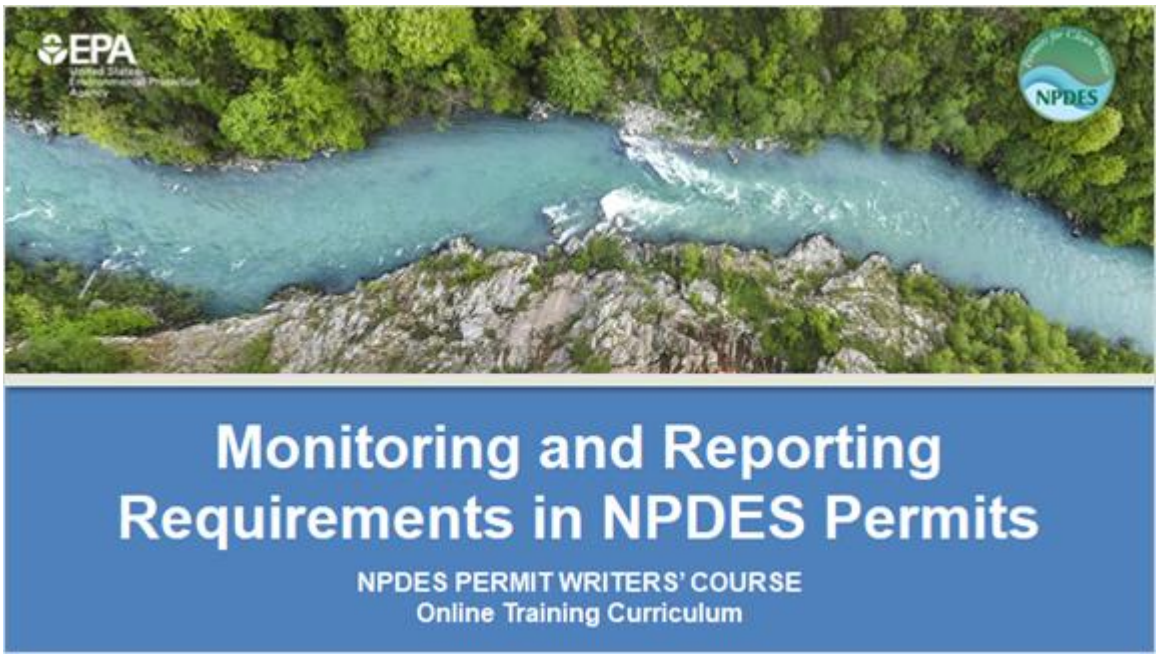
Monitoring and Reporting Requirements in NPDES Permits

1. NPDES Permit Writers' Course Online Training Curriculum

1.1 Monitoring and Reporting Requirements in NPDES Permits



Notes:

Hello, and welcome to this presentation on monitoring and reporting requirements in National Pollutant Discharge Elimination System, or NPDES, permits.

This presentation is part of a Web-based training series on the NPDES program sponsored by the Environmental Protection Agency's Water Permits Division.

We'll get started with our presentation in a moment, but first I will introduce our speakers and cover one important housekeeping item.

1.2 Presenters

Notes:

Your speakers for this presentation are David Hair, an environmental engineer with the Water Permits Division of USEPA in Washington, DC, and me, Greg Currey, an environmental engineer with Tetra Tech, Incorporated in Fairfax, Virginia.

Now for our housekeeping item. I need to tell you that all the materials used in this presentation have been reviewed by USEPA staff for technical accuracy; however, the views of the speakers are their own and do not necessarily reflect those of USEPA. NPDES permitting is governed by the existing requirements of the Clean Water Act and USEPA's NPDES implementing regulations. These statutory and regulatory provisions contain legally binding requirements. The information in this presentation is not binding. Furthermore, it supplements, and does not modify, existing USEPA policy, guidance, and training on NPDES permitting. USEPA may change the contents of this presentation in the future.

Dave, how about you starting us off by taking a look at the purpose of monitoring and reporting requirements in NPDES permits.

1.3 Purpose of Monitoring

Notes:

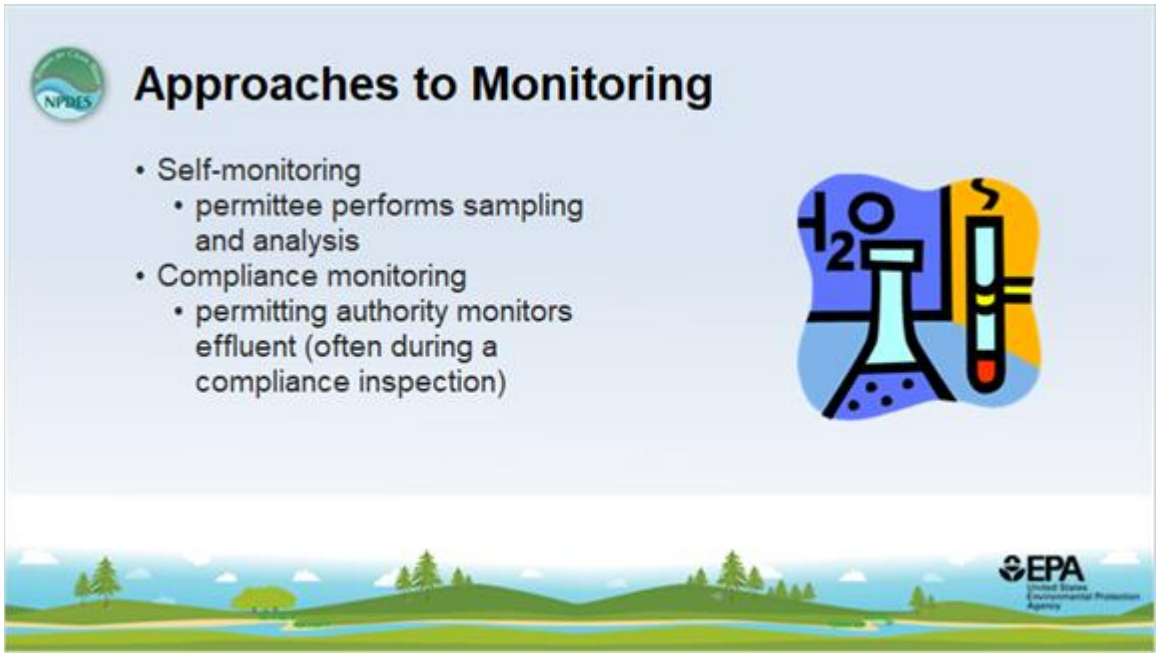
Let's begin this presentation by answering a fundamental question: Why are permittees required to monitor and report?

Well, first, because the regulations say so. 40 CFR 122.44(i) states that permits must contain monitoring requirements to assure compliance with permit limitations including the mass (or other measurement specified in the permit) of each pollutant limited in the permit, the volume of effluent discharged from each outfall, and other measurements, as appropriate.

In effect, we require monitoring of pollutants limited in the permit so that the permittee can demonstrate compliance with its limits. Hopefully, that's the case; however, if the monitoring demonstrates noncompliance, then the data can be used as the basis for an enforcement action.

In addition to compliance assessment, monitoring can also serve to provide data for the permitting authority or the public regarding treatment efficiency and to more accurately characterize the effluent for the permit reissuance process.

1.4 Approaches to Monitoring



Notes:

There are two basic approaches to NPDES monitoring: self-monitoring and compliance-monitoring. Self-monitoring, as the name implies, is performed by the permittee, while compliance monitoring usually refers to monitoring performed by the permitting authority.

If there were an unlimited budget, and the monitoring was approached like an experiment, a permitting authority might choose to collect all of the data itself as part of its oversight responsibilities or have all monitoring performed by an impartial third party who's sole purpose is to collect data. However, as we're all, aware, there is not an unlimited budget.

Consequently, we generally rely on the permittee to self-monitor its discharge and self-report on its compliance status.

Because most of the monitoring is done by the permittee, and the permittee is not an impartial third party, some problems can arise. For example:

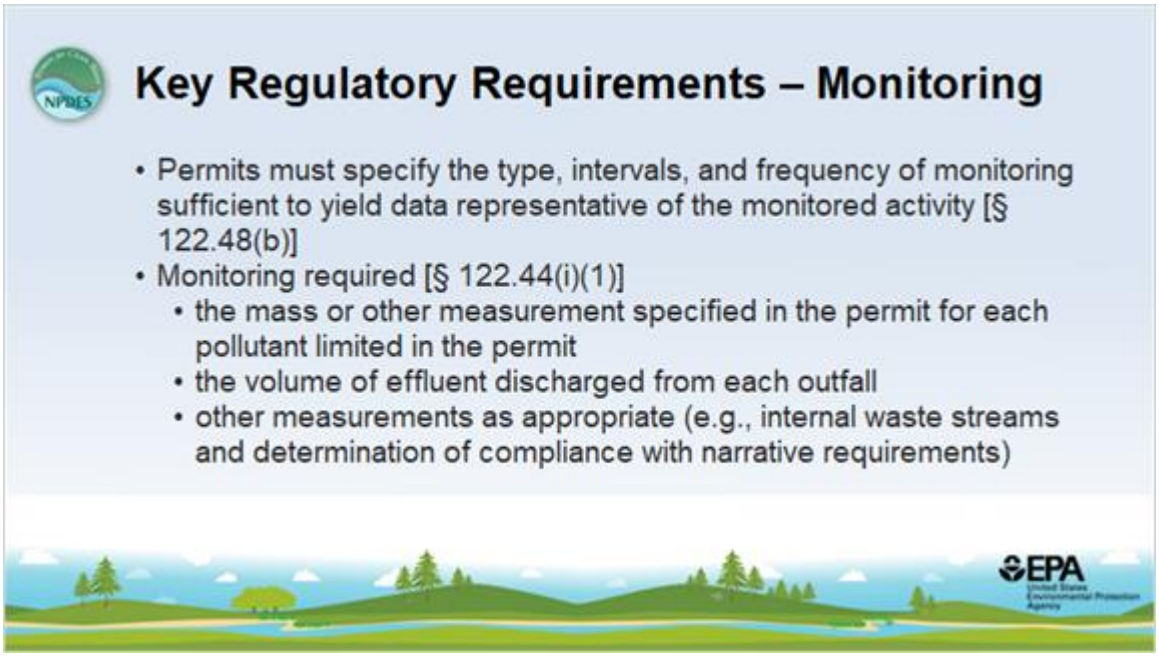
- improper sample collection procedures (such as lack of sample preservation);
- improper or poor analytical techniques;
- collecting samples only on the best discharge days;
- transcription errors; or
- falsification of records.

We try to minimize these potential problems by establishing clear, precise, and detailed monitoring and reporting

conditions in NPDES permits, and ensuring that permittees document and comply with these requirements.

In addition, the permitting authority occasionally performs compliance monitoring to independently assess the permittee's self-monitoring efforts, and to demonstrate a regulatory presence that may help deter violations.

1.5 Key Regulatory Requirements – Monitoring



Notes:

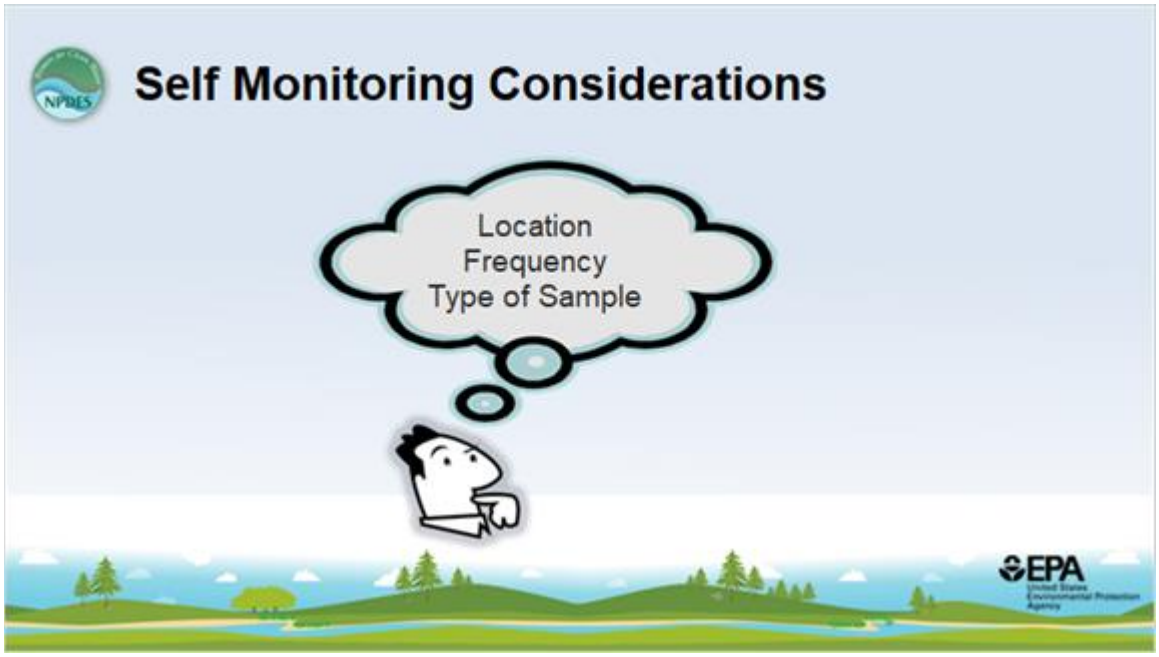
With respect to establishing the self-monitoring requirements in NPDES permits, there are several regulatory provisions that permit writers will need to consider.

First, 40 CFR 122.48(b) requires that permits must specify the type, intervals, and frequency of monitoring sufficient to yield data representative of the monitored activity.

Second, 40 CFR 122.44(i)(1) requires that the permit include monitoring for every pollutant limited in the permit, the volume of effluent discharged from each outfall, and other measurements as appropriate.

As you can see, these provisions provide a lot flexibility to the permit writer to decide the specific monitoring conditions to include in the permit. However, the regulations are very clear that some monitoring must be required for all regulated pollutants, and that permit writers need to explicitly establish these requirements in the permit.

1.6 Self Monitoring Considerations

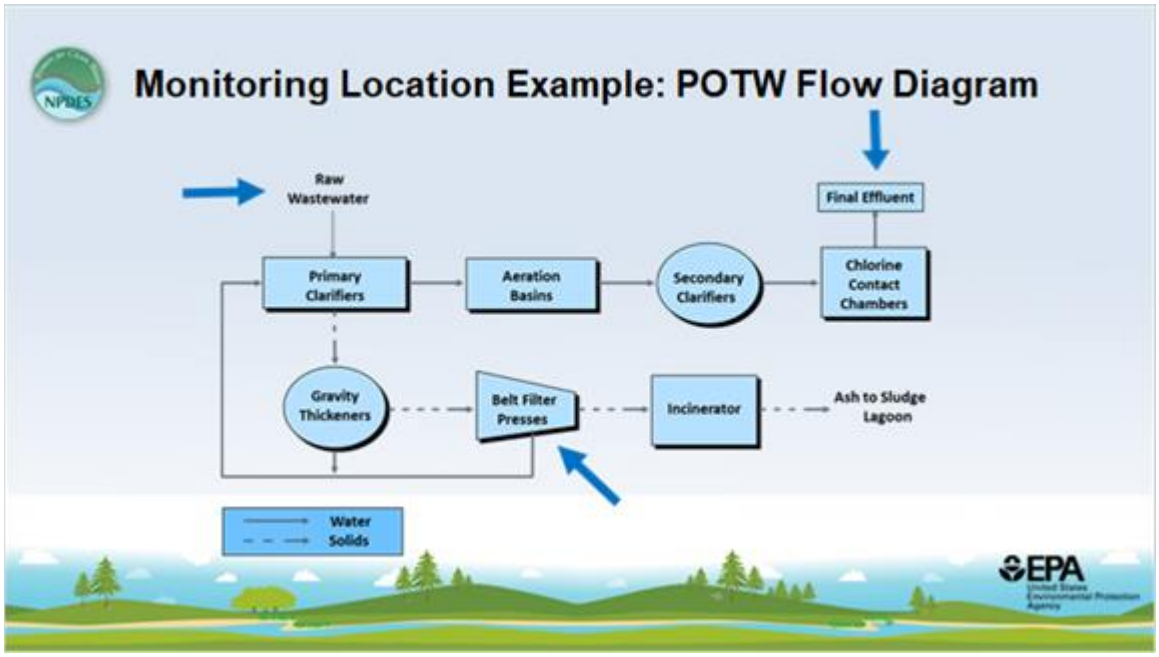


Notes:

Let's take a look at the factors a permit writer should consider when developing specific self-monitoring terms and conditions.

The three most important considerations are listed on this slide: location, frequency, and sample type. Each of these factors is important to the permit writer's decision, so in the next few slides we'll take a closer look at each with respect to both a POTW and an industrial discharger.

1.7 Monitoring Location Example: POTW Flow Diagram



Notes:

First, let's consider the monitoring locations that might be established in the permit for a publicly-owned treatment works or POTW, as depicted on this slide.

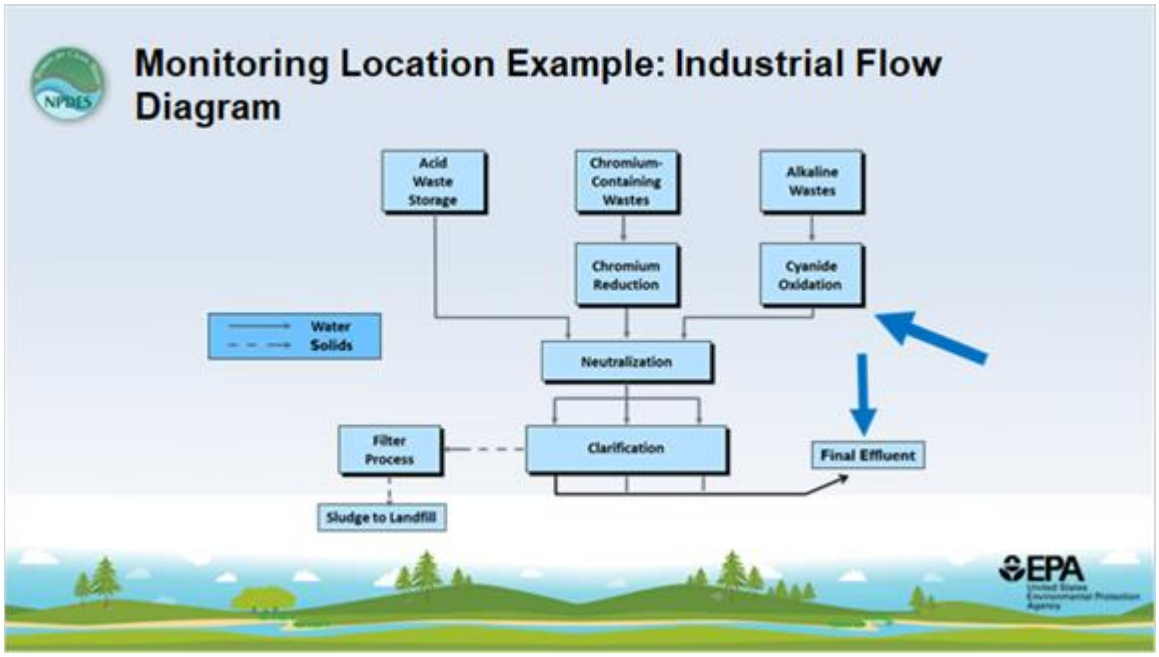
What monitoring locations might be necessary to assess compliance with both technology- and water quality-based effluent limits?

Well, certainly we would need to monitor the final effluent for any pollutants limited in the permit. However, the permit writer may need to consider the characteristics of the pollutants to be monitored and the configuration of the treatment units in making decisions about where to monitor. For example, it may be more appropriate to monitor different pollutants at different locations due to the arrangement of treatment units, the location of chemical additions or recirculation flows, and physical constraints to accessibility.

For most POTWs, the permit should also require influent monitoring to determine compliance with the percent removal requirement established by the secondary treatment standards in 40 CFR Part 133. Influent monitoring may also be necessary to determine toxics loadings at the influent for pretreatment local limits development.

Finally, many NPDES permits for POTWs will require monitoring of the sewage sludge to assess compliance with biosolids use and disposal standards.

1.8 Monitoring Location Example: Industrial Flow Diagram



Notes:

Now let's take a look at where we might establish permit monitoring locations for a non-POTW, or industrial, facility. To determine appropriate monitoring locations, the permit writer should consider the basis of all permit limitations established in the permit and whether the underlying technology and water quality standards impose any special requirements with respect to where monitoring should be conducted.

With that in mind, where might the permit writer establish monitoring locations for the facility described in the schematic on this slide?

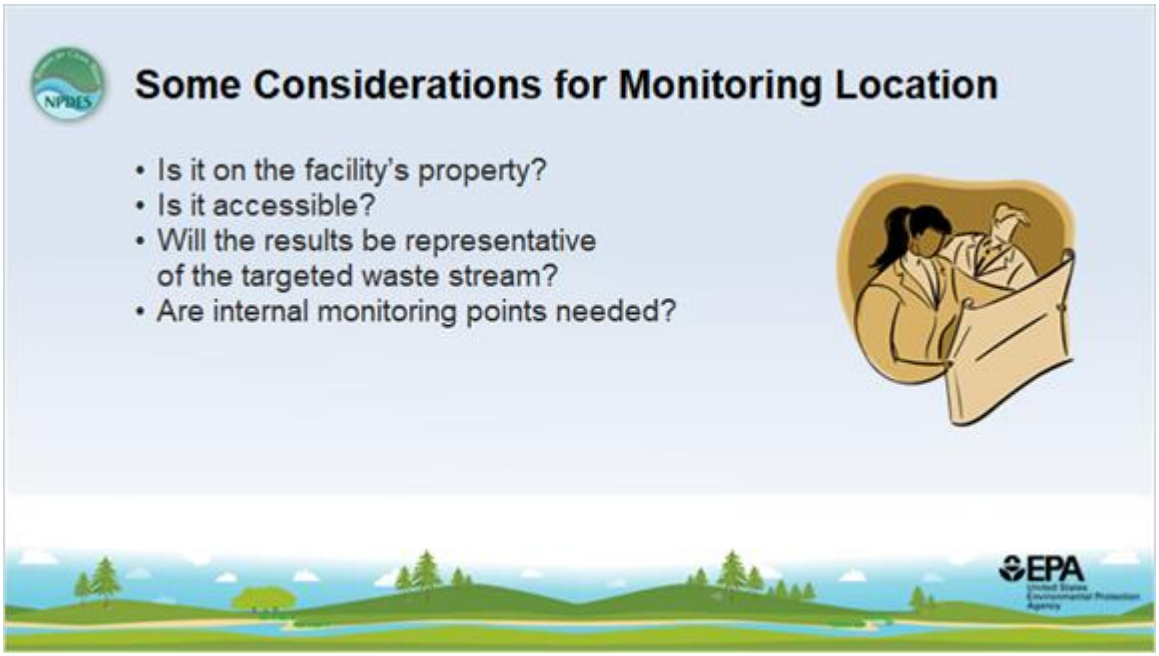
Well, certainly we would need to require monitoring of the final effluent. As we noted previously, effluent monitoring is nearly always required to assess compliance with end-of-pipe technology- or water quality-based effluent limits.

Do we need to require monitoring of the influent to the industrial process? In this case, probably not. There are no technology-based requirements for percent removal across non-municipal treatment plants. However, if the facility has applied for an intake credit adjustment for technology-based effluent limits, then influent data will likely be needed.

What about monitoring at internal outfalls? Well, perhaps. In this particular example (which depicts a facility subject to the Effluent Limitation Guideline for the Metal Finishing Industry-40 CFR Part 433), the guideline specifically requires compliance with the cyanide limit immediately following cyanide oxidation and before mixing with other waste streams. In this case, the permit writer could apply the limit and establish a monitoring requirement at this internal outfall. Specifically, the regulations at 40 CFR 122.45(h) allow monitoring to be required at internal outfalls when monitoring of the final effluent is impractical or infeasible (for example, the outfall is under water or dilution with non-process waste streams make determination of compliance with an effluent guideline-based limit

impossible.)

1.9 Some Considerations for Monitoring Location



Notes:

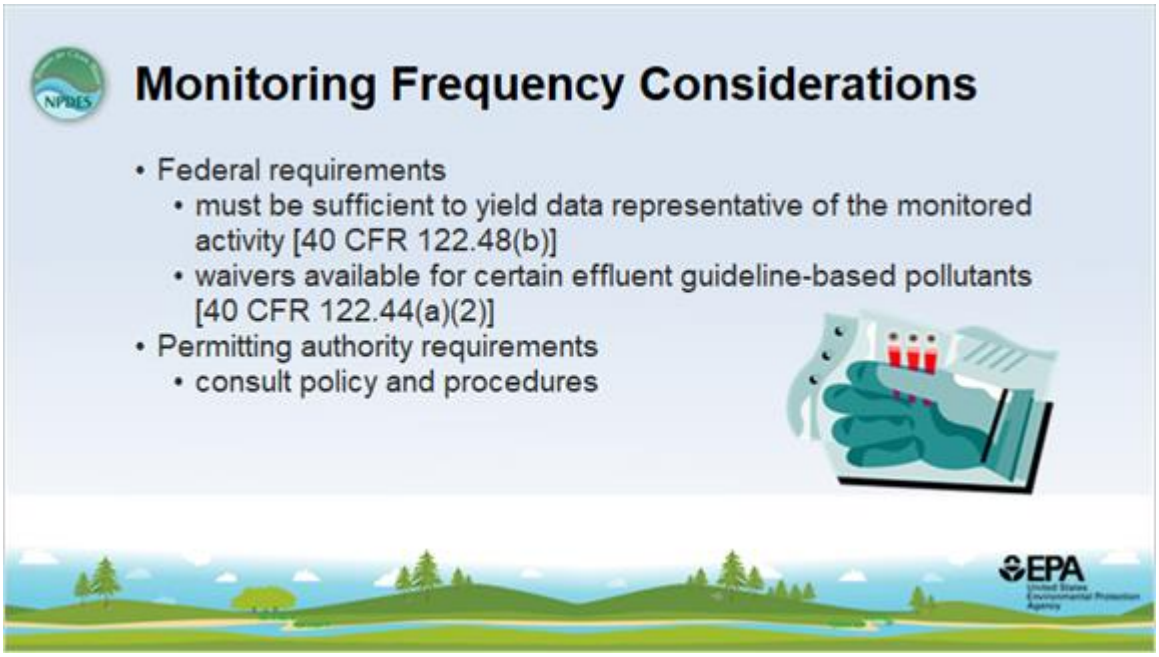
The monitoring location, or locations, specified in an NPDES permit can also be affected by other considerations, some of which are listed on this slide.

The permit writer must be sure that the prescribed monitoring location is accessible to the permittee and to the permitting authority. Ideally, the location would be secure and within the facility's control to prevent tampering, but would also provide easy access to the permitting authority so that it could collect compliance monitoring samples without undue restrictions.

The monitoring location must also be representative of the regulated process for which the limits have been developed. For example, if the effluent limit was calculated to restrict the total amount of a pollutant authorized to be discharged by the entire combined flow for the facility, then the monitoring location must reflect the total facility flow. In this case, if the monitoring location preceded the final effluent discharge point (in other words, before all the regulated flows had combined) then it would not be consistent with the calculated limit. The bottom line is that the point where the limit applies and the point where monitoring is required must be the same. If not, then the data can't be used to assess compliance with the limits.

Our last point here is that the permit writer may need to consider whether an internal monitoring point will be necessary. As we just mentioned, 40 CFR 122.45(h) allows internal monitoring points to be established when needed to determine compliance with a standard or in cases where setting an "end-of-pipe" monitoring location is not feasible.

1.10 Monitoring Frequency Considerations



Notes:

The next question to consider is "What sampling frequency should we require in the permit for each pollutant?"

As we noted on a previous slide, the NPDES permitting regulations at 40 CFR 122.48(b) require that the frequency of monitoring be sufficient to yield data representative of the monitored activity.

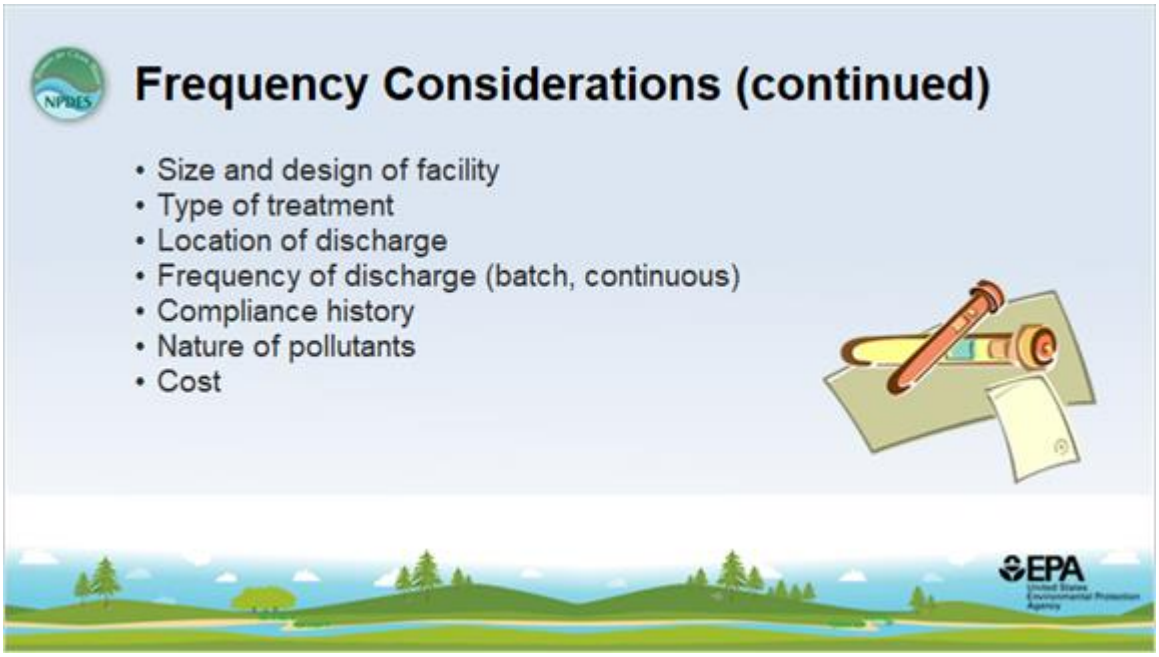
Beyond this basic requirement there isn't much federal guidance regarding what frequencies might be appropriate; however, many states, tribes, and territories have guidelines or requirements that specify monitoring frequencies based on type of discharge or flow.

We also need to note here that there is a monitoring waiver available for certain pollutants. Specifically, 40 CFR 122.44(a)(2) allows applicants to request a waiver from monitoring certain pollutants limited in a permit where a limit is included solely due to a requirement in an effluent limitation guideline. To obtain a waiver:

- the discharger must request the waiver at the time of permit application;
- the discharger must demonstrate that the pollutant is not present in the effluent, or is there only at background levels; and
- the permit writer must include the granting of a waiver as part of the permit.

We should also note here that, although the monitoring requirement is waived, the permitting authority must still include the enforceable effluent limit in the permit.

1.11 Frequency Considerations (continued)



Notes:

As I mentioned, there's not a lot of federal guidance on establishing monitoring frequencies, but the *NPDES Permit Writers' Manual* does include some factors for consideration in making the case-by-case determination. These factors include:

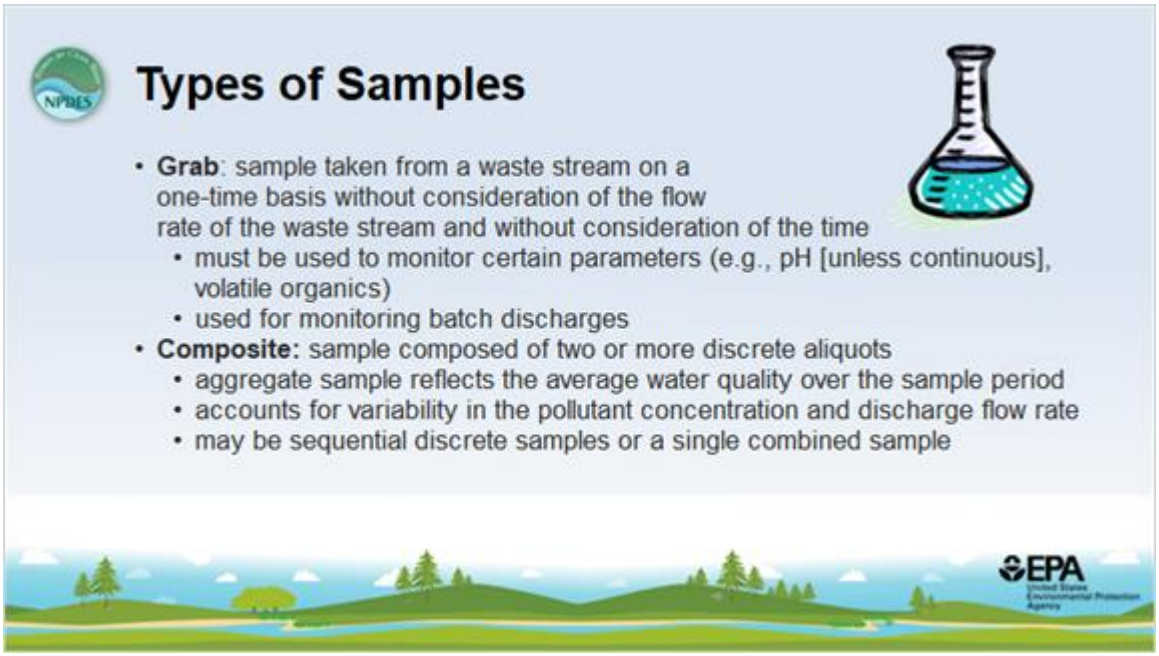
- *The size and design of the facility*. In general, the larger the facility and its effluent discharge, the more frequently you might require monitoring. This tracks the concept that a larger facility has potential for greater impact on the receiving water, and so might require more scrutiny.
- *The type of treatment*. If the technology is new and not yet proven, more monitoring might be required until a track record is established. Also, if past history indicates the treatment system is prone to upset, then more frequent monitoring may be appropriate to identify and characterize these upsets.
- *The location of discharge*. If the discharge is to sensitive waters, or if the receiving water is effluent dominated, then more frequent monitoring may be warranted.
- *The frequency of discharge*. If a discharge is batch or episodic rather than continuous, then the monitoring frequency requirements in the permit should account for these unique circumstances. Even for continuous discharges, the duration and frequency of the facility discharge could vary, perhaps seasonally. If this is the case, permit monitoring requirements might be adjusted accordingly.
- Permitting authorities often consider a facility's *compliance history* in the monitoring determination as well. A poor compliance history may result in increased monitoring frequencies, while a good compliance history may lead to decreased monitoring.
    - We should note here that EPA has published guidance that addresses reducing monitoring frequency where a facility has demonstrated consistent compliance. The April 1996 document is called *Interim Guidance for Performance-Based Reductions of NPDES Permit Monitoring Frequencies* and is available in the publications section of EPA's NPDES web site. This guidance provides a statistical approach for assessing

monitoring frequencies based on compliance history and performance on a parameter-by-parameter basis.

- Next on our list is the *nature of pollutants* being monitored. In some cases, it may be appropriate to require more frequent monitoring for toxic pollutants, particularly where sensitive species are present or human health protection is of concern. This goes back to the idea of the potential for the discharge to impact water quality.
- Lastly, permit writers should be aware that monitoring does impost a cost on the discharger. While this is a factor, it should not limit the decision to obtain data necessary to properly characterize the permitted activity.

OK, that wraps up our discussion of monitoring frequency considerations. Greg, why don't you take over and tell us about permit requirements for sampling techniques.

1.12 Types of Samples



Notes:

Thanks, Dave.

The next thing we need to consider is the type of sample that is required or most appropriate for each limited pollutant.

There are three types of monitoring or sampling techniques that we want to discuss: grab, composite, and continuous monitoring.

To provide an analogy, you can think of a grab sample like taking a snapshot or maybe a very short video clip, while a composite sample is like taking a series of snapshots or videos over a day, and continuous monitoring is similar to using a surveillance camera.

Let's consider grab samples. A grab sample is an individual sample collected over a period of time that is not to exceed 15 minutes and without regard to the flow rate of the discharge or when the sample is taken.

There are a few situations where we need to use grab samples.

First, there are certain pollutants which must always be monitored using grab samples. These generally are pollutants that will be affected by the compositing process or that can degrade or change quickly, such as pH, temperature, oil and grease, total phenols, cyanide, total residual chlorine, fecal coliform, and volatile organic compounds.

Grab samples also can be used for continuous discharges when the flow and nature of the pollutants are not likely to vary significantly or for episodic or batch discharges where the concentrations tend to not vary over time.

Now let's consider composite samples.

A composite sample should be required if we would expect significant variation in the discharge over the sampling period. This variation could be either in the flow or in the concentration of the pollutants in the discharge or both. Given this variation, the composite provides more a representative picture of the discharge over time than we would obtain from a single grab sample.

Composite samples might be taken as discreet sequential samples or as one large single combined sample.

The next slide shows pictures of two types of composite samplers that help to give us an idea of how composite sampling works.

1.13 Composite Samplers

Notes:

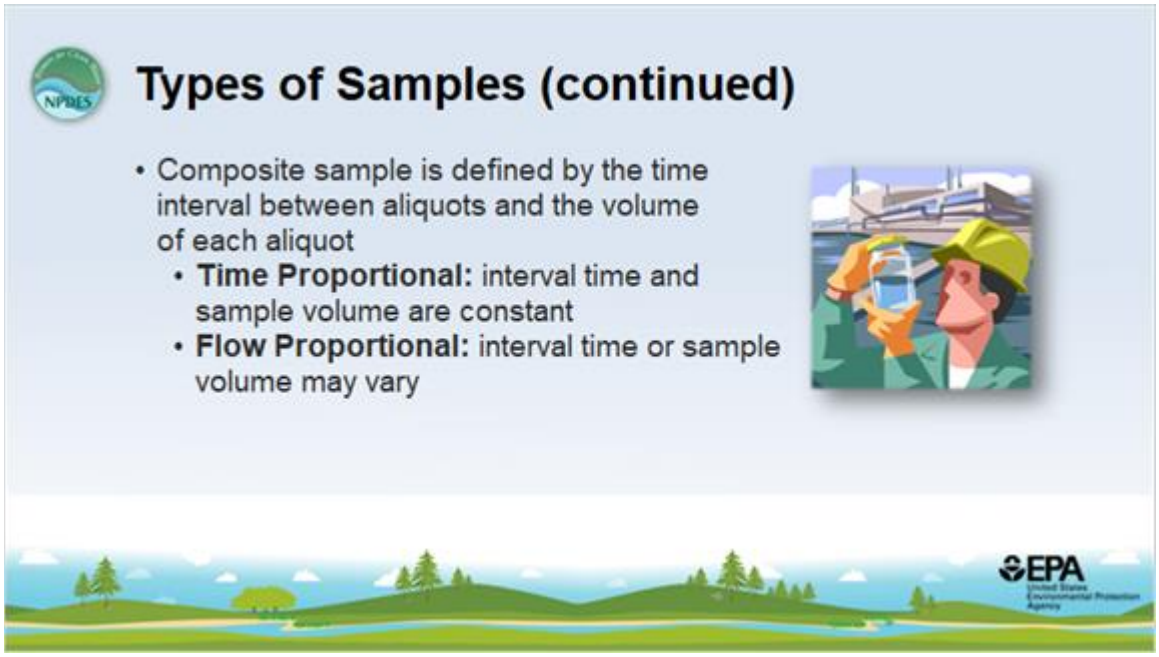
On the left is a picture is of a discrete composite sampler.

Notice that there are 24 individual sample bottles. By taking individual aliquots over the course of the sampling period, this type of sampler allows us to see both the average concentration of a pollutant for the sampling period and see how the concentration varies over time.

The picture on the right shows another type of composite sampler in which a certain amount of sample is added to the bottle at specified time intervals to create a single combined sample.

That single combined sample simply shows the average pollutant concentration over the sampling period.

1.14 Types of Samples (continued)



Notes:

When we're thinking about composite sampling, there are a couple of issues that naturally arise. One is when to take the individual samples, or aliquots, that make up the composite sample and a second is the size of each aliquot.

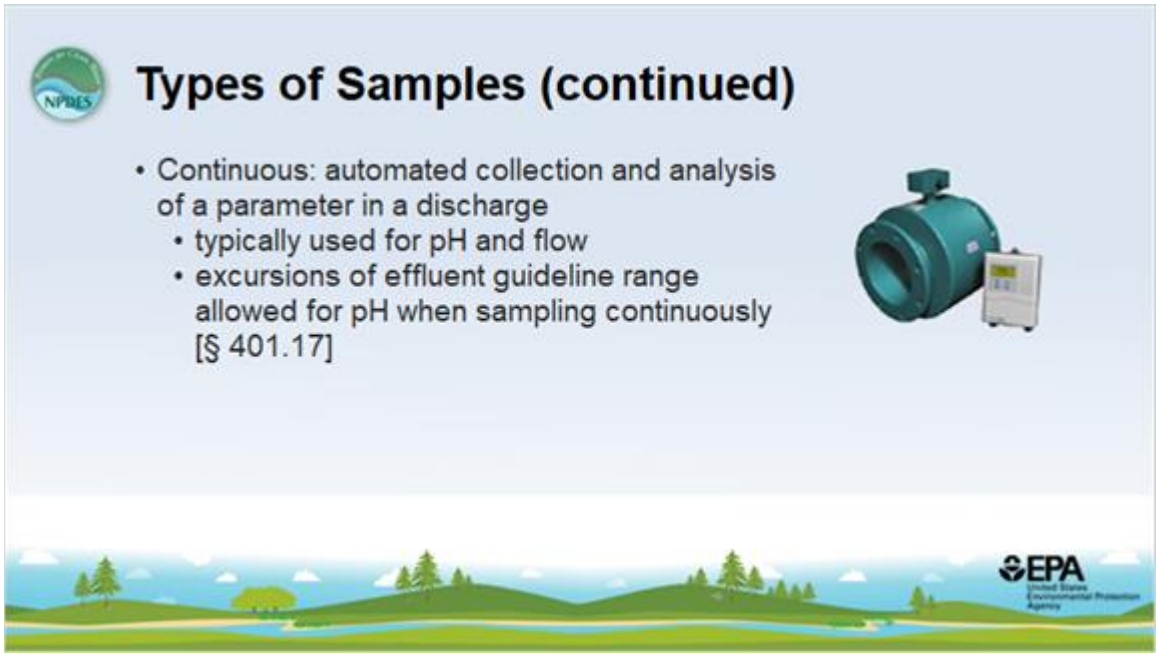
Let's look at two types of composite sampling and how they address these issues.

First, there is time proportional composite sampling. In this case, the time interval between the individual aliquot pulls and the volume of sample drawn are constant over the period of sampling, such as a 500 milliliter sample taken every hour. This approach could be used when the pollutant concentrations vary randomly, but the discharge flow remains fairly constant.

The other type of composite sampling to consider is a flow proportional composite. In this case, the timing or volume of each aliquot is adjusted to account for the volume of effluent that has been discharged. Either the time between samples or the sample volume is proportional to the effluent flow.

Automated samplers and portable flow metering devices make flow proportional composite sampling easier than it might sound. So, it's very common to see this type of sampling required in NPDES permits.

1.15 Types of Samples (continued)



Notes:

Finally, we have continuous monitoring.

Typically, continuous monitoring devices are in-line measuring devices connected to data recorders, and they frequently are used to monitor parameters such as flow, pH, temperature, or total residual chlorine.

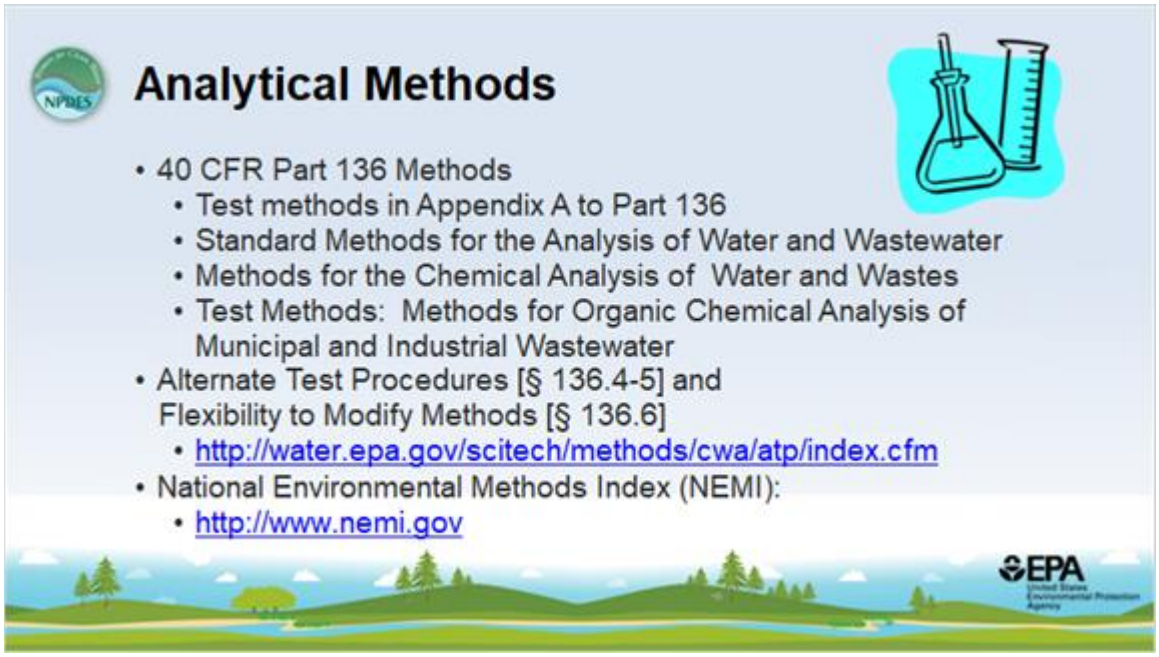
There might be monitors available for other pollutants, but not all are consistent with approved test methods. So, a permit writer considering requiring continuous monitoring in a permit should first determine whether the method is consistent with the requirements in 40 CFR Part 136, which Dave will discuss in just a moment.

One last note on continuous monitoring before I turn it back over to Dave. Where a permit requires continuous monitoring for pH, the regulations provide an allowance for infrequent excursions of the technology-based effluent limits for pH. This allowance, found in 40 CFR 401.17, says that the total time for excursions shall not exceed 7 hours and 26 minutes during a calendar month and shall not exceed one hour for any individual excursion.

You might be thinking “7 hours and 26 minutes-where did they come up with that?” Well, that period of time happens to be 1 percent of a 31-day month. So the regulations are essentially recognizing the expectation that the technology exists to maintain pH within a specified range established in the effluent limits, but that the technology is not flawless. So, if you are watching pH continuously, very short excursions are acceptable.

I think that covers what we want to say about sample type. Now, as promised, I am going to turn it back over to Dave to talk about analytical methods.

1.16 Analytical Methods



Notes:

Thanks Greg.

We've discussed location, frequency, and sample type. Now let's talk a bit about permit requirements dealing with sample analysis.

The most important thing to remember is that, except under some very unusual circumstances, the permit must require that the analysis of samples be performed using EPA-approved methods.

These approved methods are listed in 40 CFR Part 136, and the methods themselves are found in various sources. The requirement to use Part 136 methods is a standard condition listed in 40 CFR 122.41 and must be included in every NPDES permit.

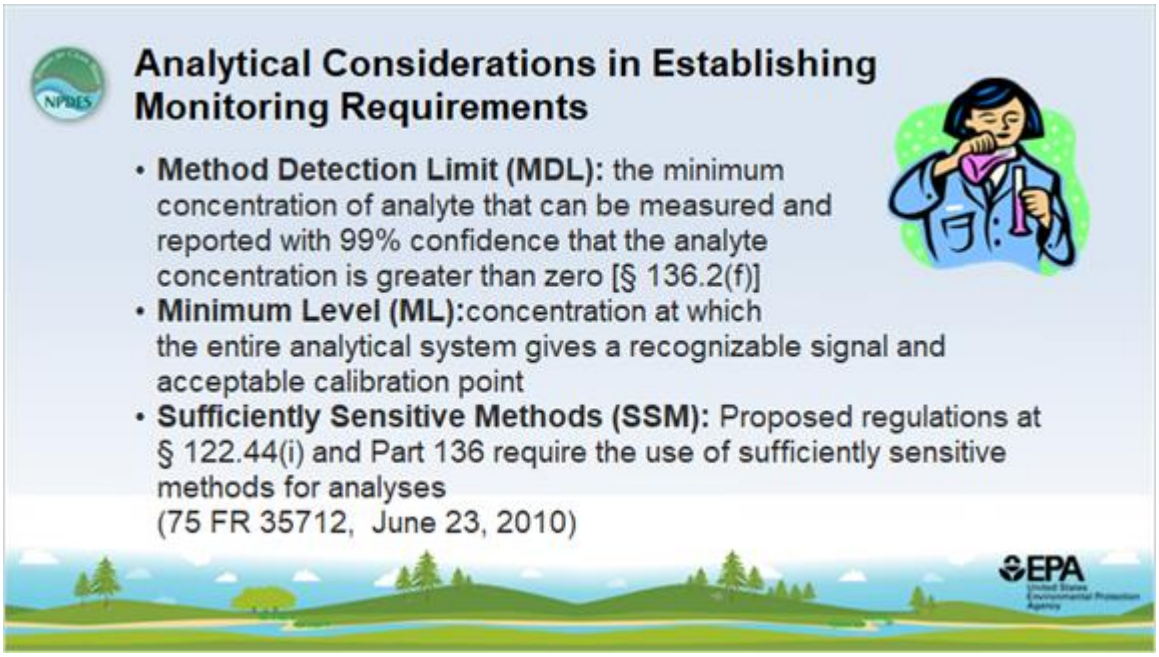
For many pollutants, 40 CFR Part 136 provides multiple approved methods, each of which may differ in the precision and accuracy of the analytical results. Because some approved methods can detect a pollutant at much lower levels than other methods, it might be necessary for the permitting authority to prescribe a specific method in the permit to accurately assess compliance with a permit limit.

EPA also has established processes for developing alternate test procedures in 40 CFR 136.4 and 5 and for modifying an existing approved method in 136.6. Additional information is available on EPA's Water Science and Technology Web site at the address shown on this slide.

While 40 CFR Part 136 is the only regulatory source to identify EPA approved methods, a Web site called the National Environmental Methods Index (or NEMI), sponsored by USGS and EPA, provides a user friendly listing of

analytical methods. NEMI is a searchable, online database of methods that provides general information about the method, its source, and relative costs of the analyses.

1.17 Analytical Considerations in Establishing Monitoring Requirements



Notes:

As mentioned on a previous slide, different approved analytical methods are capable of generating results at different levels of resolution for the same pollutant parameter. The expressions of how much of a pollutant a particular method can detect and quantify in a sample are typically established by the method detection limit, or MDL, and the minimum level, or ML.

The MDL represents the minimum concentration of an analyte that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. In other words, we can confidently say the pollutant is present in the sample, but we can't say exactly how much is there.

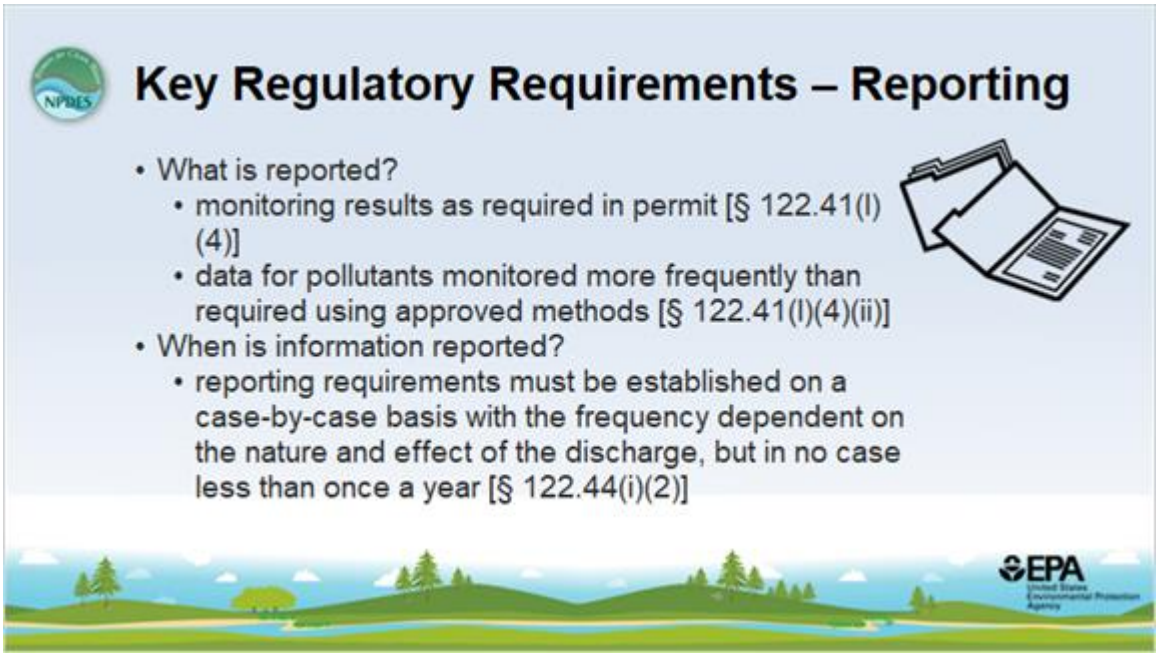
The ML is the concentration at which the entire analytical system gives a recognizable signal and acceptable calibration point. Quantification below an established ML requires extrapolation of the calibration relationship. In other words, the ML is a value at which the lab has calibrated the instrument, and results at or above the ML accurately quantify the pollutant at the reported concentration.

In some situations a permitting authority might calculate an effluent limit that is below the ML, and possibly the MDL, for one or more of the Part 136 test methods. In this case, the permitting authority must include the calculated limit as an enforceable condition in the permit; however, the permitting authority may include additional requirements regarding the appropriate analytical method to ensure that the permittee uses a sufficiently sensitive method to assess compliance with the limit.

In fact, a proposed EPA regulation would require the use of sufficiently sensitive methods for analyses required by a permit or in a permit application.

Where none of the EPA approved methods can quantify the pollutant at the limited value, the permitting authority should include specific reporting requirements in the permit to instruct the permittee on how to report “non-detect” results.

1.18 Key Regulatory Requirements – Reporting



Notes:

OK, we’ve covered the basics regarding permit monitoring requirements. Now let’s discuss how permits require facilities to report these results.

The standard conditions of an NPDES permit state that the permit must require that the permittee provide monitoring data for all pollutants that are limited in the permit, that reported data be collected and analyzed in accordance with EPA approved methods, and that the permittee certify that all monitoring data are collected in accordance with required procedures and are representative of the regulated discharge.

The permit must also require that all data collected using approved test methods be reported. This requirement prevents the permittee from sampling until it gets a favorable result, and reporting only those favorable results.

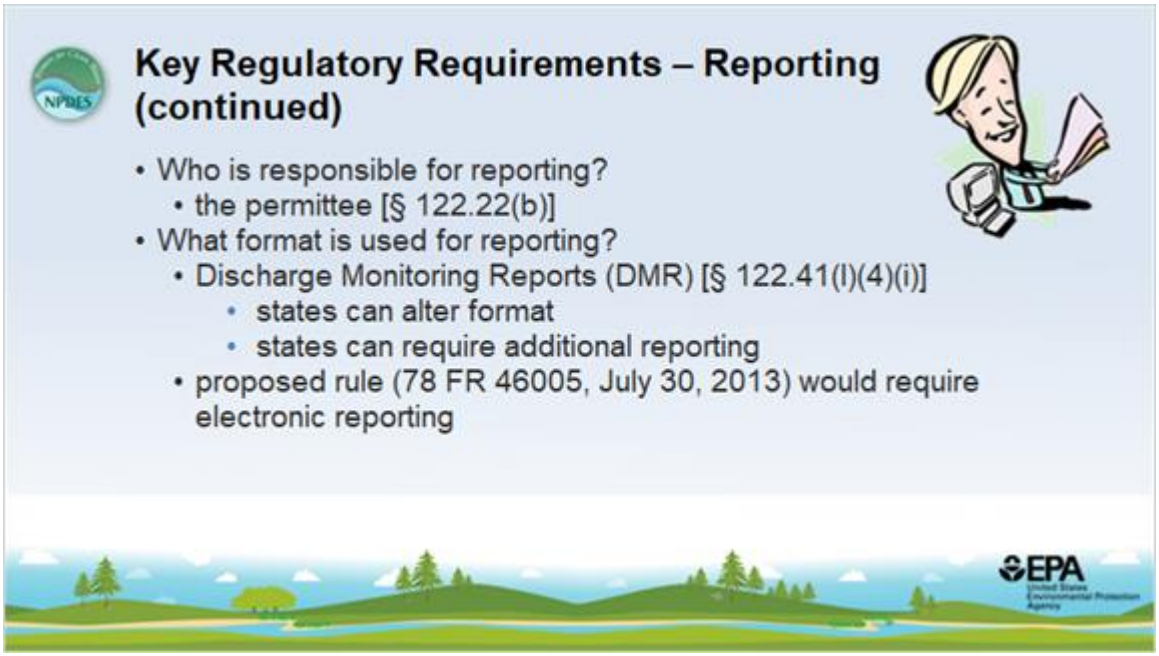
Why might a permittee sample more than required? Well, it might help to better characterize the discharge, and perhaps lower the monthly average result. As long as the results are representative of the discharge, it is fine for

the facility to monitor more frequently than required, as long as all data are reported.

With regard to the frequency of reporting, 40 CFR 122.44(i)(2) states that reports must be required at a frequency based on the nature and effect of the discharge, but in no case less than once per year.

Usually major facilities with continuous discharges will be required to report results monthly, while minors or episodic dischargers might be required to report less frequently; perhaps quarterly or based on the occurrence of a discharge.

1.19 Key Regulatory Requirements – Reporting (continued)



Notes:

It is important to remember that it's the permittee and not the laboratory or some other third party that bears the responsibility for reporting monitoring results to the permitting authority.

40 CFR 122.41 (l)(4)(i) requires that those monitoring results be reported on the Discharge Monitoring Report, referred to as a DMR, or forms provided or specified by the Director.

The DMR provides a reporting format that ensures that a facility's compliance data are submitted in a uniform manner to facilitate compliance review and the entry of data into state and federal database systems. The form also incorporates the required certification statement and signature of the person authorized to provide the report.

States are encouraged to use the EPA DMR form, but can alter the format and require additional reporting to

conform to state requirements.

A number of states use electronic reporting and, in fact, a proposed EPA regulation would require electronic reporting in the future.

Well, that does it for reporting. Greg, can you tell us how the permit deals with recordkeeping requirements?

1.20 Key Regulatory Requirements – Record Keeping

Notes:

OK, Dave.

If a permittee is collecting data, of course there are requirements regarding what it needs to do with all of those records.

A standard condition in every NPDES permit requires the permittee to retain records for all monitoring information, such as maintenance and calibration records, strip charts, reports required by the permit, and data used to complete the application, for at least three years from the date of the sample, measurement, report, or application. For sewage sludge use and disposal records and records from concentrated animal feeding operations, or CAFOs, that period is extended to five years.

These records must include: the date place and time that the sampling or measurement occurred, the name of the individual who performed the sampling, the date of the analysis of that sample, the name of the individual

performing the analysis, the methods used for the analysis, and, of course, the results.

In addition, though not required, it is advisable for the permit to specify where records should be kept, generally on-site at the facility. Such a requirement prevents the unfortunate circumstance of an inspector asking to see records and learning that they are kept at a distant headquarters office.

1.21 Other Requirements

Notes:

Thus far, we've been talking primarily about routine effluent monitoring and, to a lesser extent, other routine facility monitoring, such as influent monitoring, that could be required in the permit.

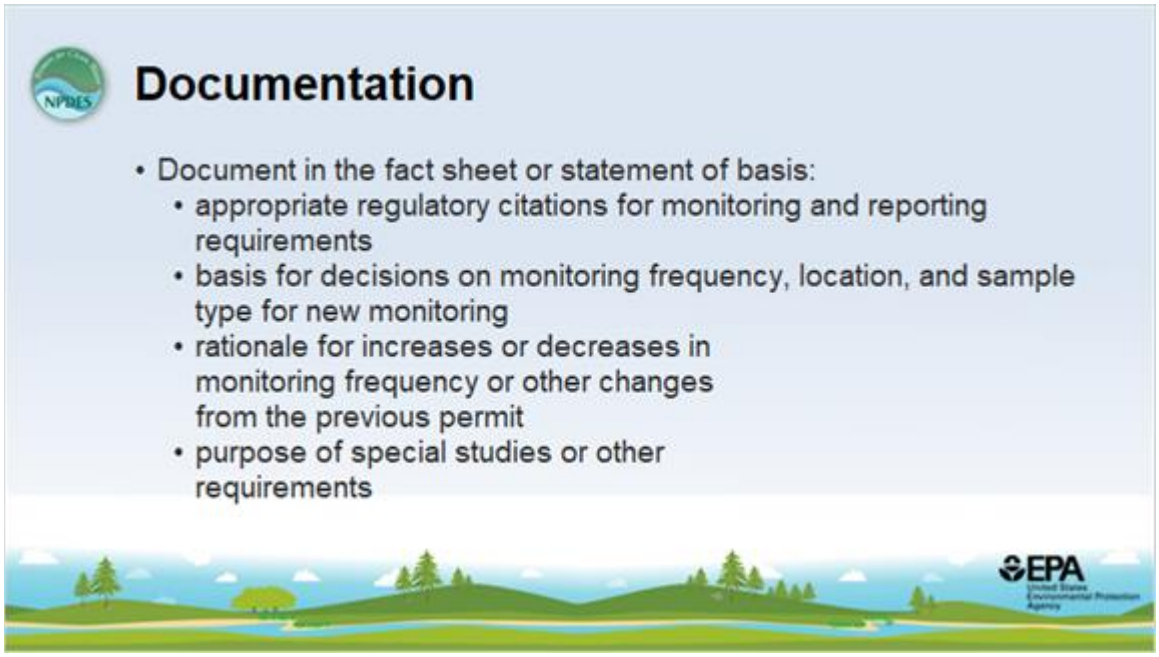
Keep in mind that the permit might also contain other related requirements in the monitoring and reporting section.

Examples could include special studies, visual monitoring of treatment systems, maintenance of equipment inspection records, and requirements for postings or public notice of a discharge or treatment area.

Another place you could find these types of requirements is in the special conditions section of the permit.

Special conditions, or narrative conditions, are the subject of another presentation in this series that you might want to view when you have the opportunity.

1.22 Documentation



Notes:

As we usually do, we'll end this presentation with a discussion of the importance of documenting your permitting decisions.

You should document in the fact sheet or statement of basis the rationale for monitoring and reporting requirements, including:

- the appropriate regulatory citations;
- the basis for your decisions on those three major considerations we discussed-monitoring frequency, location, and sample type-particularly for new monitoring requirements;
- the rationale for any increases or decreases in monitoring frequency or other changes made from the previous permit; and
- the purpose of any special studies or other requirements that go beyond routine self-monitoring for compliance with effluent limitations.