

MODULE 6.

SELECTING AN ENVIRONMENTAL LABORATORY

In order for an environmental monitoring program or single sampling event project to be successful, it is usually necessary to locate and hire an environmental laboratory. The guidance in this module is designed to provide perspective on a number of the areas you may want to consider in selecting a laboratory to support the data quality needs of your project. The information is presented as a starting point. For additional assistance, feel free to consult with your Region's US EPA QA staff, talk with other Tribes regarding laboratories they may be familiar with, and/or, if necessary, consider hiring a consultant.

Careful selection of laboratories and analytical methods is critical to the success of your project. Many routine laboratory procedures may not be able to support your data quality needs and/or report data to low enough limits to support decisions for your specific project. Following a review of a laboratory's qualifications and credentials, you may end up selecting a different laboratory and/or analytical method than originally considered. This decision point is critical to the success of your project. If an inappropriate laboratory and/or analytical procedure are selected, you may end up having to repeat your entire study.

(NOTE: If a commercial laboratory will not be used, the project will need to rely on field measurements and/or possibly an in-house laboratory instead. Field measurements should be discussed in your QA Project Plan and will not be addressed here. Similarly, setting up an in-house environmental laboratory can involve many steps and considerations, and will also not be discussed in this module; it is beyond the scope of this CD-ROM QAPP development tool.)

There are several factors to consider when selecting a commercial laboratory including:

Technical and Logistical Qualification

- Experience with sample media/matrices and analyses
- State certification and/or NELAP accreditation
- Laboratory capacity
- Laboratory location and support services
- Experience with other tribal projects
- Cost

Quality System Documentation

- Laboratory Quality Assurance Plan (or Manual)
- Standard operating procedures
- Personnel resumes
- Cost of QC

- Chain-of-custody
- Archiving data

Other Factors

- Data review procedures
- Laboratory report content
- Sample retention and disposal
- Laboratory subcontracts

Additional guidance on these factors is provided in the subsections that follow.

Technical and Logistical Qualifications:

1. Experience with sample media/matrices and analyses - *Does the laboratory have experience analyzing the types of samples (e.g., water, drinking water, waste water, sediment, soil, fish tissue, plant materials, etc.) that you want analyzed? Does the laboratory perform the specific analyses that you require?* Some laboratories may be niche organizations specializing in analyses based on either a particular matrix (e.g., drinking water, fish tissue, etc.) or a particular type of analysis (e.g., pesticides, dioxin, etc.). Others are full service organizations that can handle many types of matrices/media and analyses.

It is important that you determine what matrices/media and analyses you require while you are planning your project (and prior to writing your QA Project Plan). Usually laboratories have a business manager, client services manager, sales representative, etc. who will work with you to determine whether they can provide the particular analyses required for your project. Most laboratories will perform routine surface or ground water analyses. Two types of water analyses not always available at every laboratory include: organic chemistry methods for drinking water compliance analyses (as these methods require a laboratory to handle reporting at the low detection limits); and dioxin analyses (as these methods require special reagents, instruments, and expertise).

Lack of prior experience should not necessarily disqualify a laboratory, but should lead to a more thorough investigation of the laboratory's qualifications.

2. State certification and/or NELAP accreditation - *Does the laboratory have state certification in the state in which your tribe resides? Does the certification include the types of sample media/matrices and analyses of interest for your project?* It is important to note that all states do not run their certification program the same way. Some state certifications include only drinking water, while others may

include many different media (e.g., waste water, hazardous waste, tissue, etc.). Even laboratories within a given state seldom are certified for exactly the same media or analytical parameters. Laboratories are certified for specific media and analyses depending on their interest to pursue specific certification categories, as well as their ability to demonstrate compliance with the associated qualifications. State certification by itself does not guarantee that good quality work will be produced, but it may provide a good starting point to help you evaluate a laboratory's ability to support your project needs.

Does the laboratory have NELAP accreditation? Does the accreditation include the types of sample media/matrices and analyses of interest for your project? Many states, independent of size, also participate in NELAP (National Environmental Laboratory Accreditation Program). This program attempts to ensure a national uniformity in accreditations (similar in intent to certifications), and involves a more detailed review than that provided historically by many state certification programs.

Has the laboratory successfully analyzed all recent performance evaluation (PE) samples? Usually state certification and/or NELAP accreditation require regular participation in some kind of PE program. Although these PE programs do not cover all analyses or all possible analytes, they usually cover many of the most common analytes of interest to water monitoring programs. It is recommended that you request the laboratory's most recent (last two years is good) PE results. If there have been recent problems, you should inquire about the results of the laboratory's investigation of the problem and its corrective actions to ensure the problem was fixed.

Do you know the current status the laboratory's state certification or NELAP accreditation? You may want to request the certification/accreditation audit reports, although the laboratory is not obligated to share them with you (as their availability may be dictated by company or laboratory confidentiality policy). The state certification/NELAP accreditation agency will, however, tell you the media/matrices, analytes, and methods the laboratory is certified/accredited for, as well as whether the laboratory is in good standing with regards to its certification/accreditation.

3. Laboratory capacity - *Does the laboratory have the capacity to handle your samples (and all related sample preparation and analyses) on the schedule you need?* Do they have sufficient instruments (and back-up instruments in case of instrument failure) and personnel to handle the anticipated sample load?

If you are not generating a large number (typically, less than 40) of samples, most laboratories can handle this sample load without problem. However, if your project will generate a large number samples at one time and/or you have samples to be analyzed

for a variety of analytical parameters, you need to ensure that the laboratory can handle the work load in all of its departments. For example, a laboratory may have capacity to analyze 60 metals analyses (as these are relatively fast and involve minimal preparation), but they might not be able to analyze 60 pesticide or semivolatile organic compound analyses (as these require more time consuming sample preparation steps, as well as longer analysis time) in a specific time frame.

Make sure you discuss sample capacity loads, sampling holding times, and data deliverables with the laboratory and then make plans to schedule your sample collection accordingly; or, find a different laboratory that can handle your samples when they need to be analyzed, if you cannot be flexible in your sample collection and shipping schedule.

4. Laboratory location and support services - *Is the laboratory location convenient?* A local laboratory may be advantageous to your project as it may more easily facilitate transferring your samples directly to the laboratory the same day as collected, either hand-delivered by a project team member or picked up by a laboratory courier service. This may be especially critical if your project's analytical methods require that your samples be analyzed within a short time frame (after collection) to ensure sample integrity. However, with overnight courier services, shipping samples within a state or even to another state doesn't necessarily mean that processing of the samples will start any later than if they were delivered to a local laboratory.

What support services does the laboratory provide, and what is its sample receipt policy? You also need to discuss with the laboratory how it typically receives samples and what support it might provide in this regard. For example, the laboratory may provide coolers for shipping, chain-of-custody forms, free pre-cleaned/certified sample bottles and preservatives, courier service, etc. Some laboratories have staff available to receive samples after hours or on Saturdays, but not all do.

5. Experience with other tribal projects - *Does the laboratory have experience working with tribes, and does it have an established reputation for providing "tribe-friendly" services?* Tribes are sovereign governments, and their data usually don't need to be provided to state regulatory agencies nor need to conform to the state's reporting requirements.

You may wish to check with other tribes in your area to find out their experience and recommendations regarding various laboratories. You may also check with your EPA Project Officer or Regional QA Office to see if they have any knowledge of laboratories other tribes have used. Although EPA must be impartial and cannot recommend any laboratory, it may have information concerning laboratories other tribes

have used, the types of analyses performed, and the name of a tribal contact you can call to obtain additional information.

6. Cost - *Are the laboratory's prices reasonable?* Shop around and find the laboratory that best meets your needs and look for a competitive price. Sometimes there are economies by making a longer term commitment (e.g., for all four quarterly monitoring events in a year) or in sending all your samples to one laboratory facility (e.g., rather than splitting up samples submitted for various analyses to two or more individual laboratories).

Quality System Documentation:

1. Laboratory Quality Assurance Plan (or Manual) - *Does the laboratory have a written Quality Assurance (QA) Plan, and is it adequate to meet your project's data quality needs?* Almost all laboratories will have some form of QA Plan, but these documents may vary considerably in terms of their content.

Some QA Plans are designed to provide general information as a form of marketing tool. These plans might describe the laboratory's capabilities, identify any state certifications or accreditations, discuss the QA program in place (in a general sense), list the methods it performs, describe the matrices it typically handles, list personnel and their qualifications, and provide an overview of the organization. This type of QA Plan may be supplemented with additional information available in other laboratory documentation, such as standard operating procedures (SOPs). However, acquiring this additional information may require you to "dig deeper" and ask more questions.

The other end of the spectrum might be a QA Plan containing similar types of information (as discussed above), while being much more detailed in scope. For example, this type of QA Plan might include lists of analytes associated with each method (rather than just listing the methods alone), as well as the reporting limits and/or method detection limits for each analyte for each method. Rather than merely stating it has a QA program, this type of plan might provide specifics with respect to: the types of QC samples run; the frequency with which they are run; the sources and concentrations of specific spiking solutions that are used (in preparing surrogate spikes, matrix spikes, and/or laboratory control sample mixtures); the acceptance criteria associated with each type of QC check (on an analyte-specific basis); and the corrective actions taken when these criteria are not met. Details on calibration criteria and associated corrective action criteria may also be included in this type of plan.

2. Standard operating procedures - *Does the laboratory have written standard operation procedures (SOPs) for all of its operations?* Most full-service laboratories are divided up into departments or sections that include: sample receipt; organic sample preparation; inorganic sample preparation; metals analysis; general chemistry analyses; gas chromatography/mass spectrometry (GC/MS) analyses (often including separate volatile and semivolatile organic compound analysis areas); and gas chromatography (GC) analyses (often including separate pesticide, polychlorinated biphenyl (PCB), and total petroleum hydrocarbon analysis areas). Some laboratories also offer microbiological analyses or toxicity testing, while others may provide analysis of tissue or foliage samples.

Each laboratory department or section should document its procedures in written SOPs. SOPs for each analytical method should include detailed step-by-step procedures, as well as specific QC requirements, frequency, acceptance criteria, and corrective actions (to be taken if these criteria are exceeded) associated with that method. It is important to remember that a “published method” is not an SOP. In general, published methods such as EPA methods or those in *Standard Methods* vary considerably in their method description and may need to be supplemented with specific QC requirements, calibration criteria, reporting limits and/or method detection limits, etc. At times, the published methods may be modified to improve performance if necessary to meet a project objective.

3. Personnel resumes - *Are the resumes of key personnel available for review, if necessary?* Sometimes this information is found in the laboratory's QA Plan, while other times resumes are kept confidential unless requested specifically. State certification agencies typically have minimum experience and/or educational requirements for management and supervisor positions, and they may review the laboratory's general qualifications as part of the certification process. However, you may want to review specific resumes if there are concerns related to a critical analysis area, especially for the more complex analyses.
4. Cost of QC - *What QC samples are analyzed and typically reported by the laboratory on a routine basis, and what QC samples may will require an additional cost to the tribe?*

Unless requested otherwise, most laboratories will perform their QC analyses on a batch basis. A batch is a set number of samples (frequently, 20) of a similar matrix/medium. The batch may be comprised of samples from a single client or include small groups of samples from multiple clients. The intent of batching samples is for the laboratory to avoid performing an overall disproportionate number of QC sample analyses. For example, a tribe may submit 5 samples and another client may submit 10

samples for the same type of analysis. But, as the laboratory typically performs analysis of the associated QC check samples (that may include a laboratory blank, a matrix spike, laboratory duplicate and possibly a laboratory control sample) at a rate of one for every 20 samples, the laboratory may combine the tribe's samples and the other client's samples into one batch and report the same batch QC results to both clients. This is logical from a laboratory perspective, as the laboratory typically absorbs the cost of these QC samples. But, this batching could result in generating results of matrix spike and lab duplicate samples that may not be representative of the tribe's samples. Thus, they provide information about the laboratory's performance, but not necessarily about the tribe's sample matrix/medium. In most cases, batch QC is sufficient for tribal purposes, but in some cases having one of the tribe's samples designated to serve as the matrix spike, laboratory duplicate, and/or matrix spike duplicate may be desirable. Some laboratories may batch an individual client samples together (even if just a small group) and not combine samples from different clients. If that is the case, they may use the tribe's samples as a basis for the QC samples without any additional charge.

It is recommended that you engage the laboratory in discussions regarding what QC samples it runs routinely for each analysis (as they may differ from method to method), the frequency of those QC sample analyses, as well as which are performed at client versus laboratory expense. Samples sent blind to the laboratory, such as field duplicates and field blanks, will always be at client expense.

5. Chain-of-custody - *If there are legal considerations to the data, does the laboratory have a well-documented, internal chain-of-custody system?* Oftentimes this is done electronically or with a combination of electronic and logbook documentation.
6. Archiving data - *Does the laboratory have a system in place to track, store, and archive raw data and old data reports?* Most laboratories have retention policies, but you should know and understand what they might be. With the increasing use of electronic data, but ever changing formats, a permanent hard copy may be the only way to ensure data is available for any future use (such as if the client loses their data, a complete data package including raw data was not requested by the client but needed later on, etc.).

Other Factors:

1. Data review procedures - *Does the laboratory have defined procedures in place covering administrative tasks such as sample receipt and check in, as well as for the reporting and processing of data?* It is important to understand the level of

review associated with these tasks. Most laboratories will have SOPs in place covering these tasks. Some specific questions to consider include:

- *Does the QA Officer (or some individual independent of performing the actual activity) review all data or a fraction of the data in real time (prior to providing the data to the client)?*
- *Is there an automated data review system in place? Does the data review SOP describe the review system satisfactorily?*
- *Are data flagged for the client to review? How are data flagged? Is the system clear?*
- *Will all data reports contain a narrative explaining any problems?*

2. Laboratory report contents - *What are the contents of a typical laboratory report?*

It is recommended that you request to see a typical data report (to ensure the laboratory will provide the information you will need) prior to selecting your laboratory, and that you specify the laboratory QC data you need to be reported with its data (so that you will have the information necessary to perform at least a minimum QC check on your project data). You should ensure you have a clear understanding of the criteria by which the QC data were evaluated for inclusion in your QA Project Plan (especially if this is not to be summarized in the data report). For example, seeing a matrix spike recovery of 50% might look unacceptable, but for certain difficult compounds this may actually be an excellent recovery justified by the laboratory QA Plan and/or analytical SOP.

In some cases, it may be desirable or necessary to have the laboratory provide a complete data package, sometimes called a data validation package. Basically, this data package includes all the data and sample information used to generate a sample result. It may include, but not be limited to, chain-of-custody and sample receipt records, sample preparation logs, analysis logs, standards logs, raw data from the instrument for both sample and QC sample analyses, calibration information for initial and continuing calibration analyses, sample analysis results, QC sample results, and all information related to sample processing (for example, results of manual integrations of results, etc.). (Note: For an example of items to consider for inclusion in a complete data package, visit the EPA Region 9 QA website at: <http://www.epa.gov/region9/qa> and download the document entitled *Draft Laboratory Documentation Requirements for Data Validation, R9QA/004.2, August 2001*.) “Complete” data packages are typically required for litigation. This type of data package may cost an additional \$50-100 or more per sample batch, if they are even offered as an option from a given laboratory (which is information you would want to know about up front). Such packages are usually considerably cheaper if ordered when the samples are analyzed.

Asking the laboratory to generate this data package after the fact may cost considerably higher.

3. Sample retention and disposal - *What are the laboratory's policies with respect to retention and disposal of samples?* The tribe should be reassured that there is no future liability associated with providing samples to the laboratory.

4. Laboratory subcontracts - *What are the laboratory's policies with respect to subcontracts, and what samples might be subcontracted for your project?* The laboratory should have a system in place to evaluate its subcontractor's quality system. It should be reviewing subcontractor data as if it was its own, since it will be reported as such. It is important to note that a subcontractor does introduce another variable into the quality system, one that you may not be able to evaluate directly. Thus, it is important that you are comfortable with whatever samples might be sent out. If considered critical to a project's success, you may need to request documentation (such as an SOP) from the subcontract laboratory, so that it too can be evaluated.