Developing a Tribal Water Quality Program Monitoring Strategy

Supplement to the Clean Water Act Section 106 Tribal Guidance

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Notice

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Summer interns electroshocking Fond du Lac Creek for fish community data, photo courtesy of Fond du Lac Resource Management

Water quality sample collection, photo courtesy of Pyramid Lake Paiute Tribe

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Introduction

The Section 106 grants for Tribes include three programmatic reporting deliverables, one of which is a Monitoring Strategy. This document is a supplement to the Clean Water Act Section 106 Tribal Guidance and addresses in more detail the development of a Water Quality Monitoring Strategy.

This document is meant to provide additional details about how to address the ten elements of a Monitoring Strategy that describe the current and future water quality program goals. Example tables throughout the document may serve as a useful starting point for describing a monitoring program. These tables are intended to serve as general examples only and are not expectations of information required or expected by EPA. Monitoring program staff can modify or replace these tables to reflect the specifics of a Tribe's monitoring and assessment program.

The complexity of a Monitoring Strategy will depend on the complexity of the monitoring program and can vary in length. The overall goal of a strategy is to adequately describe a program that meets data and information needs and considers future needs. The format should be based on what works best for each Tribe. The Tribe's EPA contact may have examples to support strategy development. A Monitoring Strategy may include links to other programs and funding sources as they interrelate to help provide a more comprehensive view of a monitoring and assessment program. The Monitoring Strategy should cover five years. Tribes should review their strategies annually, update them as needed, and submit them to EPA at least every five years.

A Monitoring Strategy is a long-term implementation plan that describes how a monitoring program will serve tribal water quality management needs and address tribal water resources over time. A Monitoring Strategy addresses the ten elements identified in this document and is reviewed by EPA. It ensures the continuity of the program as staff change and serves as a communication tool with other programs, management, and communities. In some instances, Quality Assurance Project Plans (QAPPs) may include components of a Monitoring Strategy or can be cited within the document. In these circumstances, Tribes and EPA regional staff evaluate and identify any additional information that may need to be documented to meet the Monitoring Strategy requirements.

A Monitoring Strategy describes current and future monitoring plans and incorporates a timeline for implementation, including milestones, to address needed enhancements. The Monitoring Strategy should be comprehensive in scope and identify resources and needs even when all waterbodies cannot be monitored at the time due to funding, staffing, or time limitations. For example, the Monitoring Strategy should serve the scope of water quality management needs and address tribal waters of all waterbody types, such as streams, rivers, lakes, Great Lakes, reservoirs, estuaries, coastal areas, wetlands, and ground water. The strategy should also identify issues and needs that currently impede an adequate monitoring program. Where possible, a Monitoring Strategy will document plans and needed resources for filling current gaps and weaknesses in the Tribe's monitoring program.

Elements of a Monitoring Strategy

Element I: Monitoring Program Overview

This section of a Monitoring Strategy introduces the water quality program and can include historical information, departmental responsibilities, and other information to provide overall context. General

background information such as a water atlas of all waterbody types can be included. This section can also introduce the current condition of monitored waters, priorities for those waterbodies, or other resources. It can also specify which waterbodies will be part of the monitoring program recognizing that not all waterbodies can be monitored due to access, resources, equipment, time, staffing, budget, or other limitations. In general, Element I should include pertinent information that refers to monitoring program objectives, such as Indigenous Knowledge, past studies, or proposed development. See Figure 1 for content to highlight when developing a Monitoring Strategy.

Figure 1. Recommended Monitoring Strategy contents

Ten elements of the Tribe's Monitoring Strategy.

I. Monitoring program overview
II. Monitoring goals
III. Monitoring design
IV. Water quality parameters
V. Quality assurance
VI. Data management
VII. Data analysis and assessment
VIII. Reporting
IX. Programmatic evaluation
X. General support and infrastructure

Note: EPA recommends that all programs give special attention to ensuring that data management, assessment and reporting capabilities are developed during the first several years of program implementation. These are recommendations and understand that there are various reasons that monitoring programs are at different levels. This is an effort to address a range of complexities with various resource allocations with the ultimate goal of continued program sustainability, growth, and development.

Element II: Monitoring Goals

Monitoring goals identify why the data are needed and how they are used by the water monitoring program. Tribes can base their monitoring goals on historic knowledge, Indigenous Knowledge, and data they collect on or near tribal waters. The goals documented in the Monitoring Strategy help determine the direction of the program and may evolve over time. Chapter 4: Program Development of the *CWA Section 106 Tribal Guidance* has additional information on establishing monitoring goals, including what activities are eligible for CWA Section 106 funding, and it includes a section on eligible water quality monitoring locations. In addition to the example goals listed below, Figure 2 highlights content to be explored for Element II.

Example goals may include:

- Assessment of all waters on the reservation.
- Establishment of the current condition of waters for pertinent uses over a set time frame (status).
- Track changes or trends in water quality over time.

- Development and refinement of tribal goals or designated uses for water quality standards program.
- Refinement of thresholds or water quality criteria.
- Identification of waters needing restoration and those needing protection.
- Identification of causes and sources of possible impairment (pollutants coming from point and nonpoint sources).
- Identification of contaminants of concern and possible sources.
- Effectiveness of management actions and restoration efforts.
- Information for permitting (as needed).
- Evaluation of projects at various scales (such as, what water quality improvements occurred as a result of implementing a shoreline stabilization or a local ordinance).
- Emergency monitoring (e.g., fish kills or spills).
- Other.

Figure 2. Example approach to establish monitoring goals

A. Identify current questions or goals the Tribe is addressing that require water quality data. Some initial goals may include:
    - Development of watershed- or reservation-wide assessments to help determine tribal goals or designated uses.
    - Assessment of the status and condition of resources.
    - Assessment of the condition of priority goals (see list of goals in Table 1 below).
    - Identification of waters needing restoration and those needing protection, and the possible source of impairment.
    - Evaluation of restoration and protection projects at various scales (such as, what water quality improvements occurred from implementing a shoreline stabilization or a local ordinance).

B. Identify questions and goals for which decision makers and the programs will need information in the future (consider program growth, introduction of new programs, or expansion to cover additional waterbody types).

C. Prioritize monitoring goals (this should link with the schedule for making enhancements to the program over time).

D. Identify the scope and scale needed to answer each goal (for instance, reservation-wide, watershed, or waterbody specific).

Tribes generally consider additional details pertinent to their water monitoring program with each goal (for example, what trends are being tracked and why).

Table 1a and Table 1b show two different examples of how to organize the narrative information describing monitoring goals in a table format.

Table 1a. Example of how a Tribe may organize monitoring goals in a table format

Program Area	**Goal**	**Timeframe**
Chemical and Physical Water Quality Monitoring	Goal 1: Assess waters for recreational and cultural use • Assess ambient water quality conditions in rivers and streams. • Monitor *E. coli* levels at sampling sites adjacent to swimming areas. • Identify seasonal trends in water quality data.	Monthly between May - September
Biological Monitoring	Goal 2: Assess waters for the protection of aquatic life • Establish macroinvertebrate inventory and assess data for Bear Creek. • Establish fish community inventory and assess data for Bear Creek.	Every other year in the –index period
Ground Water Recharge/Source Water Protection	Goal 3: Assess condition of possible source water • Monitor ground water quality at monitoring wells to protect source water and identify possible contaminants to surface water for heavy metals from local mine activities.	Annually between May - September
Possible Future Studies		
Nonpoint Source (NPS) Effectiveness Monitoring	Goal 4: Assess effectiveness of best management practices (BMP) implementation • Monitor ambient water quality before and after construction or site modification. • Monitor macroinvertebrate and fish communities along with habitat data before and after site modification or NPS action.	Between April - October for 1 year prior to BMP implementation and 3 years after project completion.
Continuous Water Quality Monitoring	Goal 5: Assess potential resilience of waterbody to changing environmental factors • Establish a continuous monitoring location to deploy sonde and collect data with set increments to help determine changes due to time of day, weather or upstream actions. • Measure water level.	Ice-out to Freeze-up (April or May to November)
Additional Chemical Water Quality Parameters	Goal 6: Expand assessment capability • Sample ground water related parameters (hard metals and nutrients) at sites known to be associated with ground water recharge, source water, or other monitoring sites of interest. • Explore sampling locations and needs for pharmaceuticals, PFAS, or microplastics.	May - September Funding Dependent

Table 1b. Secondary example of how a Tribe may organize their monitoring goals

Goal	Description
Goal 1	Assess waters for recreational and cultural use
Goal 2	Assess waters for the protection of aquatic life
Goal 3	Assess condition of possible source water
Goal 4	Assess effectiveness of BMP implementation
Goal 5	Assess potential resilience of waterbody to changing environmental factors
Goal 6	Expand assessment capability

Element III: Monitoring Design

A monitoring design lays out the sample collection location, frequency, and timing to meet monitoring goals. As water quality programs grow and program priorities change, Tribes should update monitoring designs to best represent changes in monitoring goals. Information about different monitoring designs is also available in Chapter 5: Development and Implementation of a Monitoring Program of the *CWA Section 106 Tribal Guidance*. See Figure 3 for content to consider when documenting a monitoring design.

Figure 3. Monitoring design considerations

A. Describe the monitoring programs and networks (such as other sources of information) the tribal monitoring program plans to use to meet their monitoring goals. Describe the designs and number of stations the Tribe typically sampled each year. See Chapter 5: Development and Implementation of a Monitoring Program of the *CWA Section 106 Tribal Guidance* for further information.

B. Identify goals the monitoring program plans to meet based on designs in the monitoring plan. Identify which goals need additional sites, different designs, or greater frequency to be successful. Identify gaps in the current program for meeting the Tribe's goals. Examples:
   - Perhaps the Tribe cannot yet monitor all lakes or all wetlands.
   - Perhaps the Tribe is starting up an NPS implementation program and will need program designs to monitor the success of the project.

C. Describe how resources are utilized (number of stations, number of times sampled, sampling protocols, laboratory protocols) to meet goals.

D. Identify and include descriptions of other monitoring networks used (for example, U.S. Geological Survey [USGS], states, watershed organizations and partners, or other Tribes) to help meet goals.

Table 2a and Table 2b, along with a detailed narrative explaining why sites are selected or how to address relocation, can help document sample designs. A map of the area and possible sample locations may also be useful. In Table 2a, the "Design" column identifies the type of design used for sampling as targeted, probabilistic, or other sampling design options. The "# of Sites" and "Frequency" columns summarize the sampling information annually. The "Resources" column captures the staff time required to conduct the monitoring and the last column provides a brief program description.

Table 2a. Example of a format for summarizing the Tribe's monitoring activities and their design in an ambient water monitoring program

Program Area	**Design**	**# of Sites**	**Frequency**	**Resources**	**Program Description**
Ambient Water Quality Monitoring	Rotating basin with targeted sites.	10	Bi-weekly	2 Full Time Equivalent (FTE) for 9 months	2022 – Long Lake 2023 – Deer Lake 2024 – Duck Creek 2025 – Bear River
Water Quality Status and Trends	Fixed station network of integrator sites.	5	3 x per year	2 FTE for 6 months	Begun in 2022. Long-term sites for trends.
Monitoring for Effectiveness of NPS Implementation Program	Targeted design upstream/ downstream of NPS projects.	5 sites/ 2 projects	Monthly sampling during the summer	1 FTE	NPS sampling targets sites above and below BMP implementation projects. Sampling for each project covers a 2- to 4-year timeframe.

In Table 2b, the "Segment or Assessment Units" column refers to the extent of the area that will be assessed using the sample design and the "Tribal Goal or Designated Use" column refers to the uses identified by the Tribe or the Tribe's water quality standards program.

Table 2b: Example of format to describe monitored waters and assessment units

Waterbody	Waterbody, Segment or Assessment Units	Tribal Goal or Designated Use
Duck Creek latitude/longitude	From the confluence of Duck Creek and the lower branch of the Salmon River upstream to Trout Road crossing. Area to include popular swimming hole with samples collected above and below confluence, road crossing, and in swimming hole.	Aquatic Life, Cultural, Recreation
Deer Lake latitude/longitude	Entire Lake using random transects in areas with aquatic plant growth	Edible Aquatic Plant
Flowing Waters in Tribal Jurisdiction	Entire extent of river and stream miles on reservation using probability design	Aquatic Life, Recreation, Cultural, Wildlife

Element IV: Water Quality Parameters

Water quality parameters are an important aspect of the monitoring design. The parameters a Tribe selects should reflect what the Tribe needs to evaluate whether the program is meeting tribal goals or designated uses of the resources. Water quality parameters provide information about the aquatic environment to meet long term goals. It is important that monitoring programs have a foundational understanding of the waterbodies to determine if tribal waters support tribal goals or designated uses. Data is collected at a frequency which meets the needs to answer the questions and concerns of the monitoring program. These monitoring needs may be adjusted to account for more critical times of the year such as growing season or spawning season. Tribes may add to the list of parameters collected as they form new monitoring questions or determine additional reasons for sampling waterbodies such as new pollution sources, land use characteristics, or other factors.

Tribes may also collect different parameters to serve different purposes such as providing status and trend data or effectiveness of a nonpoint source BMP. Tribes may also add parameters which are part of a special study versus part of a routine monitoring program and may determine that continued collection of these parameters are not necessary. Figure 4 provides factors a Tribe may consider when identifying water quality parameters.

Table 3 through Table 6c show examples of how Tribes can describe activities associated with the tribal water quality goals or designated uses. These tables include examples of parameters that may be collected, frequency of sampling, and sampling locations to determine if the water quality goals or designated uses are being met. The parameters listed in these tables are not meant to describe any requirements or expectations from EPA regarding data to be collected.

For additional information, see the Selecting Water Quality Parameters section of Chapter 5: Development and Implementation of a Monitoring Program of the *CWA Section 106 Tribal Guidance*, view the common parameters factsheets available on EPA's *Factsheet on Water Quality Parameters* web

page and visit the *National Environmental Methods Index* webpage for information on sampling and laboratory protocols.

Figure 4. Example of considerations when identifying water quality parameters

A. Identify parameters that help address tribal goals or designated uses.

B. Analyze the accessibility, cost, sample holding time, and sampling frequency.

C. Determine the availability of a laboratory to analyze samples within the range of reporting limits.

D. Consider the assessment method to ensure all associated data are also collected along with sampling frequency and collection methods.

E. Identify seasonal impacts and conditions and the desired level of confidence in the data.

F. Notice that different parameters may be used for different waterbodies.

Table 3. Example of format to identify parameters used to evaluate tribal goals or designated uses

Tribal Goal or Designated Use	**Activity**	**Parameter**
Aquatic Life	General Aquatic Life Protection	pH, conductivity, temperature, dissolved oxygen, ammonia
Recreation	Swimming, Wading, Boating, Canoeing	*E. coli, enterococci, microcystin*
Cultural	Hunting, Gathering	*E. coli, enterococci*
Edible Aquatic Plant	Harvesting	2,4-D or other aquatic herbicide(s), mercury, arsenic

Table 4. Example of format to describe how water quality parameters are used to inform monitoring goals

Program Area	Goals	Review of Water Quality Parameter Data	Frequency of Collection and Analysis
Ambient Quality Monitoring	Characterize the current water quality status. Develop or refine designated uses and tribal goals. Determine attainment or meeting goals using water quality standards or thresholds. Identify waters needing restoration.	Number of nutrient criteria exceedances in ambient surface water samples from rivers/streams and lakes.	Samples are collected quarterly and sent to a laboratory for analysis. Ammonia-Nitrogen and Total Phosphorus data are collected.
		Change in ambient stream chemistry (such as pH, DO, or conductivity).	At fixed stations, grab samples are collected along with *in situ* measurements quarterly.
		Change in biological parameters (such as benthic macroinvertebrate, Index of Biological Integrity [IBI]).	Streams are monitored on a rotating basis annually.

Table 5. Examples of parameters measured to assess tribal goals and designated uses. Tribes do not necessarily need to collect all these parameters to meet the goals of their monitoring program. Starred (*) parameters represent common parameters to sample.

Aquatic Life	Recreation	Drinking Water Source	Fish/Shellfish Consumption

• Dissolved oxygen (DO)*
• Temperature*
• Conductivity*
• pH*
• Nutrients (total phosphorus (TP); total nitrogen (TN)*
• Turbidity*
• Biological communities*
• Secchi depth*
• Habitat assessment*
• Flow
• Sediment toxicity
• Eutrophic condition in lakes
• Nutrients (NH_3, DIN, DIP, PO_4)
• Chlorophyll *a*
• TSS
• Emerging contaminants
• Floristic quality
• Metals
• Ions (Ca, Cl, Mg, Na, K, SO_4)
• Continuous (high frequency sensor) monitoring
	• Pathogen (*E. coli* or *enterococcus*)*
	• Turbidity*
	• Secchi depth*
	• Harmful algal blooms, algal toxins (microcystins)*
	• Nuisance plant growth
	• Aesthetics
	• Hazardous chemicals
		• Metals*
		• Pathogens*
		• Total dissolved solids, total suspended solids*
		• Nutrients*
		• Salinity*
		• Harmful algal blooms, algal toxins (microcystins)*
		• Flow
		• Volatile organic carbons
		• Pesticides
		• Emerging contaminants
			• Fish tissue contaminant levels for:
			  ○ Mercury*
			  ○ Polychlorinated biphenyls (PCBs)*
			  ○ Polycyclic aromatic hydrocarbons (PAHs)*
			  ○ Legacy pesticides*
			• DDT
			• Chlordane
			• Select Per-and polyfluoroalkyl substances (PFOS); Perfluorooctanoic acid (PFOA)
			• Emerging contaminants
			• Metals
			• Organochlorine compounds
			• Flame retardants
			• Dioxins
			• Furans
			• Chlorophenoxy herbicides
			• Organochlorine pesticides
			• Pharmaceuticals

Table 6a. Example of a list of parameters, sampling frequency, and the tribal goal

Parameter	Program Element			Tribal Goal
	Change in Condition (Lakes)	Change in Condition (Rivers and Streams)	Status (Ground Water)	
Dissolved Oxygen	Weekly	Weekly	Monthly	Aquatic Life
Water Temperature	Weekly	Weekly	Monthly	Aquatic Life, Recreational Use
Total Nitrogen	Quarterly	Quarterly	Monthly	Aquatic Life, Recreational Use, Drinking Water Source
Chlorophyll *a*	Quarterly	Quarterly	N/A	Aquatic Life, Recreational Use, Drinking Water Source
Iron, Total	N/A	N/A	Monthly	Drinking Water Source
Secchi Depth	Weekly	N/A	N/A	Aquatic Life, Recreational Use, Drinking Water Source

Table 6b. Example of monitoring designs and frequency of sampling

Program	Specific Monitoring		Design	# of Sites	Frequency
Ambient Monitoring	Chemistry		Fixed Site	23	Monthly
	Nutrients		Fixed Site	23	Seasonal
	Habitat		Fixed Site	23	Annually
	Biological	Macroinvertebrates	Targeted	4	Index period
		Fish	Targeted	4	Index period
		Periphyton	Targeted	4	Odd years
Fish Tissue Monitoring			Rotating/ Targeted	1	5-year Rotation

Table 6c. Example of sampling methodology used for each parameter and their reference values.

Parameter	Reference Value	Sampling Method	Source	Current Program
Dissolved Oxygen	Coldwater Fishery X mg/L Warmwater Fishery X mg/L	*In-Situ* XX Sonde	Tribal Reference	Yes
pH	Between X and X	*In-Situ*	State Agency	Yes
Water Temperature	Coldwater Fishery Not-to-Exceed Values: April - Jul: X°C Aug - Sep: X°C Warmwater Fishery Not-to-Exceed Values: April - Jul: X°C Aug - Sep X°C	*In-Situ*	State Agency	Yes
Turbidity	X NTU (0.84 – 14.50 NTU)	*In-Situ*	EPA CWA 304(a)	Yes

Element V: Quality Assurance

The quality assurance section of a Monitoring Strategy is where the Tribe can reference their draft or approved Quality Assurance Project Plan QAPPs[1]. Figure 5 shows the information to include about a QAPP in a Monitoring Strategy. Additional information on QAPPs is available in Chapter 5: Development and Implementation of a Monitoring Program of the *CWA Section 106 Tribal Guidance*. QAPPs are intended to document protocols so that results are replicable, repeatable, and comparable over time. The QAPP will also include more detailed information on monitoring design, parameters, sampling frequency and protocols, lab protocols and quality control activities. Each region may have additional quality assurance requirements for applicable Section 106 grants. Please check with the regional tribal contact for additional information.

Figure 5. Information to include about a QAPP in a Monitoring Strategy

A. Briefly describe the QAPPs that are in place for sampling projects. Identify the date approved and how often the QAPP is updated.

B. Identify the issues to be included in a quality assurance/quality control (QA/QC) review.

Table 7 is an example table that could be used in the quality assurance section of the monitoring strategy. It may also include quality assurance procedures and references to Standard Operating

[1] Tribes that have developed Quality Management Plans (QMP) should reference them along with their QAPP.

Procedures (SOPs). QAPPs generated for multi-year projects that cover the same type of work must be resubmitted every five years. A table like this can help Tribes track the status of QAPPs and plan for when they must resubmit each QAPP.

Table 7. Example for summarizing the status of quality assurance plans and submission dates

Type	Title	Completion Date	Submitted to EPA Date	EPA Approval/Date
QAPP	Water Quality Monitoring of Surface Waters	1/20/2022	3/14/2022	4/9/2022
QAPP	Zooplankton Monitoring	11/20/2022	12/4/2022	1/9/2023
SOP	Handheld Sonde	1/10/2021	3/14/2021	N/A
QAPP	Wetlands Monitoring	(Expected future date)	(Expected future date)	

Element VI: Data Management

The Tribe's strategy should describe how it will manage data within the tribal government and how these data will be submitted to EPA, see Figure 6. Please also see *Tribal Data Management for WQX Submission* for general information on how to manage data and how to upload tribal data into the Water Quality Exchange network (WQX). For any questions on WQX, Tribes may contact the WQX support line to leave a message at 1-800-424-9067 or e-mail wqx@epa.gov.

Figure 6. Data management considerations

A. Describe and include WQX codes that may be used and the expected frequency at which data will be uploaded into WQX.

B. Describe any locations where data may be stored until they are uploaded into WQX or other locations where the data are shared with the community.

C. Describe where and how data are managed such as spreadsheets, databases, or third-party data management systems and tools.

D. Note whether there are any electronic data deliverable formats available when requesting laboratory work.

Element VII: Data Analysis and Assessment

Once data have been collected, the Tribe will analyze and interpret the data to assess water quality conditions, see Figure 7. This is a good place to reflect on the purpose of assessment and how the data collected addresses the goals of the water quality program. Data analysis includes steps taken to review data quality (compare results to detection limits, check units); generate summary statistics (maximum, minimum, means values) and data visualization (graphs and plots). Assessment generally refers to

comparing the sample results to the water quality threshold value. Reference to other documents, such as an assessment methodology, may be appropriate, or a description of thresholds and tools used to calculate the IBI may be included. EPA has developed tools to assist in data analysis and assessment, please see the *Consolidated Listing and Assessment Methodology* for general assessment information and the *Tribal Assessment Modules*.

Figure 7. Data analysis and assessment considerations

A. Describe how assessments are prepared. If the Tribe does not yet interpret their data, provide details on plans and resource needs to conduct assessments.

B. Identify other sources of information used in data analysis.

C. Include or reference thresholds or water quality criteria that will be used to analyze data or indexes that may be used to assess biological data.

D. Assessment methodology documents should be referenced.

This section likely includes information that can or is a part of assessment reports. Referencing this document or copying this into the assessment report may be helpful when revisiting the strategy and assessment to determine if there are any updates needed.

Table 8a through Table 8c are examples of how threshold information may be organized to supplement narratives on how the data will be analyzed or assessed. Each example shows how data can be displayed differently depending on the parameters to be collected, the type of waterbody to be sampled and the threshold for that waterbody (either for the waterbody type in general (i.e. lakes), specific types of waterbodies (i.e. cold-water streams), or for a specific waterbody (i.e. Mud Lake)). Tribes may create a table which showcases what threshold they are analyzing their data against and the goal which they are trying to attain.

Table 8a. Example format for a table of each parameter's threshold value by resource type and its source

Parameter	**Reference**	**Threshold Value**
Chlorophyll *a*	EPA Nutrient Ecoregion Reference Condition (Ecoregion 51)	River: 1.03 ug/L Lake: 2.02 ug/L
Total Phosphorus	EPA Nutrient Ecoregion Reference Condition (Ecoregion 51)	River: 28.75 ug/L Lake: 20 ug/L
E. coli	Tribal Water Quality Standard	The monthly geometric mean for *E. coli* shall not exceed X organisms/100 mL. When fewer than five samples are collected in a month, densities of *E. coli* shall not exceed X organisms/mL in any single sample.

Table 8b. Example table of a parameter with threshold value associated with specific water resource.

Parameter	Big Lake (Surface)	Straight Creek (Warm Water)	Curvy River (Cold Water)
Dissolved Oxygen	6 mg/L	5 mg/L	7 mg/L

Table 8c. Example table of parameters for different assessment goals with associated threshold values and parameter descriptions

Parameter	Sampling Design			Threshold Value	Parameter Description
	Waterbody Type	Goal	Tribal Goal		
Chlorophyll *a*	Lakes	Assess status and track change over time	Aquatic, Recreational	XXX mg/L	Measure of algal biomass-trophic status
E. coli	Lakes, Rivers	Assess status	Aquatic, Recreational, Cultural	XXX *E. coli* cfu per 100 mL	Human health protection, identify if there are possible sources

Element VIII: Reporting

The Monitoring Strategy should describe tribal reports and how the tribal monitoring program staff will communicate products of the collected data to those interested in the results, such as the tribal council, the tribal community, the public, and EPA. Figure 8 identifies some points to consider when reporting.

The CWA Section 106 grant has three reporting requirements associated with it. Tribal grantees are to submit a monitoring strategy, submit data collected with 106 funds to WQX and submit a water quality assessment report. For more information on these reporting requirements, please see the *CWA Section 106 Tribal Guidance*. In addition to these reporting requirements, Tribes may generate other reports from the data collected such as:

- fish consumption advisory
- nonpoint source assessments
- water quality summary
- swimming advisories

Figure 8. Considerations when developing and listing reports

A. Describe major reports and products the Tribe produces using water quality information. Include water quality information that relates to overall program goals.

B. Describe plans for ensuring that decision-makers receive information promptly. Describe how monitoring results are communicated.

C. Identify gaps that exist and ways to address these in the future.

Table 9 is an example format of how Tribes can share information to indicate what reports will be developed, the frequency with which they will be made available, and the audience who will receive them.

Table 9. Example format for listing reports and their intended audience

Report	**Timeframe**	**Entities Receiving Copies of the Report**	**Comments**
Progress Report	Quarterly, semi-annual, or annual frequency	EPA Regional Office/Project Officer	Report summarizes performance and progress on the work plan.
Fish Consumption Advisory	No less frequently than every five years	Tribal Community EPA Regional Office/Project Officer	Based on tribal subsistence consumption rates.
Water Quality Assessment	Every one or two years (based on discussions with the Project Officer)	EPA Regional Office/Project Officer Tribal Community Tribal Planning Department	Serves as the primary assessment of water quality conditions on the reservation.
ATTAINs	Every year	EPA Regional Office/Project Officer	Serves as a tool for reporting assessment results.
NPS Assessment Report	At least every 5 years	EPA Regional Office, Tribal Planning Department	Meets NPS program goals.

Element IX: Programmatic Evaluation

The Tribe's Monitoring Strategy should include a process for reviewing the monitoring program to identify any necessary revisions. Figure 9 explains what to include in the programmatic evaluation.

Figure 9. Points to address as part of a program evaluation

A. Describe the process used to annually review the Tribe's monitoring program. This may be met internally or by existing discussions held with EPA regional office.

B. Describe the internal process used to systematically and regularly look at the Monitoring Strategy to see if it is providing answers to support the Tribe's needs, goals, and objectives. This would include addressing program enhancements such as expanding to new waterbody types or introducing new parameters.

Below is an example of language describing a general evaluation process between the Tribe and EPA.

A primary need identified through the development of the Monitoring Strategy is for a more comprehensive annual process for reviewing existing monitoring programs. This process should address programmatic coordination and evaluate the effectiveness of the monitoring and assessment program. The program will evaluate data needs and identify gaps and priorities that may be changing due to resource limitations, new and emerging issues, and changing program objectives. This should be part of a continuous improvement feedback loop.

An annual review and update of the Monitoring Strategy between (identify appropriate) tribal and regional EPA staff has been identified as important to implementing the strategy. Specific areas of focus will be selected annually based on water quality goals outlined in the strategy.

Element X: General Support and Infrastructure

This section of a Monitoring Strategy should indicate what resources are currently available to address current water quality goals and identify what resources are needed to address any future goals a Tribe has identified in the strategy. Figure 10 describes the Tribe's general support and current infrastructure.

Figure 10. Considerations for general support and infrastructure

A. Describe the resources of the Tribe's current program.

B. Consider resources that are needed for major objectives or next steps in the Tribe's water monitoring program.

Categories for consideration include:

- Staffing
- Training
- Equipment
- Laboratory resources

Table 10 provides an example of how the information can be presented to document the current and future goals.

Table 10. Example table to document current and future goals of a tribal monitoring program

	Goals	Staffing	Training	Equipment/Laboratory
Current Goals	Ambient Surface Water Quality Monitoring	2 FTE: monitoring, data analysis, and reporting for the current program.	WQX training completed	Canoe, handheld sonde, flow meter, general field gear (like waders, life jackets), microscopes. Macroinvertebrates are processed by staff and sent to a laboratory for genus level identification. Nutrient samples to a commercial laboratory.
Future Goals	Wetlands Monitoring	+1 FTE wetlands monitoring	Would depend on additional staff knowledge base.	Will need general gear, such as measuring tapes, magnifying glasses, boots, plant guidebooks, and plant presses.

Table 11 can be useful for capturing categories of resources, corresponding descriptions, and associated cost values.

Table 11. The below format can be used to describe the current and future program budget

Category	Description	Resources
Personnel	Water quality sampling, data entry, assessment, and analysis	$xxxx
Equipment	Handheld sonde, boat	$xxxx
Supplies	Calibration and sampling supplies, outreach education material	$xxxx
Travel	Conference and public meetings	$xxxx
Contractual	Laboratory analysis, equipment repair	$xxxx
Other	Ground water training	$xxxx
	Total	$xxxx

Appendix A: Key Terms

Assessment Methodology – A document that outlines how Tribes perform their data analysis, which includes decisions to ensure consistency in data interpretation, and provides transparency to stakeholders about how the program performed assessments and how others can reproduce the data.

Best Management Practices (BMPs) – Practices, measures, or actions that are commonly recommended to prevent, reduce, or mitigate pollution from nonpoint sources.

Designated Use – A designated use is a classification specified in water quality standards for each waterbody or segment describing the level of protection from perturbation afforded by the regulatory programs. The designated aquatic life uses established by the Tribe set forth the goals for restoration and baseline conditions for maintenance and prevention from future degradation of the aquatic life in specific waterbodies.

Effectiveness Monitoring- Water quality monitoring conducted to measure the effects of implemented BMPs to prevent, reduce, or mitigate pollution from nonpoint sources.

Fixed Station (monitoring design) – Fixed station networks monitor the same sites over a long period of time. These are often used to establish long-term trends in water quality at these sites.

Full-Time Equivalent (FTE) – This term is used to determine the number of full-time employees available to work on various projects within an organization. Institutions have varying definitions for this term.

Integrator Sites – Stream sampling sites located down-stream of drainage basins that are large and complex and often contain multiple environmental settings. Most integrator sites are on major streams with drainage basins that include a substantial portion of the study area of interest.

Monitoring Strategy – Serves as the foundation for a monitoring program and addresses how the program will meet water management needs.

Nonpoint Source (NPS) Pollution – Pollution not discharged from a point source. This generally consists of pollution from diffuse sources, without a single point of origin or not introduced into a receiving stream from a specific outlet. The pollutants are generally carried off the land as a result of precipitation events (rainfall, snowmelt). Sources include atmospheric deposition, agriculture, grazing, construction, roadways, etc.

Parameters – Water quality parameters are measurements that are used to assess the quality of a waterbody. The terms “indicator,” “analytes,” “characteristics,” and “constituents” are synonymous for the purpose of this document. Parameters can measure the physical (temperature), chemical (phosphorus or nitrogen), or biological (macroinvertebrates or bacteria) characteristics of waterbodies.

Point Source – A stationary location or fixed facility from which pollutants are discharged through a conveyance system; any single identifiable source of pollution, such as a pipe, ditch, ship, ore pit, or factory smokestack.

Probability-Based (monitoring design) – Also known as a statistically valid survey. Based on some form of random selection of sites or

sampling locations. This approach eliminates the potential for sampling bias toward water locations with known problems. It allows the extrapolation, with documented confidence intervals, from a relatively small sample of monitored sites to the entire population of waterbody types covered by the design.

Quality Assurance Project Plan (QAPP) – A formal document describing in comprehensive detail the necessary QA, QC, and other technical activities that are implemented to ensure that the results of the work performed will satisfy the stated performance criteria.

Quality Assurance/Quality Control (QA/QC) – Quality assurance is an integrated system of management activities involving planning, implementation, documentation, assessment, reporting, and quality improvement to ensure that a process, item, or service is intended and of high quality. Quality control is the overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established; operational techniques and activities that are used to fulfill requirements for quality.

Rotating Basin (monitoring design) – Targets certain basins within a state or region for intensive and probability-based monitoring. The basins change each year so that over a period of time (typically five years), the entire state or region is monitored.

Targeted (monitoring design) – Judgmental or targeted monitoring designs are based on land use, geological setting, and other natural and human influences.

Tribal Goal – An alternate term that can be used in lieu of designated use. This term is useful to help in identifying parameters and thresholds that can be used in assessing waters similar to application of WQC and designated use.

Water Quality Criteria (WQC) – Limits on chemicals or conditions in a waterbody. As elements of state/tribal water quality standards, the criteria protect particular designated uses, such as propagation of fish and wildlife, recreation, and public water supply. The criteria can be expressed as acceptable levels (constituent concentrations) or as narrative statements.

Water Quality Exchange (WQX) – WQX is the water data schema associated with the Exchange Network used by Tribes, states, and EPA. More information about WQX, WQX Web, and the Water Quality Portal, including tutorials, can be found on EPA's *Water Quality Data* website.

Water Quality Standards – Provisions of tribal, state, territorial, or federal law that describe the desired condition of a waterbody and the means by which that condition will be protected or achieved. WQS consists of three core components: designated uses of a waterbody, criteria to protect designated uses, and antidegradation requirements to protect existing uses and high quality/high value waters. Tribes can develop and use WQS solely for their own use under tribal law, or they can obtain authority to adopt and administer WQS under the CWA.

United States Environmental Protection Agency

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