Montana Department of Environmental Quality

Note: This initial draft template document is being provided for consultation purposes with the Nutrient Work Group. This is a preliminary document for review and may undergo changes based on Nutrient Work Group input. Additionally, this template is based on requirements outlined in draft Circular DEQ-15. Any applicable changes to Circular DEQ-15 will be incorporated into this template.

How to Use this AMP Monitoring Plan Template

Per Circular DEQ-15, permittees operating under the phosphorus-focused phase of the adaptive management program are required to collect instream nutrients and response variables data. This template outlines all aspects of data collection including field methods, data collection timeframes, sample handling, and quality assurance and quality control measures.

This template contains both required and suggested language. Users should carefully review all language to ensure that only information that is relevant to their watershed is included in the monitoring plan. Permittees may modify and adapt this template based on their needs, with approval from the Montana DEQ AMP Scientist. Permittees are encouraged to work with the AMP Scientist throughout development of an AMP Monitoring Plan to ensure current Department guidance is followed. The most current information and AMP contacts can be found on Montana DEQ's website at: [URL]. Please refer to the website to ensure you have the most current version of this template.

Template Key:

- Black text is used throughout the document to indicate required information that should generally remain intact, such as section headings, table titles and column headings, and some boilerplate language.
- Text between brackets indicates the type of information to be inserted. The brackets (i.e., [ ]) are to be deleted once populated.
- Red text is used to provide instructions to the template user, especially brief explanations of what type of information should be included in each section. This red font information should be deleted from your final document.
- Blue text is used to provide example language in some sections, especially those where there tends to be more uniformity among AMP monitoring plans such as quality assurance and data management. This language may be included or modified as the author deems appropriate and relevant to the monitoring plan.
- Yellow-highlighted items are to be completed by DEQ. The highlighting will be removed when this template is made final.

Delete this page before finalizing your document.

AMP Monitoring Plan
[Watershed Name and Entity Name(s)]

[Month] [Year (YYYY)]
AMP ID: [ID]

The AMP ID will be assigned by the DEQ AMP Scientist

Prepared by:
[Plan Author Name(s)]
[Entity Name]
[Entity Address]

Approved by:

[Name], Montana DEQ AMP Scientist Date

[Name], Montana DEQ MPDES Permitting Section Supervisor Date

This monitoring plan applies to the Montana Pollutant Discharge Elimination System (MPDES) permits listed in the below table.

Applicable MPDES Permits:

MPDES Permit Number	Facility Name	Receiving Waterbody(ies)

Suggested Citation: [Author]. [Year Published (YYYY)]. [Document Title]. [City, State Abbreviation where published]: [Publishing Company or Entity Name].

The Author in the suggested citation can be an individual or a company/entity name. An example citation DEQ uses is as follows:

Montana DEQ. 2020. Madison Sediment and Temperature TMDLs and Water Quality Improvement Plan. Helena, MT: Montana Dept. of Environmental Quality.

DOCUMENT REVISION HISTORY

Revision No.	Date	Modified By	Sections Modified	Description of Changes

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To update the table of contents, right click on the table and then select "Update Field" and then "Update entire table."

Table of Contents

LIST OF TABLES

Use Header 6 to populate a list of tables.

LIST OF FIGURES

Use Header 7 to populate a list of figures.

ACRONYMS

Expand the provided table to list all acronyms and abbreviations that appear in the document and their meaning.

Acronym	Definition
AMP	Adaptive Management Plan
DEQ	Department of Environmental Quality (Montana)
MCA	Montana Code Annotated
MPDES	Montana Pollutant Discharge Elimination System
TN	Total Nitrogen
TP	Total Phosphorus

1.0 Introduction

This section provides background information and context to clarify the motivations for the data collection and explains the problem statement or need that the monitoring described throughout this plan will support.

1.1 Problem Definition and Background

In this section, introduce the monitoring purpose and goals:

- Provide background information to provide context for the monitoring. State whether you are in the initial phosphorus-focused AMP phase (i.e., only upstream and downstream near field site monitoring) or implementation phase of an AMP (i.e., watershed-scale monitoring).
- State the reason you are conducting water quality monitoring and describe your monitoring goals, including any decisions to be made or outcomes to be achieved. Goals are the big picture desired outcomes of your project and can be broadly stated (e.g., evaluate current conditions, establish a baseline for future comparisons, identify sources of pollution, analyze trends over time, evaluate if a project effectively improved water quality).
- Describe if there are specific problems, needs, or data gaps motivating the monitoring.
- Consider including other past or current monitoring efforts that are related to this plan.

Consider including or modifying the following introductory background language:
Per 75-5-321, Montana Code Annotated (MCA), DEQ adopted rules allowing for the use of an adaptive management program when implementing narrative nutrient water quality standards. The adaptive management program is an incremental, watershed-based approach for protecting and maintaining water quality affected by excess nutrients. An important element of the adaptive management program is that it allows different types of nutrients (phosphorus vs. nitrogen) and nutrient sources to be addressed separately and incrementally over time by incorporating flexible decision-making which can be adjusted as management actions and other factors become better understood in each watershed. Per Section 5.0 of Circular DEQ-15, permittees operating under the phosphorus-focused phase of the adaptive management program are required to collect instream nutrients and response variables data.

1.2 AMP Watershed Boundary

In this section, describe the AMP watershed location and boundary where monitoring will take place. Include:

- The watershed (HUC and name) within which the monitoring will occur
- The waterbody or waterbodies targeted during the project, noting which are impaired for nutrient-related causes (search the most recent cycle of DEQ's Clean Water Act Information Center found at: https://deq.mt.gov/water/resources)
- The geographic location and size of the watershed, including counties, major cities/towns, and a general upstream and downstream watershed context.
- Map(s) of the project area

- Key features of the project area (e.g., natural characteristics that influence water quality such as climate, geology, elevation, and ecoregion, land cover, and human activities and land use).
    - Per Section 5.3 of Circular DEQ-15: Ecoregions must be based on the 2002 version (version 2) of the U.S. Environmental Protection Agency map which is found at: https://www.epa.gov/eco-research/ecoregion-download-files-state-region-8#pane-24 .
    - Per Section 5.3 of Circular DEQ-15: "Permittees should refer to ARM 17.30.607 through 613 and identify their receiving waterbody's use classification, and then review the associated beneficial uses provided in ARM 17.30.621 through 631. A proposed AMP monitoring plan must describe the applicable use class of the waterbody, which ecoregion zone (western or eastern) best applies to them, and which response variables will be measured, along with a justification; this is subject to department review and approval." Please review all of Section 5.3 in Circular DEQ-15 when determining your watershed boundary, applicable ecoregions, and which response variables to monitor.

      Note: stream classification can be found at Montana's Clean Water Act Information Center and by using the "Use Class Map," both found here: https://deq.mt.gov/water/resources

2.0 Objectives and Sampling Design

This section states the monitoring objectives, describes key elements of the sampling design such as monitoring locations and the timing of monitoring events, and outlines information about each parameter that will be monitored.

2.1 Monitoring Objectives

In this section, articulate the monitoring objective(s). Monitoring objectives should be very specific and measurable. Clearly articulated objectives explain why you are monitoring and often begin with the word "to" and contain four elements: parameter, location, timing, and context. For example, "To collect nutrient samples (TN, TP and NO_{2+3}) at five sites along the entire length of Anywhere Creek during the summertime growing season from July 1 - September 30 when ecoregional nutrient concentration ranges apply" This section ensures that the plan developer is considering sample analysis, size, and locations specific to addressing all the project goals from Section 1.1. Provide both descriptive text and a bulleted list of objectives.

2.2 Sampling Design

In this section, describe the sampling design that will be used. According to EPA (EPA QA/G5, 2002), there are two classes of sampling designs to consider: probability-based and judgmental. Strong statistical conclusions are available with probability-based designs but not with judgmental designs. Key questions to consider include:

- Is this project to be comparable with previous sampling or analytical efforts, or with a regulation standard?
- Is the objective of the sample to estimate an average or to find a hot spot?

- Will a reference or background population be used as a comparison to the target population?
- What considerations will be used in the field to confirm sampling locations are appropriate or adequate?
- Will you use a network of sampling sites that will be visited periodically or where sampling will be performed continuously?
- Do all the samples need to be taken during a similar timeframe? Is sequencing important, upstream to downstream or vice versa? Note: Per Section 7.2 of Circular DEQ-15: Sampling events for a specific parameter must be within the defined index period, at the minimum frequency described in the permit, and may not exceed 24 hours between near field upstream and downstream sample collection.
- What are minimum data requirements?
- Will samples need to be composited?

Note if you are simply conducting near field upstream and downstream monitoring around a facility (in the initial AMP phase), you do not need to be too detailed here, as "upstream versus downstream comparison" is your basic design. However, the above list of questions still need to be considered.

2.3 Monitoring Locations

In this section, state the total number of sites that will be visited and include a table which identifies each site's name, description, and latitude and longitude coordinates. For each site:

- Summarize which parameters will be collected throughout the sampling period.
- Describe the rationale for site selection. Where applicable, include references to:
  - applicable monitoring objectives
  - site access comments
  - features that may influence water quality such as tributaries, springs, return flows and withdrawals, suspected sources of pollution, ecoregion boundaries, slope, geology, etc.

Include a map displaying your monitoring sites within your project area.

Describe how sites will be located in the field (e.g., GPS, visual observations). Note: Always use the GPS coordinate system datum NAD 1983 and record coordinates in decimal degrees, to at least the third decimal.

Note: Monitoring locations should be carefully selected to represent conditions of the waterbody or reach you are monitoring. When selecting monitoring locations, consider aspects that may impact the parameters that you are sampling, such as tributaries; springs; irrigation withdrawals or diversions; suspected pollution hotspots; roads/bridges; landowner access issues; changes in ecoregion, slope, or geology.

Per Section 5.4 of Circular DEQ-15, "Sampling site locations in a submitted AMP monitoring plan are subject to department review and approval. At a minimum, an AMP monitoring plan must comprise one near field site upstream and one near field site downstream of each point source discharge (**Figure 5-2**). The department expects the permittee to establish the sampling sites in an approved AMP monitoring plan as long-term monitoring locations." Please review Section 5.4 on near field sites and Section 8.1 on far field sites in Circular DEQ-15 before selecting your sampling locations. Additionally,

Section 4.5 of the Guidance Document for the Implementation of Narrative Nutrient Standards provides additional help in selecting monitoring locations.

Table 2-1. Monitoring Locations*

Station ID	Latitude	Longitude	Parameters to Collect	Rationale for Site Selection

*These are proposed sampling locations which may change due to unforeseen access or other issues

Table 2-1. WQX Station Information

Station ID	Station Name	Station Description

Insert a map of monitoring locations above the Figure 2-1 heading.

Figure 2-1. Map of Proposed Monitoring Locations

When populating the above tables and entering data into WQX, please use the Montana EQuIS Water Quality Exchange (MT-eWQX) Guidance Manual (found at: https://deq.mt.gov/water/Programs/sw) for guidance on Station IDs, Station Names, Station Descriptions, and Latitude and Longitude Coordinates.

Additional WQX Guidance

Project Name, Description, and ID

- Use the Montana EQuIS Water Quality Exchange (MT-eWQX) Guidance Manual (found at: https://deq.mt.gov/water/Programs/sw) for guidance on Project Name, Project ID, and Project Description.
- The Project Name and Project ID must include the abbreviation "AMP."
- The Project Description must include "Adaptive Management Plan."

WQX Organization

All data entered for this monitoring plan should be entered under the WQX Organization: MDEQ_MPDES_WQX

2.4 Monitoring Timeframe and Schedule

Describe when monitoring events will occur:

- Include a statement that identifies the timeframe within which all sampling described within this monitoring plan will occur (e.g., One year or multiple years? During certain months or hydrologic periods?)
- State the frequency of sampling per parameter. For example, nutrients will be collected twice during the index period with a minimum of six weeks between sampling events or macroinvertebrates will be collected once annually during the index period.
- Note that per Circular DEQ-15, "Sampling events for a specific parameter must be within the defined index period, at the minimum frequency described in the permit, and may not exceed 24 hours between upstream and downstream sample collection." **Refer to Tables 5-3 and 5-4 of Circular DEQ-15 for minimum sampling requirements.** Section 4.3 of the Guidance Document for the Implementation of Narrative Nutrient Standards provides information on when the index period may need to be adjusted, subject to DEQ review and approval.

Include a table listing each sampling event:

- Explain the rationale for the timing/frequency (e.g., meeting the minimum sampling requirements per Circular DEQ-15 (state what they are); seasonal or flow conditions targeted such as baseflow, runoff, algal growing season/index period (July 1 to September 30), before irrigation withdrawals).
- Summarize which parameters will be collected during each sampling event, especially if it varies.
- Note: the "Date of Sampling Event" in the below table can be a date range, such as Mid-July or First week of May.

Table 2-3. Monitoring Schedule

Date of Sampling Event	Parameters	Rationale for Timing/Frequency

2.5 Parameters

List each parameter that will be collected and, for each:

- Briefly summarize the approach that will be used to collect each type of data (e.g., "measured via water samples analyzed by a lab" or "measured in situ with a field meter" or "collected by deployment of continuous dataloggers").
- Include a brief explanation and justification for including each parameter in the study design (i.e., what is it and why is it relevant). For example, discharge (flow) is necessary to pair concentrations with flow data to calculate loads, TSS can help evaluate nutrient patterns, and photos can help track benthic algae conditions. Note that your "Justification for Collecting" in Table 2-4 below should not be "required by Circular DEQ-15."

Table 2-4. Water Quality Parameters

Parameter or Data Type	Collection Approach	Justification for Collecting

3.0 Monitoring Team and Responsibilities

In this section, identify individuals involved with the major aspects of the monitoring and specify each person's affiliation, roles, and responsibilities:

- Examples of roles may include monitoring plan leader, field team leader, field personnel, equipment technician, database manager, data technicians, contractors, modelers, etc.
- Examples of responsibilities may include develop monitoring plan, oversee field personnel, provide training, provide equipment, calibrate equipment, review field forms, lab coordination, sample shipping or delivery, data quality review, validate and upload data into MT-eWQX database, perform data analysis, etc.

For more complex projects with multiple partners, consider including an organizational chart.

Table 3-1. Project Team Roles and Responsibilities

Role	Individual(s)	Affiliation	Responsibilities

4.0 Field Procedures

This section cites or describes each field procedure that will be applied while collecting data during this project and references the field forms that will be used to record data and sample collection activities.

4.1 Order of Operations

In this section, list the order in which each monitoring-related task will be conducted to serve as a guide for field personnel.

Consider including or modifying the following language if it is relevant to your monitoring:
The following sequence illustrates the order of operations applied for each site visit:

1. Prepare for the field (e.g., review sampling plan, pack equipment and supplies, inspect and calibrate instruments, obtain ice/dry ice, confirm site access and permissions).
2. Navigate to the proposed monitoring site location using the coordinates provided in the SAP, a handheld GPS unit, maps, and site descriptions.
3. Initiate field forms:
    - Record station information on site visit form.
    - Fill in header on field forms.
    - Fill in header and account information on analytical laboratory chain-of-custody form.
4. Collect data at site (Note: collect data types that are most sensitive to disturbance first):

- Collect chemistry data and samples (e.g., *in situ* field measurements, water samples, data logger deployment)
- Layout sampling frame and collect biological samples (e.g., benthic algae, macroinvertebrates, periphyton)
- Collect physical information (e.g., measure or estimate total discharge, take site photos)

5. Wrap-up site visit; review field forms for completeness and accuracy; complete chain-of-custody forms.
6. Deliver samples to the laboratory.

4.2 Field Forms and Sample Labels

In this section, provide a list of field forms that will be used during this project; include the official name of the form and any stipulations for when each form should or should not be filled out. Include the actual field forms in an Appendix at the end of this document and reference that Appendix in this section.

Describe the sample labels that will be used to identify each collected sample and provide instructions for filling out or affixing sample labels to sample bottles.

Consider including or modifying the following language:
All field forms should be printed on water resistant all-weather paper and filled out using pencil (preferable) or permanent fine-line marker.

The field forms used during this project (**Appendix A**) include:

- A site visit form designed for this monitoring plan will be used to record site visit information (e.g., date, time, personnel), site information (e.g., station ID, waterbody name, station description, latitude, longitude), instantaneous field measurements, sample collections and other data collection activities performed during the site visit.
  All samples to be submitted for analysis by an analytical laboratory or biological contractor will be recorded on the respective laboratory's chain-of-custody (COC) form.
  Additional DEQ-approved field forms will be used to record information during the site visit: List each field form that will be used

All field forms must be reviewed by the field crew prior to departure from each site to verify completeness and accuracy.

Prior to collecting samples at each site, all sample containers will be labeled, at a minimum, with the SVC, waterbody name, date, and personnel performing the sampling, as well as any other information requested on the label (filtration, transect number, method type). Labels will be filled out with pencil or permanent fine-point marker, affixed to the sample container and covered completely with clear plastic tape to protect the label from being damaged during storage.

4.3 Data Collection Procedures

In this section, cite or write the standard operating procedures (SOPs) that will be used to collect each type of data during this project:

- If a documented SOP exists which accurately describes the field procedure intended for use during the project, it is preferable to simply identify and cite that SOP. Because many SOP documents are compilations of multiple procedures, clearly identify the exact procedure to be followed (e.g., citation plus section or page numbers). **Section 4.6 of the Guidance Document for the Implementation of Narrative Nutrient Standards outlines existing DEQ SOPs that apply to nutrient data collection.**
- If no documented SOP that can be cited exists, write detailed step-by-step instructions and any other relevant guidance for the procedure in this section. These instructions should be very detailed to instruct field personnel through the exact procedures to be followed.

Use third-level sub-headings (4.3.1, 4.3.2, and so on) to organize this section, for example:

- **Instantaneous in situ measurements** (include type of field meter, which parameters will be measured, necessary calibrations, etc.)
- **Continuous Dataloggers** (include type of datalogger, process for deploying, checking, cleaning and retrieving, averaging period, data upload process, etc.)
- **Water and Biological Sampling** (include the type of samples to be collected, the method of collection, rinsing or other decontamination, filtration, preservation and sample storage, etc.)
- **Flow/discharge** (include guidance for where to measure, which meter or alternate method will be used, etc.)
- **Photos** (include the minimum number of photos to take per site, what subject matter should be targeted, instructions for repeat photopoints if applicable, etc.

Include a list of equipment and supplies needed to conduct all data collection activities associated with this monitoring plan in Appendix B.

If applicable, cite or write any decontamination procedures that will be conducted by field personnel, including equipment decontamination procedures (McCarthy, 2014) as well as aquatic invasive species decontamination (Esquivel and McWilliams, 2017).

4.4 Changes to the Field Sampling Plan

In this section, describe what will be done if modifications must be made to the monitoring plan while in the field. Describe what corrective actions will be taken, for example:

- If a site becomes inaccessible.
- If a sampling event must be cancelled.
- If an instrument is lost or malfunctions.

Consider including or modifying the following language if it is relevant to your monitoring:
As conditions in the field may vary, it may become necessary to implement minor modifications to sampling as presented in this plan. Field personnel will clearly document any modifications made to the approved plan and will communicate these modifications, preferably before or as soon as possible after, with the monitoring plan leader. If, for any reason, field staff feel that conditions are unsafe for collecting samples (e.g., swift waters, weather or ice conditions, other site hazards) they are not to collect the samples. Field personnel will make reasonable effort to reschedule any missed sampling events in consultation with the monitoring plan leader, or to replace samples that are lost or broken during the sampling event. If field personnel suspect that an instrument is malfunctioning or giving

inaccurate readings, they will add a comment to the site visit form explaining the issue and will communicate the issue to the monitoring plan leader and equipment technician. Monitoring plan leaders will acknowledge modifications in the document revision history table and in annual AMP progress reports submitted to the DEQ AMP Scientist.

4.5 Field Health and Safety Procedures

In this section, describe any measures that will be taken to ensure field health and safety.

Consider modifying the following language:
Field personnel are required to adhere to all health and safety protocols applicable to travel, chemical safety, water safety, site access, and other field data collection activities as required by their sponsoring entity.

5.0 Sample Handling and Laboratory Analysis

This section contains information pertaining to sample handling, chain-of-custody, and laboratory analysis.

5.1 Sample Handling and Delivery

In this section:

- Describe the procedures that will be followed to ensure that samples retain their original physical form and chemical composition through collection to final disposal.
- Describe the process that will be used to store samples between collection and receipt by the lab.
- Describe the process that will be used to deliver samples to the laboratory. For example, samples may be delivered in-person "by hand" to the lab or, in some cases, samples must be shipped. If samples are to be shipped, specify the mode of shipment and specific shipping instructions to guide field personnel.

Consider including or modifying the following language if it is relevant to your monitoring:
In the field, samples will be stored according to the preservation requirements shown in **Table XXX**. Care will be taken to maintain appropriate temperatures (e.g., adequate air circulation or ice supply), and coolers will be drained frequently to avoid contamination from melted ice. Storage time between sample collection and delivery to the lab will be minimized and samples will be received by the lab within the holding times specified in **Table XXX**.

Samples will preferably be delivered by hand to the lab. If samples must be shipped, the method of delivery (USPS, FedEx, or UPS) will be indicated on the site visit form and packing instructions provided by the lab will be followed. Upon delivery of samples at the laboratory, [entity] will keep the original site visit forms with chain of custody signatures in place and the laboratory will keep a photocopy.

5.2 Chain of Custody

In this section, describe the procedures that will be followed to maintain a record of chain-of-custody for all samples collected under this monitoring plan.

Consider including or modifying the following language if it is relevant to your monitoring:
A record of chain-of-custody will be maintained for each sample collected under this monitoring plan so that physical possession is tracked at all points from sample collection through laboratory analysis. The chain-of-custody form provided by each analytical laboratory or biological contractor will be used to record signatures, dates and times when samples are relinquished and received during transfers among people including laboratory staff. If samples are shipped, custody seals will be used on the shipping container to ensure that custody is maintained and that samples are not tampered with while in transit.

5.3 Laboratory Analytical Requirements

In this section, specify which analytical laboratories and/or biological contractors you will send each type of sample to, and include a table which shows, for each analyte, the analytical method, the required reporting limit, the holding time, the container (material and size), and the preservation requirements. Required reporting values for nutrients are outlined in Table 5-1 of Circular DEQ-15. Note: DEQ will provide additional guidance for populating the below table.

Table XXX shows the laboratory analytical requirements for each analyte included in this project.

Table 5-1. Monitoring Parameter Suite, Sample Handling, Analysis, & Preservation

Parameter	**Required Method**	**Required Reporting Limit** (µg/L unless noted otherwise)	**Holding Time** (days unless noted otherwise)	**Container**	**Preservative**

6.0 Quality Assurance and Quality Control (QA/QC)

This section describes the quality assurance and quality control elements applicable to this monitoring plan.

6.1 Training and Qualifications

In this section, describe the approach that will be used to ensure that field personnel are adequately trained to successfully complete the monitoring in this plan.

- Identify any corrective actions that may be taken as needed to address mistakes.
- Specify any additional qualifications or certifications that field personnel must possess. Note: If sampling will be performed in an exclusion or contaminant reduction zone of a hazardous waste site, sampling personnel are required to have Hazardous Waste Operations and Emergency Response (HAZWOPER) training. Industrial facilities such as refineries or mines may also have specific training requirements.

Consider including or modifying the following language if it is relevant to your monitoring:
Before sampling commences, all field personnel conducting monitoring under the requirements of this plan will receive training from experienced professionals. Each participant will be provided with a copy of this monitoring plan, applicable SOPs, and field forms, will be required to review them, and must keep these copies with them in the field during all sampling events for reference. Whenever feasible, an experienced professional will accompany inexperienced staff during initial sampling events until each field personnel demonstrates proficiency. If mistakes are identified throughout the sampling period, efforts will be made to provide supplemental training and clarify guidance documents to prevent further issues, and these corrective actions will be revisited during a lesson learned review period.

6.2 Instrument Calibration and Maintenance

In this section, describe the plan for calibration and maintenance for each instrument that will be used. Identify the make and model of the instrument, the procedures for calibrations, including those done pre-field, in-field, and post-field, and indicate the frequency at which calibrations will be performed. Include detailed instructions in this document if not documented elsewhere.

6.3 Data Quality Indicators

Data quality indicators (DQIs) are attributes of samples that allow data users to assess data quality.

Precision
Precision is a measure of agreement among repeated measurements of the same property under identical, or substantially similar conditions (EPA, 2002).

Note: DEQ generally requires field duplicate samples to be collected at a rate of 10% of the total number of samples collected per analyte. That is, one field duplicate sample should be collected for every ten routine samples collected per sampling event.

Include or modify the following language if it is relevant to your monitoring:
Field duplicates are two samples of ambient water (i.e., a routine sample and a duplicate or replicate sample) collected from a waterbody as close as possible to the same time and place by the same person and carried through identical sampling and analytical procedures. Field duplicate samples are labeled, collected, handled and stored in the same way as the routine samples and are sent to the laboratory at the same time.

Field duplicates will be submitted to the analytical lab for each water sample parameter monitored for this project at a rate of at least 10% of the total number of routine samples collected. Duplicates may be collected at any of the monitoring locations in **Table XXX**. Analytical requirements for field duplicates are shown in **Table XXX**.

Field duplicates are used to determine field precision (e.g., to ensure that proper procedures are followed consistently). For each set of field duplicates, the relative percent difference will be calculated:

Relative Percent Difference (RPD) = ((D1 – D2) / ((D1 + D2)/2)) x 100
where: D1 = routine sample result value
D2 = duplicate sample result value

Precision will be assessed by ensuring that relative percent difference (RPD) between duplicates is less than 25%. If the RPD of field duplicates is greater than 25% and the parent and duplicate result values are greater than five times the lower reporting limit, the result values will be flagged with a "J".

Bias

Bias is the systematic or persistent distortion of a measurement process that causes errors (EPA, 2002). This project will apply standard operating procedures for data collection which are designed to minimize bias (**Section 4.3**). If the lab's matrix spike/matrix spike duplicate % recovery is above or below the lab limits, we J flag the associated results with a Result Comment such as "MS/MSD failed low (84/81%), expect low bias."

Accuracy

Accuracy is a measure of the overall agreement of a measurement to a known value (EPA, 2002).

Note: For most projects, DEQ requires one field blank to be prepared and submitted to the lab per analyte for each batch of samples submitted to the laboratory.

Include or modify the following language if it is relevant to your monitoring:

Field Blanks

Field blanks are samples of analyte-free, laboratory-grade deionized water poured into a sample container in the field using the same method, container, and preservation as routine samples, and shipped to the lab along with other field (i.e., routine and duplicate) samples. All labeling, rinsing, preservation, and storage requirements applied for routine and duplicate samples are applied to field blanks; the only difference is that the water is deionized water rather than ambient stream water.

One set of field blanks (one blank per analyte) will be submitted with each batch of samples delivered to the laboratory. Field blanks must be prepared while in the field. Field blanks will be prepared at or near the end of each sampling event and submitted to the laboratory alongside the other routine and duplicate samples from that trip. Analytical requirements for blanks are shown in **Table XXX**.

Field blanks are used to assess potential sources of contamination such as field personnel's handling of samples and the condition of the sample containers supplied by the laboratory. Accuracy will be assessed by ensuring that field blanks return values less than the lower reporting limit (i.e., non-detects). If an analyte is detected in a field blank, all result values for that analyte from that batch of samples associated with the field blank will be qualified with a "B" flag. The exception is that data with a value greater than 10 times the detected value in the blank does not need to be qualified.

Trip Blanks

Trip blanks are provided by the laboratory for certain parameters that are especially sensitive to exposure to the atmosphere such as ultra-low-level mercury or volatile organic samples. Trip blanks are samples of analyte-free, laboratory-grade deionized water prepared by analytical laboratory staff, carried through the sampling event and stored alongside other samples but not opened, and resubmitted to the laboratory alongside other samples.

Equipment Rinsate Blanks

When field equipment decontamination procedures are followed, an equipment rinsate blank will be collected following field equipment decontamination and submitted to the laboratory. Rinsate blanks

are analyzed for the target analyte to ensure that decontamination protocols are sufficient to avoid contamination that could stem from the reuse of sampling equipment.

Representativeness

Representativeness is the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition (EPA, 2002).

Describe how your monitoring design achieves spatial and temporal representativeness. For example:

- Spatial: Were monitoring sites chosen to capture variability in land use, flow or other watershed characteristics that may be influencing water quality? Will a specific distance between locations be required to achieve sample independence? Do monitoring sites represent the entire waterbody, or a specific reach? Will samples be composited?
- Temporal: Will sampling be conducted from downstream to upstream? Will samples be collected at approximately the same time of day at each site? Will a specific amount of time be allowed to pass between sampling events to achieve sample independence? Will certain hydrologic periods or flow conditions be targeted or avoided?

Comparability

Comparability is a measure of confidence that one data set can be compared to another and can be combined when making decisions.

Describe how your monitoring design achieves comparability.

- For example, will standard operating procedures be followed? Will the same data types be collected as was collected during previous years' monitoring efforts? Will the same analytical requirements apply as previous monitoring efforts? Will field personnel receive training to promote consistency?

Completeness

Completeness is a measure of the amount of valid data needed to be obtained (EPA, 2002).

State your overall monitoring completeness goal as a percentage and describe how your monitoring design achieves completeness.

- For example, will completeness be verified for samples and field measurements prior to departure from each site? Will cancelled sampling events be rescheduled? Will damaged or lost samples be recollected? Will lab reports be reviewed in a timely manner? Will the planned number of samples meet minimum data requirements for the intended analyses?

Sensitivity

Sensitivity is a measure of the amount of valid data needed to be obtained.

Include or modify the following language if it is relevant to your monitoring:
Required reporting limits are specified for this project at a level that are adequately low to enable comparison to the thresholds of interest or to other comparable datasets. The laboratory routinely checks sensitivity (e.g., method blanks, continuing calibration blanks, and laboratory reagent blanks) per their quality management plan.

Result Qualifiers
Result qualifiers approved for use in this project are specified in the most current MT-eWQX EDD Guidance available on DEQ's Lakes, Streams & Wetlands webpage under "Submit Data": https://deq.mt.gov/water/Programs/sw.

6.4 Laboratory Quality Control

Include or modify the following language if it is relevant to your monitoring:
Analytical laboratories shall prepare and analyze the samples in accordance with the chain-of-custody forms and the methods specified in the analytical requirement table in **Section 5.3** (**Table XXX)**. Laboratory standard operating procedures (SOPs) must be controlled under a Laboratory Quality Assurance Program (LQAP) with sufficient rigor for the lab facility to hold a current certification under the State of Montana/EPA Region 8 drinking water certification and/or National Environmental Laboratory Accreditation Conference (NELAC) program. Results from laboratory QC samples (e.g., instrument blanks, method blanks, laboratory control samples, sample matrix spikes) are submitted with the laboratory data report.

7.0 Data Management and Record Keeping

This section describes the process for managing data and maintaining records associated with this monitoring plan.

7.1 Data Review and Validation

Include or modify the following language if it is relevant to your monitoring:
Analytical laboratories will prepare and analyze the samples in accordance with the chain-of-custody forms and analytical methods specified in **Table XXX**. The lab will supply the entity that submitted samples (i.e., permittee) with laboratory analytical reports and Electronic Data Deliverable (EDD) spreadsheets. Instructions for preparing, validating, and submitting the EDD to MT-eWQX must be followed (available at https://deq.mt.gov/water/Programs/sw). For example, steps include:

- Compiling data (including site information, field measurements and lab results),
- Transforming the data into the required format,
- Performing a thorough quality control check of the data to correct errors, qualify problematic sample result values with data flags, etc.,
- Validating the data, and
- Submitting EDDs to MT-eWQX.

7.2 Data Management

In this section, explain which database(s) will be used to store each type of data that will be collected throughout this project, including the quantitative result values measured in the field or received as electronic data deliverables from the analytical labs as well as systems used to manage other data types such as photos, qualitative data such as habitat evaluations, written field observations, and field forms.

Include or modify the following language if it is relevant to your monitoring:
All site information, field measurements and analytical results from laboratories for this project will be uploaded into DEQ's EQuIS Water Quality Exchange database (MT-eWQX). Data uploaded to MT-eWQX

is submitted to EPA's National WQX Warehouse and accessible via the Water Quality Portal. All data submitted to DEQ for this project from analytical laboratories and others must adhere to the most current Electronic Data Deliverable (EDD) and submittal requirements published in the MT-eWQX EDD Guidance available on DEQ's Lakes, Streams & Wetlands webpage under "Submit Data": https://deq.mt.gov/water/Programs/sw.

8.0 Data Analysis and Reporting

This section describes the intended data analyses to be performed using data produced by this monitoring plan.

8.1 Data Analysis

In this section, describe how each type of data produced by this project will be analyzed. For example, describe thresholds or statistical analyses that will be used to evaluate result values. Discuss how the proposed data analyses will help to achieve the monitoring plan goals and objectives stated in **Sections 1.0 and 2.0**. Also, describe any other data (internally- or externally-collected) that will be used in your analyses in addition to the data proposed for collection in this plan; verify how other available data will be accessed and evaluated for data quality. Note: Section 7.0 of Circular DEQ-15 outlines options for how near field response variable data may be evaluated to determine if beneficial uses are protected and narrative nutrient standards are achieved. Additionally, Sections 5.0 and 6.0 of the Guidance Document for the Implementation of Narrative Nutrient Standards contain guidance on determining compliance with permit limits.

8.2 Reporting

In this section, describe how the data, results and decisions of this monitoring plan will be shared and reported. Indicate who the audience is for each proposed product and, if possible, comment on the expected timeline for completion of these products.

9.0 References

Use Chicago style citations to list all resources referenced throughout this monitoring plan. If retained from the recommended language included in this template, include the following:

Environmental Protection Agency (EPA). 2002. Guidance for Quality Assurance Project Plans. EPA QA/G-5. Washington DC: Environmental Protection Agency Office of Environmental Information.

Esquivel, Robert and Elizabeth McWilliams. 2017. Standard Operating Procedure: Aquatic Invasive Species Decontamination. WQDWQPBFM-05, Version 1.0. Helena, MT: Montana Department of Environmental Quality, Water Quality Planning Bureau.

McCarthy, M. 2014. Standard Operating Procedure: Field Equipment Decontamination. Document WQPBWQM-028. Helena, MT: Montana Department of Environmental Quality Water Quality Planning Bureau.

APPENDIX A – FIELD FORMS

APPENDIX B – EQUIPMENT AND SUPPLIES