DWQ Guidance for Preparing Watershed Plans

GUIDANCE FOR PREPARING WATERSHED PLANS

BACKGROUND

The North Carolina Division of Water Resources (NCDWR) is responsible for the protection and restoration of the waters of the state, often in coordination with other agencies and stakeholders. The NCDWR – Public Water Supply Section – Source Water Assessment and Protection Program is responsible for ensuring the water supplies designated to be used for drinking water supplies are adequately protected. This document provides guidance to those stakeholders interested in preparing watershed plans that will meet all these responsibilities. This introductory guidance is provided by NCDWR to assist those with little or no experience in developing watershed plans. Other watershed plan development guidance documents

- EPA – Handbook for Developing Watershed Plans to Restore and Protect Our Waters (March 2008) http://water.epa.gov/polwaste/nps/upload/2008_04_18_NPS_watershed_handbook_handbook.pdf)
- EPA - Quick Guide to Developing Watershed Plans (May 2013) http://water.epa.gov/polwaste/nps/upload/watershed_mgmnt_quick_guide.pdf, and the
- EPA Watershed Plan Builder http://java.epa.gov/wsplanner/#

are available.

NINE KEY ELEMENTS FOR 319 FUNDING

Under EPA's Watershed Program, there are nine key elements recommended as being integral to a watershed plan (Table 1). EPA requires that watershed plans follow this general format if developing a restoration plan that will be implemented using 319 funds. **Please note that 319 funds are no longer able to be used for the development of watershed plans.** 319 refers to the section of the Clean Water Act that allows EPA to provide money to the states for nonpoint source activities such as technical and financial assistance, education, training, technology transfer, demonstration projects, and monitoring to assess the success of specific nonpoint source implementation projects. EPA provides extensive guidance as noted above, but it can be overwhelming especially for those who may be preparing their first watershed plan. Therefore, NCDWR has prepared this simplified guidance.

TABLE 1. EPA'S 9-KEY ELEMENTS

1. An information/education component to enhance public understanding of the project
2. A monitoring component to evaluate the effectiveness of the implementation efforts over time measured against the criteria *(used to determine whether loading reductions are being achieved)*.
3. An identification of the causes (stressors) and sources or groups of similar sources that need to be controlled to achieve pollutant load reductions estimated in the watershed
4. An estimate of the pollutant load reductions expected for the management measures
5. A description of the Nonpoint Source pollution (NPS) management measures that will need to be implemented to achieve load reductions as well as to achieve other watershed goals identified in the watershed based plan
6. A set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made towards attaining water quality standards
7. An estimate of the amount of technical and financial assistance needed, associated costs and or sources, and authorities that will be relied upon, to implement the plan
8. A schedule for implementing the NPS management measures identified in this plan that is reasonably expeditious
9. A description of interim, measurable milestones for determining whether NPS management measures or other control actions are being implemented

EXEMPTION FROM TMDL DEVELOPMENT

In addition to the 9-Key Elements, EPA has also identified six elements (Table 2) that if addressed could exempt an impaired water from TMDL development. The Total Maximum Daily Load (TMDL) Program is a Federal program authorized under the Clean Water Act to address waters that are not meeting uses. The NCDWR has been delegated the authority to implement this program in North Carolina.

A TMDL or Total Maximum Daily Load is a calculation of the maximum amount of a pollutant that a waterbody can receive (loading) and still meet water quality standards. There is a general misunderstanding that a TMDL includes implementation requirements or plans. This is not the case. A complete TMDL need only include a detailed water quality assessment and the pollutant loading estimate and reduction requirements.

TABLE 2. SIX ELEMENTS FOR TMDL EXEMPTION

I. Identification of segment and statement of problem causing the impairment;

II. Description of pollution controls and how they will achieve water quality standards;

III. An estimate or projection of the time when water quality standards will be met;

IV. Schedule for implementing pollution controls;

V. Monitoring plan to track effectiveness of pollution controls; and

VI. Commitment to revise pollution controls, as necessary

EPA regulations recognize that alternative management measures (or pollution controls) may obviate the need for a TMDL. Specifically, segments are not required to be included on the Section 303(d) list if

"[o]ther pollution control requirements (e.g., best management practices) required by local, State, or Federal authority" are stringent enough to result in achieving applicable water quality standards (40 CFR 130.7(b)(1)) within a reasonable period of time. A complete watershed plan can supply the alternative management measures that exceed TMDL requirements. For guidance specific to meeting six elements for TMDL exemption, please see website: http://portal.ncdenr.org/c/document_library/get_file?uuid=405af771-16fa-483d-ac9f-03cf6439b51d&groupId=38364

SOURCE WATER PROTECTION PLANNING

The development of a Source Water Protection Plan (SWPP) by the entity(ies) responsible for managing the drinking water supply is a voluntary, non-regulatory recommendation. Protecting a municipality's or utility's drinking water source(s) is important because it helps a) protect the environment, b) ensure financial stability of the water provider and most importantly c) protects public health. For additional information on preparing only a SWPP, please refer to guidance available at the following website: http://www.ncwater.org/pws/swap/SWPGuidance_120109.pdf. Some of the steps to be followed in SWPP development are similar to elements required either for the Nine Element Watershed Plan and/or the Six Element for TMDL Exemption. These common requirements will be explained further in the following sections.

TABLE 3. SEVEN STEPS FOR SWPP PREPARATION

STEP 1: Obtain copy of and familiarize oneself with SWAP report

STEP 2: Form a local source water protection team

STEP 3: Conduct Potential Contaminant Source Inventory

STEP 4: Develop management strategies

STEP 5: Develop contingency plan

STEP 6: Develop schedule for implementing and updating local SWPP

STEP 7: Submit local SWP plan to the Public Water Supply Section

There is significant duplication between the 9-Key Elements and the six elements for TMDL exemptions and also some duplication with the Source Water Protection Plan requirements. Portions of the six elements and some of the steps for Source Water Protection Plan preparation will be addressed in the sections dealing with the 9-Key Elements. To allow for the development of a watershed restoration plan that meets all sets of requirements, this guidance weaves the different requirements together. Each section identifies the elements that are addressed within it for ease of determining if all elements have been met. When writing a Watershed Restoration Plan it is helpful to highlight each element to assist reviewers.

Also be aware that not all portions of the plan need to be completed at the beginning of a project. For example, some of the folks that will be responsible for maintenance of restoration activities may not be identified until further along in the process. The parameters causing the water quality problems may not

be known. All the management measures may not be identified. Each watershed plan should be viewed as a working document that can and should be updated as additional information becomes available.

PURPOSES/USES/BENEFITS

This guidance provides general content necessary to develop a watershed plan that will provide structure and a clear path to guide watershed management, restoration efforts, and/or water supply protection. By developing and implementing a watershed plan, the watershed organization can improve their watershed restoration skill set (i.e., assessing stressors and sources of impairment, effectively communicating and working with stakeholders, securing willing landowners for management measures, etc.). This knowledge can then be shared with other interested individuals and groups and used to restore other watersheds.

The watershed plan can be compared to a business plan. When one seeks a bank loan to start a business, the bank looks for a strong business plan that lets them know the business will be efficient and effective and that applicant will be able to meet the obligations of the agreement. When applying for environmental grant programs, portions of watershed plan can be used to show NCDWR and EPA (or the particular grant program) that grant money will be spent in an efficient, effective, and timely manner. A well-organized plan with clear and achievable strategies will help encourage participation by local governments and citizen groups. The plan should include management measures and monitoring programs to show water quality improvement in the case of restoration, or no water quality declines if water quality protection is the goal.

Because coordination and cooperation among different players is so important in watershed work, developing and maintaining relationships is crucial to a project's success. These strong relationships are not only important during the restoration of the watershed, but also to fulfill future maintenance and protection requirements. This concept will be addressed in greater detail in the Stakeholder Involvement section.

DWR approves watershed plans in North Carolina and acknowledges that there is flexibility in preparing these watershed plans given the great variety in watershed characteristics. Examples of this flexibility will be noted throughout this document. For those more involved aspects of watershed planning, references are provided at appropriate points throughout this document. Finally, implementation of a watershed plan is a learning process. It is essential to track and update references, information and changes in later versions of the watershed plan.

WATERSHED PLAN OUTLINE

The following outline can be used to develop a watershed plan to meet NCDWR, 319 and TMDL and DWR-SWAP Source Water Protection plan requirements. The parentheses contain references to EPA's 9-Key elements defined in Table 1 the six elements needed for TMDL exemption found in Table 2 (roman numerals) and the seven steps to be followed for Source Water Protection Plan (SWPP) preparation (Table 3). Please note that this guidance does not address STEP 5 that is required for the SWPP. Refer to the following website: http://www.ncwater.org/pws/swap/SWPGuidance_120109.pdf for assistance in preparing STEP 5 (since this step is not required in either the 9-Key or six element TMDL exemption plans, it is NOT covered in this guidance).

- Overview ..... (I, STEP 1)

COMPONENTS OF WATERSHED PLANS

OVERVIEW (I, STEP 1)

This section includes descriptive information on the watershed including location, land use, background on activities in the watershed, size, and extent of impairment. DWR's Basinwide Plans may provide some of this information. They can be accessed at: http://portal.ncdenr.org/web/wq/ps/bpu/basin.

The DWR-PWSS-SWAP has completed source water assessments for all NC drinking water sources. Some of the information in the assessment covering your watershed area could be included in the watershed overview.

RESPONSIBLE PARTIES & STAKEHOLDERS (VI, STEP 2)

Identifying who the key players are in the development and implementation of the watershed plan, as well as, their individual roles is key to the success of a watershed restoration and/or protection plan. Stakeholders are those who live, work, and/or play in the watershed. Providing them a role in the watershed planning and restoration effort has many advantages, such as:

- Fresh and valuable ideas and input.
- Greater efficiency and access to resources. A potential partner may already be doing something (e.g., monitoring, BMP implementation, etc.) that you need as part of your watershed effort.
- An avenue for providing watershed education to a great variety of people.
- Instilling a sense of ownership and personal responsibility for the project's success.

There are different stakeholder types. Some will want to be very involved while others may want to only be informed of watershed plan progress. Stakeholders can be involved in different stages of the watershed process. Some may have a role in developing the mission and main goals of the process, others may prefer to wait until tasks have been defined and help to implement them. When identifying and working with potential stakeholders, you should consider:

- Setting some guidelines, but maintaining flexibility. It is important to keep the process moving forward while still allowing for constructive criticism.
- Ensuring all necessary stakeholders are involved to the degree they want to be involved. Maintaining good communication and an information-sharing network.
- Identify willing landowners early in the process, especially if management measures on landowners' properties will be necessary as part of watershed restoration.

INFORMATION AND EDUCATION AND MARKETING (1, II, STEP4)

This component should be present throughout the entire watershed planning process. Although an education component is not specifically mentioned in the SWPP guidance, education can be important in building and maintaining a local source water protection team. Education is also a potential management strategy (or pollution control) option and thus element II of TMDL exemption and STEPS 2 and 4 of SWPP guidance are referenced. It is important to build and develop relationships among the stakeholders to ensure that they are kept informed of the project's progress and that they have an understanding of the processes involved with the restoration. There are many different information and education options that can be used as part of the watershed effort. Some examples are provided in Table 4:

TABLE 4. INFORMATION & EDUCATION MEASURES

- Website design, maintenance
- Newspaper
- Brochure/Announcement – General Mailing(s)
- TV announcement
- Radio announcement
- Letters to Targeted Sectors
- Workshops/Meetings within watershed (e.g., civic centers, schools, churches, etc.)
- School Programs
- Tours of watershed/management measures
- Stream Cleanups/Volunteer Monitoring
- Shared meals (e.g., cook-outs, potlucks, etc.)

For budgeting purposes, it is recommended that costs associated with the activities identified in the plan be included. Understanding the costs associated with each measure can assist in determining the best modes of information sharing and education for a particular project and in identifying funding sources.

It should also be noted that marketing in addition to education is needed in the watershed process. Education helps raise awareness that can create conditions for attitude changes and behaviors. Marketing is used to persuade people to buy or participate in something either directly (allowing management measure on their property) or more indirectly (changing behavior – no longer dumping oil down a storm sewer). Marketing is also related to guidance on tracking education/outreach activities, or how to survey for effectiveness. If marketing is applied following or in conjunction with education, one would expect a greater effectiveness. In watershed protection and restoration work, it may be more specific to state that 'social marketing' is needed. Social marketing is the systematic application of marketing along with other concepts and techniques to achieve specific behavioral goals for a social good.

MONITORING (2, V, STEP3)

Monitoring has many purposes including a) identifying causes, stressors, and sources of the water quality impairment, b) tracking the effectiveness of management measures (or pollution controls), and c) documenting water quality improvements achieved by implementing a watershed restoration plan. Again, monitoring is not specifically required in the SWPP, but the effort to identify Potential Contaminant Sources (PCS) that may threaten surface water may include monitoring. Proper identification of causes, stressors, and sources of the water quality impairment is important because if not correctly done, resources can be misdirected or even wasted. In addition, monitoring itself can consume significant resources, so it is helpful to use monitoring in conjunction with other tools to identify causes, stressors, and sources of the water quality impairment.

Tracking the effectiveness of management measures (or pollution controls) is not only important because it is required as one of the six elements to waive the need for a TMDL, but it also indicates those measures that are working and those that are not. Documenting water quality improvements achieved by implementing a watershed restoration plan is a top priority for funding agencies. It is this monitoring that will likely play a major role in documentation of the water's restoration. Such documentation should come from a comprehensive monitoring program appropriately scaled to the project. In addition, if resources allow, it may be useful to have a few monitoring stations that are tracking the overall health of the watershed and are not immediately downstream of management measures.

Before developing a monitoring plan, obtain the most recent and accurate land use information to help identify potential stressors, causes, and sources of problems and guide selection of monitoring locations and parameters in the watershed. This recent information may be able to be first assessed using recent aerial photography. It may be then necessary to do a windshield survey or even some ground truthing.

As the size of the watershed increases, the number of tributaries and the complexity of the land uses within the watershed increases. A more complex monitoring strategy is usually required in these cases.

Before committing to an elaborate monitoring strategy, evaluate the project's monitoring needs. The monitoring plan should address the following issues:

- Identify the purpose of monitoring in relation to the project.
- Consider the data quality needed to meet stated goals and objectives. At a minimum, your data needs to answer specific questions about your water quality. Identify the type of quality control documentation and procedures that are necessary to validate sample collection and data processes. If you wish to provide the data to the NCDWR for use support determinations and reporting, you will need to develop a detailed Quality Assurance Project Plan (QAPP) and keep careful documentation of all quality control and assurance activities. Please see end of this monitoring section for more QAPP preparation information.
- Define who will use data, and how it will be used (i.e., identify problems and/or measure improvement in stream conditions).
- Collect background information on the project study area that can be used to refine the project goals and objectives and may result in improvements to the monitoring plan. Background information could reduce or even eliminate need for monitoring in certain portions of your watershed. If, for example, monitoring is already being done in a particular area.
- Provide the identity and experience of the monitoring plan preparer
- Prepare a monitoring program general description:
  - Parameters to be monitored
  - Methods of parameter analysis

- Monitoring frequency
- Monitoring station locations (map is helpful)

Monitoring may be conducted throughout several phases of a project. It may be done initially to assess water quality in a watershed and identify potential causes, stressors, and sources of a water quality problem or problems. Monitoring data may help to identify potential management measure locations. Monitoring may continue to be conducted during and after management measures are implemented to document their effectiveness. It should also be noted that to document the effectiveness of management measures, monitoring does not have to be physical, chemical or biological sampling. Taking photographs before and after management measures are implemented can be just as effective in demonstrating improvement.

As noted above, when developing a monitoring strategy, one important consideration is whether the data will be used for use support assessment by NCDWR. In North Carolina, many types of data and information are used to determine if the water quality standards, biological aquatic life criteria, and the designated uses of the water are attained. NCDWR collects data to evaluate biological integrity, water chemistry and some physical characteristics. NCDWR also considers information collected and analyzed from other organizations (i.e., universities, discharger coalitions and volunteer monitoring programs) statewide that have an approved QAPP. Thus, if one of the goals of the project is to have monitoring data utilized by NCDWR in the use support assessment, one must have an approved QAPP. There may be additional requirements for non-DWR data to be used for use support assessment, but having an approved QAPP is the first step. For further guidance on collecting and analyzing data and preparing a QAPP for NCDWR approval, please consult one or more of the following:

- Appendix A of this document – Submitting Water Quality Data to NCDWR for Use Assessment (DWR document advising those who want to collect/analyze data and submit to NCDWR)
- Appendix B of this document – QAPP Form
- The website provided on the 319-application form that provides good, basic information for the volunteer or simple monitoring plan: http://www.epa.gov/owow/monitoring/volunteer/qappcovr.htm.
- For more detailed projects that will require more information, please refer to the following website -http://www.epa.gov/quality/qapps.html.

CAUSE & SOURCE IDENTIFICATION (3, I, STEP 3)

Water quality data can be compiled before, during and/or after a watershed assessment. A watershed assessment is a process for evaluating potential and actual impacts within a watershed. It can include information on geography and land and water resources and can also be used to identify potential stressors, causes, and sources of water quality problems.

As was stated earlier in this document, an important part of the watershed plan is the overall goal or purpose. The goal will determine whether the assessment should be simple or complex. It will also affect the elements of the assessment. For example, an assessment for a small, primarily agricultural watershed may be limited to information on the type of agricultural operations located near streams and rivers. If agricultural problems are remedied and the water quality problems persist, then perhaps a more detailed assessment will have to be done.

In any watershed assessment (either simple or complex), stressors (causes), and sources need to be identified. The watershed assessment generally has greater value if the causes, stressors and sources can

be identified with as specific location(s) as possible (i.e., subwatershed, stream, stream segment). This association could help guide and direct management measure identification and placement and is also a specific requirement for waiving the need for TMDL development.

The following discussion defines stressors, sources, and indicators and explains them and their relationship to one another in the effort to assist with their accurate identification.

Watershed Function: Beneficial watershed characteristic (Examples: fish habitat/cover, aquatic habitat)

Stressor (Cause): physical, chemical, or biological agent within watershed that has potential to change or degrade watershed functions either by acting alone or in conjunction with other stressors. Stressors can generate additional stressors (as shown in figure 1). Watershed function changes can occur to such a degree so as to render the water incapable of supporting some of its functions or uses.

Source: origin of stressor that releases or imposes stressor into waterbody.

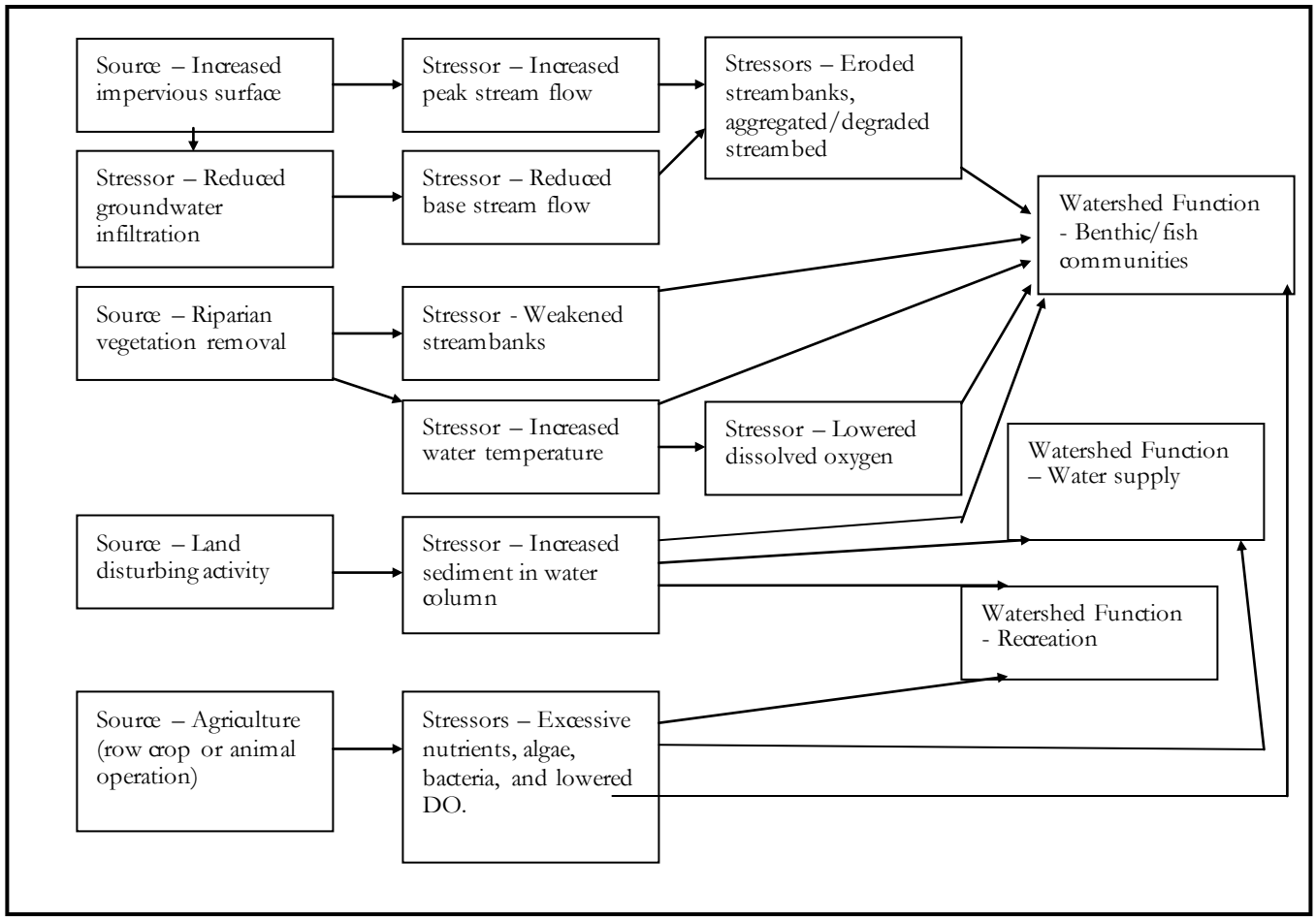
Indicator: used to measure the impacts associated with stressors. Indicators are quantifiable or subjectively rankable measures that provide a means of evaluating the health of watershed functions.

As shown in Table 5 and Figure 1, there are indicators associated with the different sources and stressors. These indicators associate the problems with numeric water quality targets. A watershed restoration plan should identify numeric water quality target(s) - a quantitative value used to measure whether or not the applicable water quality standard is attained. For example, fecal coliform must be reduced to 200 organisms/100 ml in Class C waters to meet the fecal coliform water quality standard. Another numeric target may be a value associated with a fish or benthic community that is indicative of a supporting water. Where the impairment is based on non-attainment of a narrative (non-numeric) water quality criterion, the plan should identify one or more appropriate numeric water quality target levels that will be used to evaluate attainment of the narrative water quality criteria. The plan should also describe the basis for selecting the numeric target levels.

TABLE 5- SOURCES, STRESSORS, INDICATORS AND ASSOCIATED IMPACTED WATERSHED FUNCTIONS.

Source	Potential Stressor	Indicator	Watershed Function
Increased impervious surface	• Increased peak flow • Eroded streambanks • Aggregated/degraded streambed • Increased deposition • Reduced deep-water habitat	Flow and cross section measurements	Fish/benthic habitat or community rating
Contaminants on impervious surface	• Increased contaminants such as metals, nutrients, fecal coliform • Increased sediment • Increased algae and bacteria • Lowered dissolved oxygen (DO).	Metals, Chlorophyll-a, DO, bacteriological, TSS and turbidity measurements.	Fish/benthic habitat or community rating, water supply, recreation
Riparian vegetation removal	• Increased temperature • Lowered DO, • Increased nutrients and sediment	Temperature, DO, nutrient, TSS and turbidity measurements	Fish/benthic habitat or community rating
Riparian vegetation removal	• Weakened and eroded streambanks	Flow and cross section measurements	Fish/benthic habitat or community rating
Land disturbing activity (construction, agriculture, forestry, mining, etc.)	• Increased sediment in water column	TSS, Turbidity	Fish/benthic habitat or community rating, water supply, recreation
Fertilized acreage or animal operation too close to water	• Excessive nutrients, algae, and bacteria • Lowered DO	Chlorophyll-a, DO, and Bacteriological Measurements	Fish/benthic habitat or community rating, water supply, recreation

FIGURE 1. HOW STRESSORS AND SOURCES IMPACT WATERSHED FUNCTIONS



There may be situations where it is difficult (at least initially) to identify a pollutant of concern or a numeric water quality target. These situations are included in the next section.

LOAD ESTIMATES (4)

As part of developing a TMDL, the amount (loading) of a pollutant is estimated that would result in attainment of the surface water quality standard. This loading estimate provides a goal for reductions and is required as part of the 9 element plans. The following section provides guidance on determining if a load estimate is necessary and, if so, estimating the necessary load reductions for inclusion in the watershed plan and for determining appropriate management actions.

ESTIMATION OF LOAD REDUCTIONS - SCENARIOS

Determine which of the following scenarios is applicable to your situation:

Scenario No. 1 – Pollutant of concern (POC) has **not** been identified at this time (POC examples: fecal coliform, turbidity, nitrogen, etc.): GO TO MANAGEMENT MEASURES SECTION

If benthic/fish communities have been negatively impacted in a stream, but there has not been a POC associated with these degraded communities, it is NOT necessary to estimate existing loading. The

communities could be degraded due to one or more stressors such as toxicity, habitat degradation (includes many stressors), and/or a water quality violation. Therefore, until one or more POCs have been identified, DO NOT estimate loading. It is NOT necessary to complete this section. One can simply state, "POC(s) is/are not known at this time".

Scenario No. 2 – POC(s) is/are known and TMDL has been completed.: CONSULT THE TMDL DOCUMENT.

It is very likely that loading information you need is contained within that document. Referencing a TMDL document in a watershed plan is encouraged. It is not necessary to reinvent the wheel. TMDL documents can be found at: http://portal.ncdenr.org/web/wq/ps/mtu/tmdl/tmdls.

Scenario No. 3 – POC(s) is/are known or can be hypothesized: PLEASE USE ONE OR MORE LOADING TOOLS DESCRIBED IN THE LOADING/LOAD REDUCTION TOOLS SECTION OR ADEQUATE SUBSTITUTE.

It is recommended that loading be estimated when possible to provide a base from which to measure improvement. For example, suppose that base loading for sediment can be estimated at 500 tons/year under existing conditions and, after management measures are implemented, loading for sediment is calculated to be 300 tons/year. If there is also improvement in actual stream conditions (improved benthic/fish), then there is a good correlation between reduced loading and stream improvement. If there is no stream improvement, even though there is an estimated/calculated loading reduction, then the problem should be examined more carefully. Two issues that could be examined:

1. The loading tool is not accurate
2. The sediment is not really contributing to stream problems (poor benthic/fish) and thus improving sediment loading is not improving the stream.

The above examples illustrate the complex nature of watersheds and the importance of dynamic watershed plans.

When the POC is identified, the watershed plan should describe relationships between numeric water quality targets and identified pollutant sources and, based on this linkage, identify what loadings are acceptable to achieve the targets. The cause-and-effect relationship may be used to determine loading capacity of the waterbody for the pollutant of concern. As stated earlier, if a TMDL has been completed, this information will be within the TMDL. If a TMDL has not been completed, please use one or more of the tools (described in the following section) to help calculate loadings. These tools can also be used to calculate loading reductions associated with management measures. Table 6 in the management measures section summarizes the relationship between stressors, sources, management measures and reductions.

It should be noted that it is not the intent of the loading reduction estimate requirement to impair the overall watershed effort by requiring modeling that may not be necessary. For example, if fecal coliform is the known POC, and the fecal coliform sources are known, then measuring fecal coliform concentrations before and after management measure implementation and calculating fecal coliform reduction instream could meet this loading requirement. This example is provided because more than one of the models described below are not really applicable for fecal coliform.

ESTIMATION OF LOAD REDUCTIONS - LOADING/LOAD REDUCTION TOOLS

Export Coefficient Model: Export coefficients for different land uses (that can be obtained from literature) are multiplied by the specific land use acreage to obtain a nutrient load for that land use. For example, export coefficient for forested land of 1.8 kg Nitrogen/acre/year is multiplied by 100 acres of forestland to generate 180 kg Nitrogen/year exported from this forestland. To download the spreadsheet tool for calculating loads using export coefficients go to www.water.ncsu.edu/watershedss

Long Term Hydrologic Impact Assessment (L-THIA) Model: This is an online tool to assess water quality impacts of land use change. Based on community-specific climate data, L-THIA estimates changes in recharge, runoff, and nonpoint source pollution resulting from past or proposed development. Please see the following website: http://www.ecn.purdue.edu/runoff/lthianew/Index.html

Spreadsheet Tool for the Estimation of Pollutant Load (STEPL): This tool calculates amount of nitrogen, phosphorus, biological oxygen demand (BOD), and sediment generated from a watershed based on its different land uses, activities, precipitation, and soils. It first calculates existing loading. Then, one can also calculate load reductions for these four parameters following implementation of combinations of different management measures. Because this tool can be applied to the entire nation, it may not be as site specific as other tools, but can be a good place to begin for a watershed. Please see the following website for additional STEPL information: http://it.tetratech-ffx.com/steplweb/.

Revised Universal Soil Loss Equation 2 (RUSLE2): RUSLE2 is a model that predicts long-term, average annual erosion (soil loss). RUSLE2 is an update of RUSLE and USLE. (Note: climate, soil, vegetation, and cropping management databases are updated for RUSLE2). The STEPL tool (described in previous section) allows the user to modify USLE (precursor of RUSLE) parameters. Thus, if one wants to obtain the most accurate soil loss numbers, one may prefer to use RUSLE2 instead of STEPL for soil loss calculations. For more information on RUSLE2, please see the following website: http://www.ars.usda.gov/Research/docs.htm?docid=6010.

Nutrients: North Carolina Agricultural Nutrient Assessment Tool (NCANAT) contains both the Nitrogen Loss Estimation Worksheet (NLEW) and the Phosphorus Loss Assessment Tool (PLAT).

NLEW was developed to assist with accounting and tracking associated with the Neuse River Basin nutrient management rules and to assist the agricultural community in determining nitrogen reductions associated with different management measures.

There are two versions of NLEW. The field scale version can be used anywhere in the state, while the aggregate version is designed for larger areas such as the Neuse and Tar Pamlico river basins.

PLAT was developed in response to the USDA Natural Resource Conservation Service (NRCS) nutrient management standard. The charge was given that each state must assess phosphorus status during nutrient management planning if animal waste is involved and/or the field is within an impaired watershed. PLAT is a field version tool and can be used throughout the state.

For additional information on NCANAT and nutrient management in NC, please see the following website. http://nutrients.soil.ncsu.edu/ncanat/software.htm

MANAGEMENT MEASURES & EVALUATION CRITERIA (5, 6, II, V, VI, STEP4)

The watershed restoration plan should describe

- management measures already in place, or scheduled for implementation, that will result in reductions of pollutant loadings to a level that achieves the numeric water quality standard
- basis upon which determination is made that the management measures will result in the necessary reductions, and
- basis for concluding that management measures are "requirements" or why other types of controls already in place may be sufficient.

EPA will consider a number of factors in evaluating whether a particular set of management measures are in fact "requirements" as specified in EPA´s regulations allowing the watershed plan to replace a TMDL. Requirements may be other than those based on statutory or regulatory provisions, as long as some combination of factors are present and will lead to achievement of water quality standards within a reasonable period of time. For example, established plans of government agencies that require attainment of water quality standards within a reasonable period of time may qualify even when their components include incentive-based actions by private parties.

Table 6 presents possible management measures with their associated stressors, parameters and loading reduction evaluation measures. There are a variety of best management practices and other activities not shown below that can also result in pollutant load reductions and would be acceptable.

TABLE 6. MANAGEMENT MEASURES, STRESSORS, PARAMETERS AND EVALUATION MEASURES

Possible Management Measure	Stressor	Parameter Targeted for Load Reduction	Evaluation measures to determine if Load Reductions achieved
Stormwater wetland	Increased peak flow, eroded streambanks, aggregated/degraded streambed	Sediment: ft3/sec and ton sediment/yr (c)	Flow, cross section, and streambed composition measurements, TSS
Planting riparian vegetation	Increased Temperature, Lowered Dissolved Oxygen (DO)	Temperature: degrees and DO: mg/L	Temperature and DO
Planting riparian vegetation	Weakened and eroded streambanks	Sediment: tons/yr Streambank: ft/yr	Cross section and streambed composition measurements
Stormwater wetland	Increased sediment in water column	TSS: mg/l Turbidity: NTU	TSS and turbidity
Fencing out cattle, planting riparian vegetation	Excessive nutrients, algae, and bacteria, Lowered DO	Sediment: tons/yr Streambank: ft/yr Nitrogen & Phosphorus: mg/L Chlorophyll-a: ug/L DO: mg/L	Nitrogen/Phosphorus, chlorophyll-a, and DO

TECHNICAL & FINANCIAL ASSISTANCE ESTIMATES, IMPLEMENTATION SCHEDULE & MILESTONES (7, 8, 9, III, IV, V, VI, STEP6)

Addressing technical and financial needs, implementation scheduling and milestones provide structure to the entire watershed effort and should help the watershed coordinator ensure that the watershed effort is progressing on track. These details will make it easier to do the following: a) identify problem areas and b) prepare future watershed planning efforts.

This section (represented in Table 7) should be as specific as possible. For instance, "we will be fencing 2000 ft of stream on the Jones property at a cost of $15,000. SWCD conservationist John Doe will be the lead on this project." In many cases it is not possible to be so specific. At a minimum, the plan should state "We will have $XX,XXX allocated for cattle exclusion fencing and will install it as willing landowners are identified". The partner responsible for maintenance of each activity should be identified. Because specific landowners who will have management measures on their property may not be known at the time of plan development, a plan of action can be developed or modified as each landowner agrees to participate.

TABLE 7. ACCOUNTING AND TRACKING TEMPLATE FOR ESTIMATING RESOURCES BASED ON MANAGEMENT MEASURE

Management Measure	Cost	Technical Assistance	Schedule and Milestones
Stormwater Wetland (SW) (Design) (approximately X acres)	$/ac	Hire consultant (private, university, etc.)	1/14-2/14 – draft design prepared
Secure landowner agreements	$/hr	Work with community groups	2/14 – 4/14 - Identify and secure willing landowners
SW Permitting	$/hr	Consult and work with regulatory agencies	4/14-7/14 – permit applications submitted
Stormwater Wetland (Construction)	$/ac	Hire consultant or contractor	8/14-12/14-wetland constructed, approved at end of process
Fencing Cattle (approximately X linear feet)	$/ft	Contract with local SWCD or hire consultant	1/14 – 3/14-fencing 25, 50, 75, 100 percent complete. Monitor vegetation and other recovery on streambanks.
Planting Riparian Vegetation (approximately X linear feet)	$/ft	Hire consultant or contractor or volunteers?	3/14-5/14-vegetation planted, growth monitored and recorded
Monitoring following management measure implementation (see attached draft monitoring plan)	$??	Hire consultant, certified lab, or volunteers?	1/14 – 12/14 – throughout entire project to document expected improvements.

Financial Assistance to support management measures can come from a variety of sources including: federal, state, or local grants or loans, paid through utility fees, or private assistance. Monitoring will occur throughout the process to determine if water quality is improving.

The plan should provide a time estimate by which the controls will result in water quality standard (numeric target) attainment, including an explanation of the basis for conclusion. Initially, this can be as simple as "December 2014 when all management measures/pollution controls are implemented." As stated previously, watersheds plans are dynamic, thus they include a commitment to revise and update the plan including identification of new management measures and pollution controls and a schedule as to when they'll be implemented.

ADDITIONAL INFORMATION NEEDED FOR SWPP (STEPS 1 AND 7)

This guidance was initially intended for those preparing the Nine Element Plan required as part of the 319 grant and/or the Six element plan required for TMDL exemption. Some Source Water Protection Plan (SWPP) requirements not included among the Nine or Six element plans are described in this section. Before one begins a SWPP, one should obtain a copy of the entity's Source Water Assessment Program (SWAP) report (STEP 1). One should also become familiar with this report as it likely contains valuable information regarding the watershed. After much of the SWPP is complete, one normally develops a contingency plan to respond to emergencies that might threaten the drinking water supply (STEP 5). Again, as stated earlier in this document, for more information on preparation of the contingency plan, please refer to the following website: http://www.ncwater.org/pws/swap/SWPGuidance_120109.pdf. As part of the SWPP, one is supposed to provide schedule for implementing and also updating the plan (STEP 6). Finally, after the plan is complete, one is required to submit the plan to the PWSS for approval (STEP 7).

APPENDIX A. SUBMITTING WATER QUALITY DATA TO NCDWQ FOR USE ASSESSMENT PURPOSES

The North Carolina Department of Environment and Natural Resources, Division of Water Quality (NCDENR-DWQ) invites all interested parties to submit water quality information. The opening and closing dates for accepting data are listed below.

Data Submission Periods: EVEN NUMBERED YEARS FOR ALL RIVER BASINS

303(d) List Year	Letters, Photographs, Data, and Observations Due:	Data for Period Including:	QAPP Due:
2010	Jan. 15, 2009	Jan. 2004 - Dec. 2008	July 2008
2012	Jan. 15, 2011	Jan. 2006 - Dec. 2010	July 2010
2014	Jan. 15, 2013	Jan. 2008 – Dec. 2012	July 2012

Submitted information will be used to assess the health of the waters in the basin. This information is relevant to the development of the current Basinwide Water Quality Plan and as a reporting requirement to the US EPA under Section 303(d) of the Federal Clean Water Act. NCDENR-DWQ staff will evaluate submissions to determine if they are applicable and useful to the basinwide planning process or 303(d) reporting requirements

What Type of Data is Needed?

Depending on the type of data you have NCDWQ may use it to supplement existing data or it may be used to contribute to use support decisions. Use support decisions are based on the classification or designated use of the waterbody and the surface water standard for a particular pollutant. Pollutant standards for each classification are listed in the Appendix A of the Surface Waters and Wetland Standards "Redbook" (http://h2o.enr.state.nc.us/admin/rules/documents/Redbook2007_000.pdf).

Water quality assessments are used to develop the State's Integrated Report and Impaired Waters 303(d) List (updated every 2-yrs), identify waters to be targeted for special studies related to Total Maximum Daily Loads (TMDLs), and aid other agencies or watershed groups in identifying watersheds for restoration or protection activities. Data used for these assessments must fall within a specific data window to meet federal deadlines. NCDWQ assesses designated uses for aquatic life, recreation, fish consumption, water supply, and shellfish harvesting.

The following data is assessed for the aquatic life and recreation categories:

Aquatic Life- Physical and chemical parameters that are used to assess aquatic life include dissolved oxygen, pH, temperature, turbidity, and chlorophyll-a. A minimum of 10 samples during the data window is required and the Chlorophyll-a data must be analyzed by a NC State certified laboratory. Field data must be taken using Standard Operating Procedures (SOP) related to equipment pre- and post-calibration. Quality assurance procedures must be followed and documented (see Quality Assurance Project Plan (QAPP) below). No non-DWQ collected biological benthic macroinvertebrate or fish data are accepted for use support decisions at this time.

Recreation - Water quality standards for fecal coliform and enterococci bacteria are used to make assessments in the recreation category. Five samples in a 30-day period are required. Data must be analyzed by a NC State certified laboratory.

Data to be used in Impairment decisions (303(d) category 5 listings) must meet the quality assurance goals found in the NCDWQ approved QAPP. More information about waterbody classifications, use support decisions and the 303(d) list can be found on the NCDWQ Planning Section website: http://h2o.enr.state.nc.us/pb/.

Quality Assurance Project Plan (QAPP)

A QAPP and associated quality assurance/control information must accompany all data submitted. The purpose of a QAPP is to document how an organization will plan, implement, and assess the effectiveness of its quality assurance and quality control operations. Specifically, it describes how an organization structures its quality system, the quality policies and procedures, areas of application, roles, responsibilities, and authorities.

Following a QAPP allows data collected from multiple organizations to be compared because similar parameters and sampling criteria are used. Completing the QAPP process allows NCDWQ to evaluate whether your methods will get results comparable to state-collected data. NCDWQ reserves the right to make all final interpretations of data submitted and whether that data represents a contravention of use-support.

DWQ's chemical and physical data collection SOP can be found at: http://www.esb.enr.state.nc.us/documents/PHYSICAL-CHEMICAL%20SOP.pdf, this should be used as guidance to developing your own SOP. Guidance for developing the QAPP can be found at:

Quality Management Tools- http://www.epa.gov/quality/qapps.html
EPA General Guidance - http://www.epa.gov/quality1/qs-docs/r5-final.pdf
EPA Volunteer Monitoring Guidance- http://www.epa.gov/OWOW/monitoring/volunteer/qappcovr.htm

SUBMISSION CRITERIA

All information must be **scientifically valid** and verifiable by NCDENR-DWQ staff. Letters, including photographs and other information, may be submitted regarding the uses of surface waters for boating, drinking water, swimming, aesthetics, and fishing. Summary reports and memos including distribution statistics will be accepted. If information includes summaries of chemical or biological sampling data, maps showing sampling locations must be included.

Raw data should be submitted electronically and must be accompanied by the methods used to collect and analyze the samples. Documentation of applicable quality assurance and quality control (QA/QC) and SOP programs as described in the project's QAPP is required.

- Data must have been collected within the time period specified.
- Qualifiers must be in separate fields and must be defined (e.g., < is non-detected value).
- Pollutant name, with units, must be defined. STORET codes may also be used see the EPA website for more information: http://www.epa.gov/storet/.
- All sampling locations must be referenced on maps and with latitude and longitude. Electronic maps will be accepted in Adobe Acrobat, ArcView shapefile, tif, gif, jpg, and bmp image format.
- For co-located samples at multiple depths, depths must be specified in a separate field in the database.
- Electronic data will be accepted in delimited ASCII, spreadsheet (e.g., Excel, Quattro Pro, Lotus 1-2-3), or database (e.g., Access, dBase, or SAS) platforms.
- The name and telephone number of a contact person must also be provided with information submitted. NCDENR-DWQ will call this person if questions arise concerning the information. The

information submitted will not be returned.

Submitting Information

Please coordinate data submission with appropriate Basin Planner, contact information can be found at the following website: http://h2o.enr.state.nc.us/basinwide/contacts2.htm.

To submit information by mail, address to:
Kathy Stecker
Modeling and TMDL Unit
Division of Water Quality
1617 Mail Service Center
Raleigh, NC 27699-1617

APPENDIX B: QUALITY ASSURANCE PROJECT PLAN

Required for certain US EPA funded grants and contracts that are awarded by the Division of Water Quality, NCDENR

NCDENR- DWQ QUALITY ASSURANCE PROJECT PLAN CHECKLIST	
To first assess whether a Quality Assurance Project Plan is necessary, please answer the following four questions:	
1. IS FEDERAL MONEY FROM THE US EPA BEING SPENT ON THIS ACTIVITY? *(IF THE ANSWER IS "NO" THEN A QAPP IS NOT NECESSARY; PROCEED TO ANSWER SECTION A1 ONLY. IF "YES" THEN PROCEED TO # 2).*	❑ **Yes** ❑ **No**
2. WILL WORK REQUIRE ACQUISITION OF ENVIRONMENTAL DATA GENERATED FROM DIRECT MEASUREMENTS ACTIVITIES (I.E., WATER QUALITY SAMPLING), COLLECTED FROM OTHER SOURCES, OR COMPILED FROM COMPUTERIZED DATABASES? *(IF THE ANSWER IS "NO", THEN A QAPP IS NOT NECESSARY; PROCEED TO ANSWER SECTION A1 ONLY. IF "YES" THEN PROCEED TO # 3).*	❑ **Yes** ❑ **No**
3. *WILL ALL INSTREAM WATER QUALITY SAMPLES BE ANALYZED BY A LABORATORY CERTIFIED BY THE STATE OF NORTH CAROLINA? PROCEED TO # 4.*	❑ **Yes** ❑ **No**
4. HAS A QAPP ALREADY BEEN APPROVED FOR YOUR ACTIVITY*? (IF THE ANSWER IS "NO" THEN PLEASE COMPLETE SECTIONS A-D ON THE FOLLOWING PAGES. IF "YES", THEN PLEASE ANSWER SECTION A1 AND ATTACH A COPY OF THE APPROVED QAPP, OR PROVIDE A REFERENCE (INCLUDING AGENCY, TELEPHONE NUMBER, AND WEB ADDRESS, IF AVAILABLE) FOR THE COMPLETE APPROVED QAPP, AND RETURN THIS FORM WITH ATTACHMENTS TO YOUR DWQ EPA FUNDS MANAGER*).	❑ **Yes** ❑ **No**
5. DO YOU INTEND FOR YOUR DATA TO BE CONSIDERED FOR USE SUPPORT DECISIONS, E.G., 303(D)	❑ **Yes** ❑ **No**

QUALITY ASSURANCE PROJECT PLAN FORM

Adopted from the US EPA by the Division of Water Quality, NCDENR

A1. PROJECT TITLE AND APPROVAL SHEET

_____

(Project Name)

_____

(Responsible Agency)

_____

(Date)

_____

(NC DENR Contract #)

Project Manager Signature _____

(Name/Date)

Project QA Officer Signature _____

(Name/Date)

DWQ EPA Funds Manager

Signature of Receipt (Name/Date) _____

GUIDANCE FOR PREPARING WATERSHED PLANS

Quality Assurance Project Plan Details and Explanation

All environmental projects that are funded, directly or indirectly, by the US Environmental Protection Agency (EPA) and which generate data from direct measurement activities, collect data from other sources or compile data from computerized data bases and information systems must have a Quality Assurance Project Plan (QAPP) approved prior to the collection of project data. QAPPs are required under Code of Federal Regulations 48CRF46, and 40CFR 30, 31 and 35. The QAPP documents the planning, implementation and assessment procedures of the project's data needs. Specifically, it describes and documents the collection methods, and type and quality of data to be gathered. These criteria will vary from project to project depending on the scope of the work, expectations for the end result and perhaps overall cost of the project. Some project QAPPs must follow the national consensus standard, (ANSI/ASQC E4-1994, *Specifications and Guidelines for Environmental Data Collection and Environmental Technology Programs*) in order to be acceptable for their end use. Whereas other projects may use non-standardized or simplified data collection approaches because the end result, or use of the data, may not need to conform to existing data quality or may not be as critical for decision making .The overall purpose of the QAPP is to assure that appropriate methods of data collection are used and that documentation of the quality assurance approach is available for users of the data.

EPA has established requirements for an acceptable QAPP. Details and explanations of these requirements can be found on EPA's web site at http://www.epa.gov/quality1/qapps.html. Many of the required elements may already be found in your DWQ approved study proposals (e.g., Scope of Work). If so, please copy the appropriate information from your workplan to the attached DWQ/EPA QAPP form. The completed QAPP MUST be submitted to the DWQ BEFORE data collection activities begin.

A2. Table of Contents

2. Table of Contents (continued)

Appendices

A3. Distribution List

Names and telephone numbers of those receiving copies of this QAPP. Attach additional page, if necessary. (Name, Organization, Telephone)

i.

ii.

iii.

iv.

v.

A4. Project/Task Organization

Key project personnel and their corresponding responsibilities are listed below. Organization chart is Figure 1.

Name, Position	Project Title/Responsibility
	Advisory Panel (contact)
	Project Manager
	QA Officer
	Field/Sampling Leader
	Laboratory Manager/Leader
	Subcontractors (if applicable)
	Data users (list organizations/agencies that will use data)

Organization Chart

Replace this page with a page indicating the organizational makeup and relationships between project participants. Show relationships between management, data collectors, and staff responsible for interpretation and report preparation.

Figure 1. Organization Chart.

A5. Problem Definition/Background

Problem Statement - Explain the background of the project and the reasons for initiating the project Also include uses and/or designated uses and impairment of the water resource, if applicable.)

Intended Usage of Data - State the usage and outcomes expected from the information to be collected (e.g., remove from impaired list, show that the BMP is effective, watershed characterization or background data, environmental education, etc.). Describe type of data to be collected (e.g., screening, definitive, characterization, baseline/background). If applicable, cite technical or regulatory standards or criteria to which data will be compared.

A6. Project/Task Description

General Overview of Project - Summarize the work to be performed. Define geographic, spatial, and/or temporal boundaries. Briefly describe the monitoring/experimental design and how monitoring data will assist in achieving project monitoring objectives. Note, details on sample locations and monitoring design should be provided in Section B1 below. Discuss resource and time constraints, as appropriate.

Project Timetable - Work schedule indicating critical project points

Activity	Start Date	Known or Anticipated Date of Completion

A7. Quality Objectives and Criteria Identify performance/measurement criteria for all information to be collected; and acceptance criteria, including project action limits and laboratory detection limits, and range of anticipated concentrations of each parameter of interest (includes field and lab, if applicable)

Data Precision, Accuracy, Measurement Range

Express the degree to which sample results are repeatable. State decision error limits, if applicable
Note: Projects which are based on authoritative rather than statistical sampling designs will not have quantitative decision error limits

Matrix	Parameter	Measurement Range	Accuracy	Precision

Data Representativeness

Express the degree to which the data accurately represents the population or the environmental condition at the sampling location (i.e. explain how well the monitoring characterizes the physical conditions)

Data Comparability

Express the degree of confidence that one data set can be compared to another at the sample location or to a sample taken at another location

Data Completeness

Measure of the amount of valid data needed to develop conclusions (i.e., estimate how many measurements are needed to meet each monitoring objective(s))

Parameter	No. Valid Samples Anticipated	Minimum No. Valid Samples needed	Monitoring Objective

A8. Special Training/Certification - General description of training requirements and needs. Describes special personnel or equipment requirements, if applicable.

Training Logistical Arrangements

Training Topic(s)	Personnel Trained	Training/Certification Frequency

Description of Training and Trainer Qualifications

Training Topic(s)	Training Description	Trainer Qualifications

A9. Documents and Records - Identify all data reporting information and list all project documents, reports, and electronic files that will be produced. Include QA records and reports, List information and records to be included in data reports (e.g., lab/field raw data, field logs, lab records, results of QC checks, problems encountered).

Information/Data Type	Recording Medium & Retention Duration	Responsible Party

B1. Monitoring Experimental Design - Describe and justify the experimental monitoring design strategy, indicating size of the area, volume, or time period to be represented by the monitoring (detail the type and total number of sample types/matrix or test runs/trials expected and needed). Also include monitoring of covariates such as rainfall and discharge.

Rationale or Criteria for Selection of Sampling Sites- Describe and justify the experimental monitoring design strategy, indicating size of the watershed area, discharge volume, or time period to be represented by the monitoring. Describe appropriate validation study information for nonstandard sampling situations (if applicable).

Project Monitoring Locations and Watershed Boundaries - Show map that delineates watershed boundaries or drainage area being monitored. Provide maps or tables that show/state geographic locations of sample locations (include GPS data coordinates). If other data sources are to be obtained and compiled, list these sources as well.

Sample Design Logistics - Sample numbers and frequency. Also include monitoring of covariates such as rainfall and discharge. State if parameter is for informational purposes only and not critical.

Type of Sample/ Parameter (i.e. storm/grab, water/sediment, etc.)	Number of Samples	Sampling Frequency and Period

B2. Sampling Methods

Identify Sampling Equipment, Collection Methods and SOPs

Parameter	Sampling Equipment	Sampling Method

Field Sampling Methods. Describe procedures for collection of monitoring samples. Describes sample preservation methods. Describe process for preparation and decontamination of sampling equipment. Describe or reference selection and preparation of sample containers and sample volumes. (Please do not simply reference another document, but summarize the procedures to be used here and include reference for details! Identify individuals responsible for corrective action

Sources and References used as Guidance for Typical Data Collection (e.g., USGS field collection methods, data needs for watershed models, monitoring design guidance documents)

B3. Sample Handling and Custody - Identify how the samples will be physically handled, transported, and received; and describe the documentation of sample information handling and chain-of-custody. Include maximum allowed holding times from collection to analysis and lab preservation procedures.

B4. Analytical Methods

Identify laboratory(ies) to conduct testing and indicated if they are State certified. Identify all analytical SOPs including field and laboratory procedures (include method for every parameter being monitored). Specify needed laboratory turnaround time. Identify individuals responsible for corrective action.

B5. Quality Control - Identify QC activities which will be used for each type of sampling, analysis, or measurement technique; for example, blanks, spikes, duplicates, etc., and at what frequency (also include what criteria will be used to determine if a corrective action is needed and what that corrective action will be).

Field QC Checks

The following table outlines QC procedures

Activity	QC Procedure	Purpose

Laboratory QC Checks - Describe Laboratory QC procedures

Data Analysis QC Checks- Describe data analysis QC procedures. Include what criteria will be used to determine if a corrective action is needed and what that corrective action will be. Provide or reference QC statistics used to determine precision and bias, if applicable.

B6. Instrument/Equipment Testing, Inspection, and Maintenance - Identify field and laboratory equipment needing periodic maintenance, and the required inspection schedule. Describe preventative and corrective maintenance activities.

Equipment Type	Inspection Frequency	Type of Inspection/Preventative/Corrective Action

B7. Instrument/Equipment Calibration and Frequency - Identify equipment, tools, and instruments that should be calibrated, and the frequency and method for this calibration (include summary of method for calibrating laboratory equipment unless a state certified lab is used; also include calibration of field equipment such as stage recorders and flow meters). Note how calibration records will be kept and traceable to equipment.

Equipment Type	Calibration Frequency	Standard or Calibration Instrument Used

B8. Inspection/Acceptance of Supplies and Consumables
Identify critical supplies and consumables for field and laboratory, and acceptance criteria. Note responsible individual(s).

Equipment/Supply	Inspection/Maintenance Activity	Acceptance Criteria

B9. Non-Direct Measurements - Identify data sources, for example, computer databases or literature files, or models that will be accessed and used, data recording methods, and references for this information.

Non-direct Measurements.
Identify data sources, for example, computer databases or literature files, or models that will be accessed and used. Describe limitations of the secondary data. Document rationale for original collection of data and its relevance to this project.

Data Recording Methods for Non-Direct Measurements

Data Element/Measurement	Minimum Data Recording Method

B10. Data Management

Describe data management scheme from field to final use and storage, and describe the process for data archival and retrieval. Include a summary of data analysis procedures, data transformations, and statistical analyses, if applicable.

Data Type and Data Management/Storage

Data Type	Management and Storage

Data Management and Analysis. Describe data management scheme from field to final use, data compiling and data storage. Describe the process for data archival and retrieval. Include summary of data analysis procedures, data transformations, and statistical analyses, if applicable. Include project-specific calculations or algorithms, if applicable.

C1. Assessments and Response Actions - List the number, frequency, and type of assessment activities that should be conducted. Specific response actions for the situations listed below will generally apply. Also list who is responsible for each action.

Situation	Response Action	Responsible Person/Organization

C2. Reports to Management - Identify what project QA status reports are needed and how frequently they will be prepared

Report	Frequency	Who Prepares Report	Who Receives Report
Project Status			
Results of performance evaluation and audits (if applicable)			
Results of periodic data quality assessments (if applicable)			
Any significant QA problems			

D1. Data Review, Verification and Validation - Describe the criteria that will be used for accepting, rejecting, or qualifying project data. (include criteria for determining anomalies or outliers, what portion of data will be reviewed, who will do it, and what happens if data deemed 'bad')

Criteria for Accepting, Rejecting, or Qualifying Project Data.
Include criteria for determining anomalies or outliers, what portion of data will be reviewed, who will do it, and what happens if data deemed 'bad'

Decision Rule or "if/then" Statement. Provide if applicable.
Note: Some projects, especially research or preliminary investigations, may not require a specific "if/ then" statement. This is also applicable for decisions regarding data "outliers."

D2. Verification and Validation Methods - Describe the process for data verification and validation, providing SOPs and indicate what data validation software will be used. State the percentage of the data to be reviewed. List the responsible individual/organization.

Data Element	Typical Validation and Verification Methods

D3. Reconciliation with User Requirements and Data Quality Objectives

Also include how the data will be summarized to be able to report results to decision makers. Describe process for reconciling project results with data quality objectives (DQOs) and reporting limitations on use of data. Identify issue resolution procedure(s) and responsible individuals
