

WATERSHED ASSESSMENT AND PROTECTION PLAN GUIDANCE: Watershed Monitoring Plans



Georgia Department of Natural Resources
Environmental Protection Division
Watershed Protection Branch

The Watershed Assessment includes monitoring to determine the current condition of the water bodies and associated biological communities within the watershed assessment area. The watershed assessment area is defined as all watersheds or sub-watersheds that are served by the permitted facility (service area), and the watersheds contained within the permittee's jurisdictional boundaries. The Watershed Monitoring Plan (WMP) presents the details of the monitoring that will be conducted.

The WMP consists of three sections. The first section discusses the reasons for the Watershed Assessment and the parties responsible for its completion. The second section provides general information about the watershed assessment area. The third describes the details of the field study to be conducted to document the current water quality and biological integrity of water resources in the watershed assessment area. The data obtained from this study are to be included and evaluated in the subsequent Watershed Assessment. The WMP should be submitted to the Georgia Environmental Protection Division (GAEPD) Watershed Planning and Monitoring Program (WPMP) for review and approval.

It is strongly encouraged that a meeting be scheduled with GAEPD staff prior to developing the WMP, and that all parties that will be involved with the Watershed Assessment/Watershed Protection Plan (WA/WPP) process be in attendance. At this meeting, the overall WA/WPP process is described and any questions about the WA/WPP process can be addressed. It provides an opportunity for the participants to discuss general issues and any issues specific to the permittee's situation. By addressing these issues early, a significant amount of time can be saved and the overall process made more efficient. A significant portion of this meeting will focus on selecting monitoring sites for the collection of water quality and bioassessment data. The objective is to end up with site locations that will allow the acquisition of data representative of the entire watershed assessment area. Supporting information should be brought to the meeting, including maps showing streams and other waterbodies, topography, delineation of the service area and jurisdictional boundaries, location of significant dischargers, and the locations of the proposed monitoring sites. Prior to the meeting, a field reconnaissance of the assessment area is recommended to verify the accessibility and suitability of potential monitoring sites. Information gathered from the field reconnaissance, including significant observations and photographs, should be brought to the meeting.

Water quality monitoring and bioassessments are often the most labor intensive and expensive components of the Watershed Assessment. It is therefore important that significant details regarding the collection of water quality and biological data be spelled out in the WMP.

The WMP should consist of the following components:

I. Introduction

- A. Explain why the WA/WPP process is being initiated (i.e., construction of a new or expansion of an existing water pollution control plant; permit renewal of a plant with a design capacity greater than 1 million gallons per day). Provide the permit numbers of all facilities covered under this process.
- B. Explain the purpose and objectives of the monitoring plan and the way in which the data will be used to support the goals of the WA and WPP.
- C. Identify the parties responsible for the WA, which may be counties, local governments, water authorities, private utilities, or partnerships made up of governments and private stakeholders.

II. Initial Watershed Characterization

- A. Provide a narrative description of the general location of the watershed assessment area within the State of Georgia. Note the major river basin(s), the associated USGS 8-digit Hydrologic Unit Code(s) (HUCs), and the Level III and Level IV Ecoregions in which the watershed assessment area is located.
- B. Provide a narrative description of the current service area of the permitted facility. Indicate the extent of the service area with relation to the jurisdictional boundaries of the permittee, and note where the service area may extend beyond jurisdictional boundaries. If there are plans for future expansion of the service area, include a brief description.
- C. Provide a preliminary survey of known potential pollutant sources that may impact watershed assessment area including landfills, RCRA sites, hazardous waste facilities, industrial sites, wastewater treatment plants, land application sites, land disturbing activities, or any other significant facilities that may impact water quality. A more complete examination of the potential sources should be performed for the WA.
- D. Provide a preliminary review of known environmentally sensitive areas, such as wetlands, groundwater recharge areas, and water supply watersheds. A more extensive survey of these areas should be performed for the WA.
- E. Indicate any waters located within the watershed assessment area that are on GAEPD's most current 305(b)/303(d) list for not supporting their designated uses. Also indicate 305(b)/303(d) listed waters within the vicinity that may be impacted by the watershed assessment area. GAEPD's most current 305(b)/303(d) listing can be found at <http://epd.georgia.gov/georgia-305b303d-list-documents>.
- F. Provide the following information on maps:
 1. Existing service area and jurisdictional boundaries, and if available, indicate planned future expansions of the service area;
 2. Areas of proposed development;
 3. Delineated watersheds (HUC 12 level) and stream hydrology with stream names;
 4. Major roads;
 5. Topography;
 6. Locations of known potential pollution sources that may impact the assessment area watersheds;
 7. Locations of known environmentally sensitive areas within or in the vicinity of the assessment area;
 8. Stream segments within and near the watershed assessment area based on the most current 305(b)/303(d) list. A GIS coverage of the current listed segments is available on GAEPD's website at:

<http://epd.georgia.gov/geographic-information-systems-gis-databases-and-documentation>.

For the above maps, include a north arrow indicating map orientation, a scale, labels, and a legend clearly indicating the important features. Note that the maps should be of a size and scale sufficient to show the areas of concern in detail.

- G. Summarize sources of available historical water quality and biological data.

III. Description of Methodologies for Collection of Field Information

- A. Stream walks are highly recommended, where possible, to provide visual verification of existing stream conditions and adjacent land uses for the assessed watersheds. They are a valuable tool whereby much can be learned about the general nature of the stream, and can lead to the discovery of otherwise unknown sources of pollutants. When conducting stream walks, significant observations should be recorded and photographs taken to serve as documentation. Of special interest are factors that may impact the water quality and biological integrity of the stream. When conducting the stream walks, the following items should be considered:

- Predominant surrounding land uses
- Nature of stream channel and bottom substrate (e.g. sinuous, braided, channelized, gravel, sand, silt or mud, etc.)
- Appearance of water (e.g., clear, turbid, algal blooms, color, oils, etc.)
- Nature of flow (e.g. riffle/run or glide/pool characteristics) and impediments to flow (e.g., beaver dams, sediment retention ponds, culverts, etc.)
- Presence of macrophytes, riparian vegetation
- Amount of canopy cover
- Evidence of bank erosion
- Presence of agricultural livestock including evidence of livestock stream crossings
- Evidence of vehicular stream crossings
- Presence of outfalls
- Evidence of illicit discharges
- Any other factors that may have a significant impact on the stream

- B. Selection of Monitoring Sites

1. Monitoring sites for water quality and bioassessments should be selected. For each monitoring site provide the following:
 - Site ID (once assigned, this should remain constant)
 - Site name
 - Narrative description as to why the locations were chosen
 - Whether the site will be for water quality monitoring, biological monitoring, or both
 - GPS coordinates in decimal degrees
 - Level III and Level IV Ecoregions

In deciding on potential sites, bear in mind that the combination of sampling locations should capture the surface drainage of all or most of the watershed

assessment area, and should be representative of major land uses and significant drainage features. Of particular interest are potential nonpoint sources of pollutants or areas where development is likely to occur. Sampling sites should provide coverage for both the existing service area and if applicable, the proposed future service area. Any 305(b)/303(d) listed segments not meeting their designated uses located within the vicinity that may be impacted by the watershed assessment area should be monitored.

Biological monitoring sites should be at the same locations as the water quality monitoring sites, either 100 meters upstream or 300 meters downstream of a bridge or road crossing. Sites selected for biological monitoring should be wadeable and have a contributing drainage area no less than 10 square kilometers and no greater than 100 square kilometers. Additional considerations for selecting biological sampling sites are discussed in Section 1.3 (Site Selection) of the GAEPD *Macroinvertebrate Bioassessment Standard Operating Procedures (SOP)* available at:

<http://epd.georgia.gov/macroinvertebrate-bioassessment-standard-operating-procedures-sop-and-metric-spreadsheets>

2. Provide a map showing at a minimum: political boundaries; sanitary sewer service area; stream hydrology with stream names; locations and monitoring site IDs, indication of sites that will be water quality monitoring sites, bioassessment sites, or both; distance scale; and north arrow indicating map orientation. Clearly indicate the above features using the map labels and legend.
3. Provide Level IV Ecoregion map for all bioassessment sites. These maps can be obtained at the following website: <http://epd.georgia.gov/macroinvertebrate-bioassessment-standard-operating-procedures-sop-and-metric-spreadsheets>.

C. Water Quality Monitoring

Water quality monitoring is performed to determine the current condition of the waterbodies within the watershed assessment area. The following details should be included in the WMP:

1. Provide a narrative description of the type and number of water quality sampling events to be conducted. These should consist of both dry-weather and wet-weather sampling events. The dry-weather events may indicate the presence of periodic or continuous, point and nonpoint pollutant sources (e.g. sewer line leaks, illicit discharges, livestock incursions in streams, etc.). Wet-weather events may show the significance of pollutants introduced through storm water transport mechanisms (e.g. runoff from urban land surfaces, sanitary sewer overflows, agricultural runoff, etc.).
 - a. Three dry weather events should be sampled. Grab samples can be used. The suggested dry-weather criterion is a period of at least 72 hours since the last rainfall of 0.1 inches or greater. Preferably, at least one of the dry-weather sample events should be conducted during critical conditions (i.e., low flow, high temperature) to determine if water quality standards are being met.

- b. At least one wet-weather event should be sampled. A composite sample that covers the complete hydrograph should be collected for the wet-weather event(s). The composite sample can be from grab samples or from an automated composite sampler. The suggested wet-weather criteria are at least 0.2 inches of rainfall and at least 72 hours since the last storm event.
 - c. In coastal streams that experience tidal fluctuations, the impact of the upstream watershed on streamflow and water quality increases significantly at ebb low tide. Therefore, for tidal-influenced streams, it is important that measurements and samples be collected at ebb-flow closest to low slack tide.
2. Stream samples should be handled in accordance with USEPA approved methods that are given in Title 40 of the Code of Federal Regulations (40 CFR). The GAEPD has developed general guidelines for surface water sampling titled *Water Quality: Quality Assurance Manual*, June 1999 (revised 2005) that can be obtained at the following website: <http://epd.georgia.gov/field-investigation-quality-assurance-water-quality>.
 3. The following parameters should be included as part of each sampling event:

Parameter	Units
Air Temperature*	Degrees Celsius
Water Temperature*	Degrees Celsius
pH*	Standard Units
Dissolved Oxygen*	mg/L
Dissolved Oxygen Saturation*	Percent
Specific Conductance*	µS/cm
Salinity*	g/L (aka ppt)
Turbidity*	NTU
Fecal Coliform	MPN/100mL
Escherichia coli ¹	MPN/100mL
5-Day Biochemical Oxygen Demand ²	mg/L
Chemical Oxygen Demand	mg/L
Total Suspended Solids	mg/L
Total Phosphorus	mg/L
Ortho-Phosphate	mg/L
Ammonia Nitrogen	mg/L
Nitrate/Nitrite Nitrogen	mg/L
Total Nitrogen or Total Kjeldahl Nitrogen	mg/L
Cadmium ³	µg/L
Copper ³	µg/L
Lead ³	µg/L
Zinc ³	µg/L
Alkalinity	mg/L as CaCO ₃
Total Hardness	mg/L as CaCO ₃

Parameter	Units
Measured or Estimated Stream Flow	Cubic Feet per Second
Any 303(d) listing violation	
Any stream specific parameter of interest	

* *In situ* measurements

- 1 - Alternatively, Enterococci should be sampled for tidally influence streams
- 2 - A reporting limit of 2.0 mg/L should be utilized
- 3 - Total Recoverable or Dissolved may be analyzed. If Total Recoverable is chosen, the Dissolved fraction must be calculated and reported for comparison to water quality standards. Ensure laboratory reporting limits less than or equal to the applicable water quality standard are utilized.

- a. The fecal coliform bacteria water quality standard is based on a geometric mean consisting of at least four samples collected within a 30-day period at intervals not less than 24 hours. A minimum of two fecal coliform geometric means should be calculated for the period from May through October. The samples should be distributed evenly over the 30-day period, and collected regardless of weather conditions. (E. coli and Enterococci should be sampled in the same manner.)
 - b. Collect metal samples using Clean Techniques (*Office of Water Policy and Technical Guidance on Interpretation and Implementation of Aquatic Life Metals Criteria*, USEPA, October 1, 1993).
 - c. Analysis of water quality parameters must be conducted according to approved test procedures provided in 40 CFR Part 136 (*Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act*). Include a table that lists the parameters to be sampled and provides the analytical method used for each parameter. Also include the detection limits for each analytical method. Permittees may use their own laboratory facilities.
4. Record and report when a sample site is dry or no flow exists. Under these conditions, water quality samples should not be collected. GAEPD should be consulted if this situation occurs to schedule alternative sampling.
 5. Record and report weather conditions during sampling events, including rainfall amounts and time elapsed since the last significant rainfall.
 6. Record and report any significant activities observed in the watershed during the sampling event. Examples may include the presence of animals, dry weather runoff from parking lots, leaking pipes, oil spills, condition of water body such as odors, foam, discoloration, algal blooms, etc.

The results of the water quality monitoring will be evaluated and discussed in detail in the subsequent WA report, providing an overview of the current status for the waterbodies within the watershed assessment area.

D. Biological Monitoring

Biological assessments (bioassessments) are conducted at selected monitoring sites to determine the health of the benthic macroinvertebrate and fish communities for waterbodies within the assessment area.

The following details for conducting bioassessments should be provided in the Monitoring Plan:

1. A complete biological assessment consists of the following:
 - Field reconnaissance
 - *In situ* water chemistry
 - Water chemistry sample collection
 - Macroinvertebrate collection
 - Fish collection
 - Sorting and Identification
 - Physical characterization
 - Habitat assessment
 - Substrate particle count
 - Channel cross-section measurements
 - Discharge measurements
 - Photographs
2. Scientific Collecting Permits issued by the Wildlife Resources Division (WRD) are required for the collection of macroinvertebrates and fish. Information for obtaining these permits can be found at the following website:

http://gadnrle.org/sites/uploads/le/pdf/Special-Permits/Scientific_Collecting_Application.pdf
3. For Watershed Assessment monitoring, bioassessments need only be conducted once at each site. Macroinvertebrate assessments sampling index period is October through the end of February. Fish assessments should be conducted from the start of April through mid-October.
4. The most recent version of the Standard Operating Procedures (SOPs) for benthic macroinvertebrates and fish bioassessments should be followed. Initial reconnaissance forms and field study data sheets are attached to each appropriate SOP. The current GAEPD macroinvertebrate SOP and appropriate metric scoring spreadsheets can be obtained at the following website: <http://epd.georgia.gov/macroinvertebrate-bioassessment-standard-operating-procedures-sop-and-metric-spreadsheets>. The current Wildlife Resources Division Fish SOP and appropriate scoring criteria can be obtained at the following website: <http://www.georgiawildlife.org/fishIBI>.
5. Sampling of fish and macroinvertebrate communities in a stream should not be done concurrently. The process of sampling one of the communities will invariably disturb the other. Allow at least two weeks for recovery and stabilization between conducting macroinvertebrate assessments and fish assessments.

6. Stream reconnaissance for fish assessments should be done at least one day prior to sampling, but no more than a week in advance. Turbidity should be at pre-reconnaissance levels prior to conducting fish sampling.
7. *In situ* measurements and grab samples for chemical parameters should be taken immediately before habitat data and biological samples are collected. The following parameters should be included as part of each bioassessment sampling event:
 - a. *In situ* measurements:
 - Temperature (water and air)
 - pH
 - Dissolved oxygen (mg/L and percent saturation)
 - Specific conductance
 - Salinity
 - Turbidity
 - b. Chemical parameters
 - Total Suspended Solids
 - Total Phosphorus and Ortho-phosphate
 - Total Nitrogen or Total Kjeldahl Nitrogen
 - Ammonia Nitrogen
 - Nitrite/Nitrate Nitrogen
 - Alkalinity
 - Hardness
 - c. In addition, Total Recoverable or Dissolved metals (cadmium, copper, lead, and zinc) should be sampled for macroinvertebrate assessments. If Total Recoverable is analyzed, then dissolved metals must be calculated and reported for comparison to water quality standards.

The chemical data can be used for one of the dry-weather water quality monitoring events.

8. Indicate which Level IV Ecoregion metrics will be used based on the locations of each of the monitoring stations for the calculation of the Macroinvertebrate Multimetric Index (MMI) for macroinvertebrate assessments.
9. Indicate which river basin and Level III Ecoregion metrics will be used based on the locations of each of the monitoring stations for the calculation of the Index of Biotic Integrity (IBI) scores for fish assessments.

The results of the bioassessments will be evaluated and discussed in detail in the subsequent Watershed Assessment report, providing an overview of the current status of the biological communities and associated habitats for the water bodies within the Assessment Area.

Failure to follow field and laboratory procedures as described in guidance documents and SOPs may cause certain data to be invalid, and depending on the extent of the discrepancies, could require that certain parts or all of the water quality monitoring or bioassessments to be repeated.