

Planning and Documentary Protocols for Water Quality Assessments

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Preface

The Watershed Protection Branch (WPB) of the Georgia Environmental Protection Division (GAEPD) has created a series of standard operating procedures (SOP) establishing uniform methods for the collection of data, document control, quality assurance, safety, as well as other activities. These protocols were developed to document, and ensure, the validity of measurements, analyses, and the representativeness of samples collected. This is necessary in the event of a dispute with other parties regarding data collection techniques and the resulting quality of field information. Enforcement activities by the Branch require full documentation on particulars of data collection and the equipment used to collect it. All Branch associates who collect samples or field data are required to be familiar with the measures outlined in the appropriate SOP's.

Requirements pertaining to specifics of sample collection for certain parameters are specified in federal regulations under the authority of the Clean Water Act (CWA) and the National Pollutant Discharge Elimination System (NPDES) permitting program. The most widely applicable guidance at this level is *Title 40 of the Code of Federal Regulations (40 CFR)*. The procedures and techniques given in *40 CFR* are updated periodically by the United States Environmental Protection Agency and field workers are advised to consult the latest revision for proper procedures and new developments. In addition, the SOPs utilized by the Branch should be reviewed annually to certify their concurrence with federal statutes. Other references used in developing each SOP are cited at the conclusion of the individual documents.

The collection protocols in *40 CFR* are in many instances based on the concern for quality assurance. As such, each SOP will contain a section devoted to maintaining and improving the quality of data collected. 'Quality Assurance and Quality Control' sections contained within individual SOPs are not meant to replace the overall Quality Assurance Project Plan documents prepared for the Branch, but rather, are provided as supplemental data for each specific, standardized activity.

This document is dynamic and will be continually revised as new developments warrant. As the Branch assumes more responsibilities for studying and sampling in new investigational areas, it is anticipated that additional SOPs will be required.

A. Introduction

The water quality inspections, investigations and studies conducted by the Branch can be broadly categorized as either enforcement or non-enforcement related activities.

The enforcement related fieldwork includes water enforcement case investigations, National Pollutant Discharge Elimination System (NPDES) compliance sampling inspections (CSIs), some diagnostic evaluations of municipal and industrial wastewater treatment plants, and monitoring of sewage spills.

Field work conducted that does not have a specific enforcement objective includes compliance with water quality standards, development of water quality criteria, trend monitoring, surveys to verify issued permit limits, waste load allocation and model calibration studies, and other intensive surveys for documenting water quality. Because studies and data derived from non-enforcement type investigations could be used for enforcement purposes, both investigations follow the guidelines presented in this document.

B. Purpose and Applicability

The purpose of this SOP is to establish a uniform procedure for planning work, documenting field procedures and findings, and retaining post-work documents and collections. The procedures outlined in this SOP are applicable to all Branch associates who plan field studies, collect data, or retain field collection documents in support of water quality and compliance monitoring.

C. Summary of Method

NPDES inspections and special response investigations do not require written study plans. Routine ambient monitoring is scheduled well in advance through monthly calendars covering staffing and laboratory analytical support needs.

Detailed investigations such as for lake and coastal monitoring, model calibration studies and other intensive surveys or large-scale technical evaluations require more planning and a formalized plan of study before initiation. The WPB has “Water Quality Survey Procedures” for these types of studies that follows a step-wise process from the initial request through planning, conducting and reporting of the results. The Ambient Monitoring Unit requires additional information be provided within its work plans which cover employee health and safety.

All sample identification, chain-of-custody records, and field records should be recorded with waterproof, non-erasable ink. If errors are made on any of these documents, corrections should consist of crossing a single line through the error and entering the correct information above the strikeout. All corrections should be initialed and dated. If possible, the individual making the error should provide the correction. Some data forms may not be amenable to using indelible waterproof ink and the use of pencil is acceptable as long as the reviewing professional certifies the accuracy of the data.

If information is entered onto sample tags, logbooks, or sample containers using stick-on labels, the labels should not be capable of being removed without leaving obvious indications of the attempt. Labels should never be placed over previously recorded information. Corrections to information recorded on stick-on labels should be made as stated above.

D. Definitions

1. **Clean Water Act (CWA)** – As amended in 1977, the Act established the basic structure for regulating discharges of pollutants into the waters of the United States. It gave the U.S. EPA the authority to implement pollution control programs such as setting wastewater standards for industry. The Clean Water Act also continued requirements to set water quality standards for all contaminants in surface waters. The Act made it unlawful for any person to discharge any pollutant from a point source into navigable waters, unless a permit was obtained under its provisions. It also funded the construction of sewage treatment plants under the construction grants program and recognized the need for planning to address the critical problems posed by nonpoint source pollution.
2. **Compliance Sampling Inspections (CSI)** – Studies which monitor permitted discharges for compliance with NPDES permits.
3. **Intensive Survey** – An intensive survey is a study that incorporates many different fields of research to fully understand the complexity of a water system. In most cases, this includes tributary and lake sampling for water quality characteristics, biotic life, sediment quality, and flow status. These studies tend to be a minimum of a year in duration.
4. **National Pollutant Discharge Elimination System (NPDES)** – As authorized by the Clean Water Act, the National Pollutant Discharge Elimination System permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. Point sources are discrete conveyances such as pipes or man-made ditches. Individual homes that are connected to a municipal system, use a septic system, or do not have a surface discharge do not need an NPDES permit; however, industrial, municipal and other facilities must obtain permits if their discharges go directly to surface waters.

5. **Special Response Investigation** – A special response investigation is a study conducted in response to a complaint or request submitted by a member of the general public, a water treatment facility operator, a member of a municipal government, a citizen’s action group....etc.

E. Health and Safety Warnings

Collection and analysis of samples can involve significant risks to personal health and safety. Planning for any type of field sampling should include extensive health and safety considerations. The top priority within these considerations should be a communications plan to be included in the plan of work submitted prior to sampling activities. Recommendations for required training, personal protective equipment, and degree of personal, physical condition should also be included in accordance with Federal, State, or organizational requirements.

F. Personnel Qualifications

All Branch associates who collect samples or field data must be familiar with the measures outlined in this document. In all aspects of water quality planning and field assessment activities, safety is to be addressed and treated as a critical element of any WPB activity. The Georgia DNR *Safety Manual* is to be consulted and its policies, protocols and procedures are to be incorporated and implemented in WPB field activities.

G. Equipment and Supplies

- Plan of Work folder
- Sample identification tags or labels
- Laboratory Source Documents (Orange sheets)
- Appropriate field sheets/field book for sampling task
- Chain of Custody form
- Clipboard
- Pencils, indelible marker, ball point pin
- Tape strips or masking tape for waterproofing sample labels

H. Procedural Steps

Pre-Plan Development

The first step in conducting any sampling activity other than routine ambient monitoring and special response investigations is the development of a brief project statement of purpose that clearly defines the goals of the project and the analytes to be measured. This will provide a point of reference while determining and verifying sample site locations and will ultimately form the framework for the Plan of Work.

Reconnaissance

Potential sample site locations must be verified via reconnaissance before the site list, and thus, Plan of Work, can be finalized. When conducting site reconnaissance, make note of the following:

1. Generate a proposed site route prior to departure, and follow it so as to evaluate its accuracy. GPS and map should be used in the event the proposed route or monitoring locations proves to be erroneous.
2. Evaluate the following at each site:
 - a. **Safety**: Where can you safely park? How wide are the shoulders on the bridge? How much traffic do you observe while visiting the site?
 - b. **Logistics**: Is there a tapedown marker, gage, or USGS station at the site? Can you sample the upstream side? Is there anything at the site that would prevent you from being able to take a representative sample (e.g. debris, beaver dame)? How deep is the water (approximately)?
 - c. **Wadeability**: Is the access to the stream bank on private or public property? If walking through private property is necessary, attempt to contact the owners and obtain permission. If applicable, find an appropriate bridge location /tree to place a tapedown/gage.

Plan of Work

Each study should have its own individual Plan of Work Folder. The Plan of Work will include, but is not limited to, the following items:

1. Sampling module/plan detailing reason for work being conducted, how it will be conducted, and expected results.
2. Detailed locations of sampling sites including GPS coordinates denoted on appropriate paperwork and Plan of Work folder.
3. Detailed driving directions (routes) to each sampling site
4. Schedule of dates for which sampling activities have been planned
5. Employee schedule for associates participating in sampling activities
6. Communication Plan/Safety Information
 - a. Emergency contact information for each associate
 - b. Detailed lodging information with contact numbers if study is conducted over multiple consecutive days and overnight lodging is required
 - c. Job hazard analysis detailing dangers associated with specified field sampling activities and suggested recommendations for avoiding harm – signed by each participating associate

- d. Pertinent health information if deemed necessary by manager. (i.e. diabetes, heart condition, or allergies)
- e. Location and contact information for nearest emergency care facility/hospital within vicinity of sampling sites – with maps to location or nearest road serviceable by ambulance
- f. Documentation of approved certification in first aid/CPR by at least one associate in field team per sampling outing if no one person will continuously be in the field

The plan of work, with all its constituent parts, should be completed and submitted to the appropriate supervisor no later than 2 weeks prior to the start of sampling activities.

Field Notes (Logbook and Other Original Written Field Records)

Each study or project shall have a logbook dedicated to it, shared with other related projects or studies, or with other work conducted in the same river basin, or watershed unit (HUC). Reasons for this include document control and consistency in filing original completed field records, ability to segregate records that may become legal evidence in enforcement proceedings from current study record keeping, and security of past data should a logbook become damaged or lost in subsequent work. The WPB has logbooks with different numbers of pages and the ability to produce specialized logbooks using resin coated paper stock that can be preprinted on laser jet printers and bound.

The study leader's name, the sample team leader's name (if appropriate), names of any additional staff collecting data, the study name, and location and study dates should be entered on the inside of the front cover of the logbook. It is recommended that each page in the logbook be numbered and dated. The entries should be legible and contain accurate and inclusive documentation of an individual's activities. At the end of all entries for each day, or at the end of a particular event if appropriate, the investigator should draw a diagonal line and initial indicating the conclusion of the entry.

Since field records are the basis for later written reports, language should be objective, factual, and free of personal feelings or other terminology that might prove inappropriate. Once completed, these field logbooks become legal documents and must be maintained as part of the official files. All aspects of sample collection and handling, as well as visual observations, shall be documented in the field logbooks. The following is a list of information that should be included in the field notes logbook:

1. Sample collection equipment (where appropriate);
2. Field analytical equipment, and equipment used for physical measurements shall be identified;
3. Calculations, results, and calibration data for field sampling, field analytical, and field physical measurement equipment;
4. Property and serial numbers of any sampling equipment used, if available;

5. Monitoring Location identification number and description;
6. Date and Time of sample(s) collection;
7. Description of the sample(s) location;
8. Description of the sample(s);
9. Sample collector(s) and data recorder;
10. How the sample(s) was collected;
11. Weather conditions that may affect the sample (e.g. rain, extreme heat or cold, wind, etc.)

Original field data that is recorded by an instrument and saved directly into a logging component (internal or accessory) are to be downloaded and secured as an electronic file. A hard copy of the data file should be printed and labeled by the investigator and included and filed with the original field notes.

Sample Identification

The method of sample identification used depends on the type of sample collected. Samples collected for specific field analyses or measurement data are recorded directly in bound field logbooks and/or recorded directly on the chain-of-custody record, with identifying information, while in the custody of the samplers. Samples collected for laboratory analyses are identified by attaching pre-printed sticker labels. In some cases, particularly with biological samples, sample tags may have to be included with or wrapped around the samples. Sample tags can be accountable documents after they are completed and attached to a sample or other physical evidence. Examples of a combination sample tag and field information form containing both sample identification and field data are provided in the appendix. The following information may be included on the sample tag using waterproof, non-erasable ink (the first four must always be provided; additional critical information is recorded on accompanying laboratory source document):

1. Study or project;
2. Field identification or sample station number;
3. Date and time of sample collection;
4. The name (or signature) of either the sampler(s);
5. Designation of the sample as a grab or composite;
6. Type of sample (water, wastewater, leachate, soil, sediment, etc.) and a very brief description of the sampling location;
7. Depth sample was taken (i.e lake, zooplankton);
8. The general types of analyses to be performed (if necessary); and
9. Relevant comments (such as detectable or identifiable odor, color, or known toxic properties).

If a sample is split with a facility, state regulatory agency, or other party representative, the recipient should be provided (if enough sample is available) with an equal weight or volume of sample. The split sample should be clearly marked or identified.

Tags for blank or duplicate (or replicate) samples will be marked "blank" or "duplicate," respectively. This identifying information shall also be recorded in the bound field logbooks and on the chain-of-custody record.

Photographs, Video and Digital Media Documentation

Photographs used in investigative reports or placed in the official files shall be identified on the back of the print and on the digital file with the following information:

1. A brief, but accurate description of what the photograph shows, including the name of the facility or site and the location.
2. The date and time that the photograph was taken.
3. The name of the photographer.

When photographs are taken, a record of each frame exposed shall be kept in the field notes along with the information required for each photograph. The field investigator shall then enter the required information on both the hard copy prints and the digital file where the photo is stored, using the photographic record from the field notes, to identify each photograph. For criminal investigations, the digital file (cd or external hard drive) and hard copy print shall be stored in a secure location. If photographic film is used, the negatives will also be stored in a secure location.

Video recorded for documentary purposes is treated in a similar fashion. When in use, the videographer (or a designated at hand narrator) should state at the beginning of the tape the investigation purpose, what is being videotaped, who is present, the date and time, and the location/area that the following recording represents. During the taping, the videographer and/or narrator are to describe what is being videotaped at the time for the audio part of the recording. It may be helpful to the videographer (and assistants), to discuss how the videotaping will proceed and prescript an approach prior to beginning the taping.

Upon return to the office or as soon as possible, the field video should be copied on to a blank tape that is labeled (on the tape directly and the tape cover), with all of the summary information that accurately reflects the tape contents. If the tape is to be used for an enforcement action, at least one duplicate tape should be produced and stored in a secured file or location with the original copy.

Images obtained using digital video cameras are secured as documentary evidence similar to that described above for taped video media. Image records made with digital media are electronic graphic files that can be modified or altered using software. If a

digital record is to be used for evidence in an enforcement proceeding, the original graphic file is to be saved and secured with chain of custody certification by the originator. Guidance should be obtained from the Georgia Attorney General's Office if digital image documentation for enforcement is anticipated.

Identification of Other Physical Evidence

Physical evidence, other than samples or images, shall be identified by utilizing a sample tag or recording the necessary information on the evidence. In addition, it is suggested that photographs of any physical evidence be taken and the necessary information recorded in the field logbook.

Occasionally, it is necessary to obtain recorder and/or instrument charts from WPB or facility owned analytical equipment (flow recorders, etc.), during field investigations and inspections. Write the following information on these charts while they are still in the instrument or recorder:

1. Starting and ending time(s) and date(s) for the chart.
2. Results of an instantaneous measurement by the recorder. The instantaneous measurement shall be entered at the appropriate location on the chart along with the date and time of the measurement.
3. A description of the location being monitored and any other information required to interpret the data such as type of flow device, chart units, factors, etc.

The field investigator should initial all of the above information. After the chart has been removed, the field investigator shall indicate on the chart who the chart (or copy of the chart) was received from and enter the date and time, as well as the investigator's initials.

Documents such as technical reports, laboratory reports, etc., should be marked with the field investigator's signature, the date, the number of pages, and from whom they were received. Confidential documents should not be accepted, except in special circumstances.

I. Data and Records Management

Chain-of-Custody Procedures

Chain-of-custody procedures maintain and document the sample custody record and provide documentation of samples for evidence. To document chain-of-custody, an accurate record must be maintained to trace the possession of each sample from the moment of collection to its introduction into evidence.

Sample Custody

A sample or other physical evidence is in custody if:

1. It is in the actual possession of an investigator;
2. It is in the view of an investigator, after being in their physical possession;
3. It was in the physical possession of an investigator and then they secured it to prevent tampering; and/or,
4. It is placed in a designated secure area.

Chain-of-Custody Record

The field Chain-of-Custody record is used to record the custody of all samples or other physical evidence collected and maintained by investigators. All physical evidence or sample sets shall be accompanied by a chain-of-custody record. This Chain-of-Custody Record documents transfer of custody of samples from the sample custodian to another person, to the laboratory, or other organizational elements. To simplify the Chain-of-Custody Record and eliminate potential litigation problems, as few people as possible should have custody of the samples or physical evidence during the investigation. The Chain-of-Custody Record also serves as a sample logging mechanism for the laboratory sample custodian. In the WPB, the GAEPD Laboratory Source Document may serve as the Chain-of-Custody Record for most samples and is completed for all samples collected and submitted to the GAEPD Laboratory for analysis. The GAEPD Laboratory Source Document may be customized to a format specific to special types of samples or monitoring projects. A separate Chain-of-Custody Record may be used for special samples. Field notes should also note the sample holding and disposition concerning custody, transfer and laboratory delivery as appropriate. An example of a Laboratory Source Document and a Chain-of-Custody Record are provided in the Appendix.

The following information is recorded in the indicated spaces to complete the Laboratory Source Document or field Chain-of-Custody Record.

1. The study or project name.
2. Name of the sample collector
3. The sampling station number or I.D., date and time of sample collection, grab or composite sample designation, and a brief description of the sampling location must be included.
4. Required analyses should be checked off in the appropriate location.
5. The sample custodian and subsequent transferee(s) should document the transfer of the samples listed on the Chain-of-Custody Record. The person who originally relinquishes custody should be the sample custodian. Both the person relinquishing the samples and the person receiving them must sign the form. The date and time that this occurred should be documented in the proper space on the chain-of-custody record.

6. Usually, the last person receiving the samples or evidence should be the laboratory sample custodian or their designee(s).

Physical evidence for criminal investigations such as video tapes or other small items shall be placed in Zip-Loc® type bags or envelopes and a custody seal should be affixed so that they cannot be opened without breaking the seal. A Chain-of-Custody Record shall be maintained for these items. Any time the seal is broken, that fact shall be noted on the Chain-of-Custody Record and a new seal affixed. The information on the seal should include the sample field custodian's signature or initials, as well as the date.

Samples should not be accepted from other sources unless the sample collection procedures used are known to be acceptable, can be documented, and the sample Chain-of-Custody can be established. If such samples are accepted, a standard sample tag containing all relevant information and the Chain-of-Custody Record shall be completed for each set of samples.

Transfer of Custody with Shipment

1. Samples shall be properly packaged for shipment.
2. All samples shall be accompanied by the Laboratory Source Document, sealed in a watertight bag if samples are shipped. The laboratory sample custodian is responsible for receiving custody of the samples and will fill in the "Received By" section.

Document Control

The term document control refers to the maintenance of records and reports produced during and as a result of field inspection, investigation, or survey activities. All files shall be maintained in accordance with WPB guidelines. All documents as outlined below shall be kept in the WPB files when completed, and approved if applicable. Investigators may keep copies of reports in their personal files, however, all official and original documents relating to inspections, investigations and surveys shall be placed in the official WPB files. The following documents shall be placed in the WPB file, if applicable:

1. Request memo from the program office;
2. Copy of the study plan;
3. Original bound field logbooks;
4. Records obtained during the investigation;
5. Complete copy of the analytical data and memorandums transmitting analytical data;
6. Official correspondence received by or issued by the Branch relating to the investigation;
7. Photographs and negatives associated with the project;

8. One copy of the final report and transmittal memorandum(s); and
9. Relevant documents related to the original investigation/inspection or follow-up activities related to the investigation/inspection.

Under no circumstances are any inappropriate personal observations or irrelevant information to be filed in the official WPB files. The project or study leader shall review the file at the conclusion of the project to insure that it is complete.

J. Quality Assurance and Quality Control

In order to maintain a quality work product, each document completed as outlined in this SOP should be reviewed upon completion. The associate conducting the review should be someone other than the associate who originally completed the Plan of Work, Sample Tag, Laboratory Source Document, Chain-of-Custody...etc. Field notes and logbooks should also be reviewed by a second party in the field team to ensure that no pertinent information concerning the sampling activity is overlooked.

K. References

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United States Environmental Protection Agency (USEPA), Office of Environmental Information, April 2007, *Guidance for Preparing Standard Operating Procedures (SOPs)*, EPA/600/B-07-001, Washington, D.C.

United States Environmental Protection Agency (USEPA), Office of Water, March 1991, *Technical Support Document for Water Quality-based Toxics Control*, Second Edition, EPA/505/2-90-001, Washington, D.C.

Example Tag (Hybrid also providing field information and chain of custody record)

<p>Purpose: Annual Bacteriological Monitoring of Ga. State Parks Operated Beaches</p> <p>Sample I.D.#: _____ Park: _____</p> <p>Lake: _____ Swimming Beach Area Sampled: _____</p> <p>Date Collected: _____ Time Collected: _____ Collector: _____</p> <p>Swimming Area Open?: _____ If Yes, Level of Use (low, high, etc.): _____</p> <p>Weather Today: _____ Weather Previous 3 Days: _____</p> <p>Water Clarity (Secchi disk): _____ Water Color: _____</p> <p>Waterfowl (Ducks, Geese, etc.) Recently Present at or near Beach Area? _____</p> <p>SAMPLE RELINQUISHED BY: _____ on _____ at _____ A / P M</p> <p>SAMPLE RECEIVED BY: _____ on _____ at _____ A / P M</p> <p>SAMPLE RELINQUISHED BY: _____ on _____ at _____ A / P M</p> <p>SAMPLE RECEIVED BY: _____ on _____ at _____ A / P M</p>
<p>EPD USE ONLY: LAB LIMS SAMPLE I.D. # _____</p> <p>NOTE TO LAB: RETURN THIS TAG TO***** , WPMP, 4220/Ste.101 Tradeport</p>

Chain of Custody Record

Georgia Department of Natural Resources
 Environmental Protection Division Laboratories
 455 14th Street NW, Atlanta, GA 30318

Matrix Type Definition: S = Soil or Semi Solid, W = Water (Aqueous), A = Air, NA = Non Aqueous Liquid (Oil, Solvent, Etc.)

Project/Facility:				Location:				Analysis Requested							
Sampler Name:				Phone:											
Address:				FAX:											
Sample		Sample Identification (Include unique sample identifier such as sample log numbers.)						Matrix Type				Number of Containers Submitted			
Date	Time							S	W	A	NA				
Relinquished By (Signature)			Date	Time	Relinquished By (Signature)			Date	Time	Relinquished By (Signature)			Date	Time	
Received By (Signature)			Date	Time	Received By (Signature)			Date	Time	Received By (Signature)			Date	Time	

Laboratory Use Only

Received For Laboratory By (Signature):	Date	Time	Custody Intact <input type="checkbox"/> Yes <input type="checkbox"/> No	Custody Seal No	Laboratory Remarks:
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