FA 1000. REGULATORY SCOPE AND ADMINISTRATIVE PROCEDURES FOR USE OF DEP SOPS

FA 1100. Intent and Purpose

This administrative SOP provides guidance and specific instructions concerning the organization and regulatory use of the various components of the collection of DEP SOPs found in DEP-SOP-001/01 (Field Procedures) and DEP-SOP-002/01 (Laboratory Procedures). For those situations where procedures alternative to the DEP SOPs are proposed, see FA 2100, Application to Use Alternative Procedures. In addition, quality assurance management recommendations and requirements for implementation of the DEP SOPs are discussed in FA 3000, Quality Systems. Auditing protocols used by DEP to evaluate individuals and organizations for compliance with the DEP SOPs are described in FA 4000. Minimum personnel qualifications required for certain DEP SOP activities are listed in FA 5000. Definitions and terms used throughout the DEP SOPs are found in the Tables and Glossary included in the Appendix to FA 1000.

1. TERMS SPECIFIC TO RECOMMENDED AND REQUIRED PROCEDURES

Although the entire collection of DEP SOPs comprises minimum requirements under the DEP Quality Assurance Rule, 62-160, F.A.C., certain provisions in the DEP SOPs specifically describe recommendations that are suggested and not mandatory. In addition, certain requirements are emphasized in the text of DEP SOPs according to the terms defined below.

1.1. When the words “shall” or “must” are associated with a procedure or other item, the item is mandatory and required in all cases.

1.2. When the words “should” or “may” are used, the referenced item is recommended or suggested but not mandatory.

2. COMPLIANCE WITH HEALTH & SAFETY AND WASTE DISPOSAL REGULATIONS

The collection of DEP SOPs is not intended to provide guidance on compliance with personal protection, health & safety or waste disposal regulations. Users of the DEP SOPs should ensure that the requirements of all local, state and federal regulations concerning personal protection, health & safety planning and the storage and disposal of any hazardous or investigation-derived wastes are fulfilled when performing the procedures described in the DEP SOPs.

3. DISCLAIMER FOR USE OF TRADE NAMES

Trade names are used in certain DEP SOPs to provide examples of equipment or materials appropriate for use according to the indicated procedures. Other brand names of equipment may be used interchangeably if they are of equivalent design, construction materials and function. The use of trade names by DEP does not indicate an endorsement of any commercial product. In rare instances, the listed brand name is the only item or material of its kind available meeting specifications required by the associated DEP SOP.

FA 1200. Regulatory Use

All parties producing data for use by DEP are required to use applicable DEP SOPs per the DEP Quality Assurance Rule, 62-160.210, .240, .300 & .320, F.A.C.

FA 1210. EXCEPTIONS TO USE

Activities exempted from mandatory use of the DEP SOPs are indicated in the DEP Quality Assurance Rule, 62-160.110 & .210, F.A.C.

FA 1300. Format, Definitions and Terms

FA 1310. SOP FORMAT

The SOPs are divided into major topic areas

1. FA: ADMINISTRATION:

   1.1. Outlines the intended use and scope of the SOPs

   1.2. Defines:

   - Terms
   - Matrices
   - Analyte groups

   1.3. Outlines procedures to be used when applying for alternative field procedures and how they will be used.

   1.4. Discusses the required elements of a quality system, personnel responsibilities, and the quality manual.

   1.5. Describes auditing procedures used by DEP to evaluate individuals and organizations for compliance with the DEP SOPs.

   1.6. Lists personnel qualifications required for performing certain procedures in the DEP SOPs.

2. FC: CLEANING PROCEDURES: Outlines appropriate cleaning procedures for field equipment and sample containers.

3. FD: FIELD DOCUMENTATION:

   3.1. Summarizes the types of documentation and records that must be maintained.

   3.2. Provides field forms that may be used by organizations.

4. FM: FIELD PLANNING AND MOBILIZATION:

   4.1. Discusses recommended procedures for obtaining laboratory services.

   4.2. Discusses recommended activities to be performed before beginning a sample collection project.

5. FQ: FIELD QUALITY CONTROL:

   5.1. Discusses the types of quality control measures used by sampling organizations.

   5.2. Outlines the mandatory quality control samples to be collected.

   5.3. Discusses the quality control measures that are associated with field measurements.

6. FS: FIELD SAMPLING: Discusses sample collection procedures based on source:

   6.1. General sampling procedures applicable to all sampling activities including construction materials, container types, preservation and holding times.

6.2. General aqueous sampling procedures applicable to collecting all water samples.

6.3. Specific SOPs for:

- Surface Water
- Groundwater
- Drinking water
- Wastewater
- Soils
- Sediment
- Waste
- Biological Tissues
- Biological Community
- Contaminated Surface Sampling
- Ultra Trace Metal Sampling

7. FT: FIELD TEST MEASUREMENTS: Discusses procedures to calibrate and maintain instruments and perform field measurements for:

- pH
- Specific Conductance
- Salinity
- Temperature
- Dissolved Oxygen
- Turbidity
- Light Penetration (Transparency and Secchi Depth)
- Water Flow and Velocity (Discharge)
- Multi Parameter Meters
- Residual Chlorine
- Aquatic Biological Habitat Characterization

8. LD: DOCUMENTATION FOR LABORATORY PROCEDURES: Lists documentation requirements for the following laboratory procedures not discussed in the NELAC Quality Systems standards:

- Determination of Biological Indices
- Quality Control for Biological Community Analysis

9. LQ: LABORATORY QUALITY CONTROL: Describes quality control for the following laboratory procedures not discussed in the NELAC Quality Systems standards:

- Taxonomic Identification and Enumeration

10. LT: LABORATORY TESTING PROCEDURES: Describes laboratory methods for procedures not discussed in the NELAC Quality Systems standards:

- Biological laboratory procedures for taxonomic identification and enumeration
- Calculation of Biorecon, Stream Condition, Lake Vegetation and Lake Condition indices

FA 1320. SOP GLOSSARY

The glossary, found in FA 1000, Appendix FA 1000 defines the terms used throughout the DEP SOPs.

FA 1330. MATRIX DEFINITIONS

Table FA 1000-1 identifies and defines the sample-collection matrices that are used throughout the DEP SOPs.

FA 1340. ANALYTE GROUP DEFINITIONS

Tables FA 1000-2 and FA 1000-3 identify and define the sample-collection analyte groups as used throughout the DEP SOPs.

FA 2000. GENERAL ADMINISTRATIVE PROCEDURES

FA 2100. Application to Use Alternative Procedures

1. INTRODUCTION

When protocols described in the collection of DEP SOPs are unsuitable for a specific application, use alternative procedures approved by DEP according to the following conditions and instructions.

2. SCOPE, REGULATORY REQUIREMENTS AND EXCLUSIONS

2.1. The procedures in the DEP SOPs are minimum requirements for sample collection, sample handling, field testing and certain laboratory procedures used to generate data for DEP use. Per the DEP Quality Assurance Rule, 62-160.210 & .330, F.A.C., alternative and new procedures require preapproval by DEP before use on a project. Apply for approval to use alternatives to the DEP SOPs except for those DEP SOPs and alternative or new procedures described or listed in sections 2.1.1 – 2.3 below.

2.1.1. Certain DEP SOPs will provide for allowable alternatives to the indicated procedures. See specific SOPs for a description of these preapproved alternatives.

2.1.2. Per the DEP Quality Assurance Rule, 62-160.600, F.A.C., procedures employed for research purposes are not considered alternative procedures. However if the DEP SOPs are required for use in a research project and alternative procedures are proposed instead, an application for alternative procedures must be submitted.

2.1.2.1. Submit research procedures proposed to be incorporated into the collection of DEP SOPs according to FA 2240 below.

2.1.3. Alternative or new procedures submitted in DEP-approved Quality Assurance Plans prior to the adoption of the collection of DEP SOPs in SOP-DEP-001/01 and SOP-DEP-002/01 may be approved by DEP for future specific projects without modification if the procedure meets the data quality objectives of the future project and the request to use the procedure meets the requirements indicated in FA 2200 – FA 2230.

2.1.4. Per the DEP QA Rule, 62-160.220, F.A.C., alternative or new procedures submitted under the provisions of DEP contracts, permits or orders and approved by DEP prior to the effective date of the collection of DEP SOPs in SOP-DEP-001/01 and SOP-DEP-002/01 remain approved for the duration of the project associated with the contract, permit or order. The requirements indicated in FA 2200 – FA 2230 are waived for these procedures.

2.1.5. Procedures used by the DEP Bureau of Emergency Response or its designated representatives and contractors to collect samples under regulations governing emergency response incidents may deviate from the requirements in the DEP SOPs without preapproval to the extent necessary to protect human health, public safety and the environment. The requirements indicated in FA 2200 – FA 2230 are waived for these procedures.

2.2. DEP SOPs Not Requiring Preapproved Alternatives

- FC 1000-1430 and Appendix
- FS 8200

2.3. Excluded Modifications to DEP SOPs

The following DEP SOPs cannot be modified or replaced by alternative or new procedures:

- FS 7000, General Biological Community Sampling
- FT 3000, Aquatic Habitat Characterization
- LT 7000, Determination of Biological Indices

FA 2200. Review and Approval of Alternative Procedures

GENERAL INSTRUCTIONS

1. Submit all applications for alternative procedures to the DEP project manager assigned to the site, project, permit, or contract. Do not send applications to DEP headquarters offices in Tallahassee unless the project manager is stationed in Tallahassee or the application is submitted for general approval as a statewide-use procedure.

2. Do not commence using the alternative procedure until approval is granted by DEP.

3. In order to meet the data quality objectives of the proposed project, DEP may impose specific conditions on the use of the alternative procedure or request modifications to the procedure before approval.

FA 2210. GENERAL DESCRIPTION OF ALTERNATIVE PROCEDURES

The degree of modification of a published DEP SOP or the specifications of a proposed new procedure will in part determine whether the procedure is deemed alternative. Evaluate proposed procedures according to the following criteria in determining whether to apply for alternative or new procedure approval.

1. INCLUDED MODIFICATIONS AND EFFECTS ASSOCIATED WITH ALTERNATIVE OR NEW SAMPLING PROCEDURES:

Procedures containing the following modifications or potentially producing the indicated effects require the submittal of applications for approval as alternative or new procedures.

1.1. Step-wise, procedural modifications using the equipment specified in an affected DEP SOP that alter the integrity, nature or representativeness of the sample, as determined by comparison with the published DEP SOP.

1.2. Use of equipment or containers composed of materials that may potentially contaminate the sample with substances that interfere with sample preservation or analysis or that otherwise result in a loss or fortification (contamination) of analytes or parameters of interest in the sample.

1.3. Use of substantially different equipment as an alternative to the equipment prescribed in the affected DEP SOP.

1.4. Use of substitute reagents or chemicals, where applicable, to sample collection procedures.

1.5. Use of entirely new procedures or technology not discussed in the DEP SOPs. These procedures are defined as new procedures.

2. MODIFICATIONS TO FIELD TESTING METHODS AND NEW FIELD TESTING METHODS

Alternative field-testing methods of all types are subject to the provisions of the DEP Quality Assurance Rule, 62-160.330 FAC, for approval of alternative analytical methods.

3. MODIFICATIONS TO SAMPLE PRESERVATION PROTOCOLS/NEW PRESERVATION PROTOCOLS

Sample preservation procedures of all types are subject to the provisions of the DEP Quality Assurance Rule, 62-160.400 F.A.C., which references approved sample preservation protocols listed in FS 1006. Alternative procedures for sample preservation, container types and sample storage are subject to the preapproval requirements described in FA 2100 – FA 2230.

FA 2220. GENERAL CRITERIA FOR APPROVAL OF ALTERNATIVE PROCEDURES

1. The approval of all proposed alternative and new procedures is dependent upon fulfillment of the following general criteria.

1.1. Alternative procedures must be appropriate for the Data Quality Objectives (DQOs) established for the project for which the alternative procedure is proposed.

1.2. Where applicable, the alternative procedure must be demonstrated to be equivalent to or exceed the performance of the DEP SOP that the alternative procedure is proposed to replace.

1.3. Approval will not be granted if the procedure produces data unusable by DEP for the fulfillment of DQOs, or if the procedure produces data that are not comparable to or are otherwise incompatible for use with existing DEP data generated by other approved procedures.

1.4. Approval will not be granted if the alternative procedure is shown to produce data at obvious risk of being invalidated according to the requirements of the DEP Quality Assurance Rule, 62-160.670, F.A.C. or according to data validation criteria established by DEP as specific DQOs for the affected project(s).

1.5. Procedures developed by consensus or standardization organizations, such as ASTM, EPA or USGS, or by manufacturers or vendors and derived from collaborative studies, will be considered on merit for approval as published by the standard-setting organization or commercial interest.

1.6. Approval of alternative or new procedures of all types is independent of the operating party and may be used by any entity for the affected project for which the procedure is approved.

1.7. Each proposed alternative or new procedure will be evaluated on an individual basis against these criteria according to the specific requirements of the project for which the alternative or new procedure will be used.

2. Although most requests for alternative procedure approval must be routed through the designated DEP project or contract manager for a site or project, approval will be granted by DEP through internal review that includes other staff in addition to the project manager.

3. See additional discussion for statewide-use approval in FA 2230, section 2.

FA 2230. PROJECT-SPECIFIC AND STATEWIDE-USE ALTERNATIVE PROCEDURES

The protocol for applying for alternative procedure approval differs depending on whether the alternative or new procedure is intended for project-specific or statewide use, and will determine the scope of approval for the procedure.

1. PROJECT-SPECIFIC ALTERNATIVE FIELD PROCEDURES: Submit all applications for project-specific alternative or new procedures to the DEP project manager assigned to the project, legal case, site, permit, order, contract or other agreement. Approvals of project-specific procedures are subject to the following:

1.1. Apply for project-specific alternative procedures on a site or project basis. The approval will not be portable and the alternative procedures cannot be used on other sites or projects, **but may be used by any party performing the alternative procedure approved for the affected project.**

1.1.1. Alternative procedures employed for experimental purposes, where data derived from the alternative procedure will not be used by DEP, will be handled informally with the DEP project manager and are not subject to the approval requirements of this SOP.

1.1.2. The statewide-use application will not be required for any project-specific approval, but a statewide-use approval for an alternative procedure will satisfy project-specific approval requirements if the procedure meets the data quality objectives of the project and the request to use the procedure meets the requirements indicated in FA 2200 – FA 2230.

2. STATEWIDE-USE ALTERNATIVE FIELD PROCEDURES:

2.1. Submit applications for approval for alternative or new procedures for statewide use for general approval or for use on multiple sites in the state.

2.1.1. Statewide-use procedures require the design of a collaborative multi-party study to investigate the efficacy of the proposed procedure for specified site conditions and sample types. An evaluation of the proposed procedure on multiple sites representing different environmental conditions may be required to demonstrate the robustness of the procedure. Each application will be considered on a case-by-case basis by DEP. Approval for statewide use does not guarantee applicability of the procedure for all projects.

2.1.2. The statewide-use application will not be required for any project-specific approval, but a statewide-use approval for an alternative or new procedure will satisfy project-specific approval requirements if the procedure meets the data quality objectives

of the project and the request to use the procedure meets the requirements indicated in FA 2200 – FA 2230.

2.2. Submit written study designs and applications for approval to the DEP project manager assigned to the project, site, permit, case, contract or other agreement. If the procedure is being submitted for general approval and not for use on a specific project, submit the application for approval to the Environmental Assessment Section (EAS) at DEP headquarters in Tallahassee.

2.2.1. Consult with the DEP project manager or the EAS prior to submittal. The format and content of the application, as well as the study design, will be determined on a case-by-case basis in collaboration with all affected parties.

2.3. Procedures approved for statewide use become part of the public domain and are made available to any party.

2.3.1. DEP will not accept applications for alternative or new procedures for statewide use where proprietary rights, exclusive use or other limitations on use of the procedures are claimed.

FA 2240. ADDITION OF ALTERNATIVE PROCEDURES TO THE COLLECTION OF DEP SOPS

1. Incorporation of procedures or methods into the collection of DEP SOPs requires approval of the procedure or method for Statewide Use, per the DEP Quality Assurance Rule, 62-160.210 & .330, F.A.C.

1.1. See FA 2230, section 2, above.

2. Upon request to the Environmental Assessment Section at DEP headquarters in Tallahassee, and after approval for statewide use, the procedure will be added to the collection of DEP SOPs at the next publication date.

2.1. Approval for statewide use is effective at the time of original approval of the procedure or method, regardless of publication date of the revised collection of DEP SOPs.

FA 3000. QUALITY SYSTEMS

Each organization shall establish and maintain a quality system that will:

1. Identify, implement and promote quality assurance policies and procedures that will produce data of a known and verifiable quality;

2. Create and/or identify and follow standard operating procedures for all activities, both technical and administrative;

3. Monitor adherence to the established policies, procedures and written standard operating procedures;

4. Establish and use procedures for continual improvement through both corrective and preventive action policies; and

5. Monitor the quality of the organization’s product.

FA 3100. Quality Assurance Policies and Procedures

Each organization shall ensure that there are policies and procedures in place for the following activities:

1. ORGANIZATION

   1.1. Policies and procedures on how information concerning quality assurance issues is distributed and communicated.

   1.2. Personnel procedures and documentation - DEP will review this type of information relative to the understanding and training of each individual for their assigned duties and quality assurance responsibilities. DEP will assess these items:

   - Hiring procedures and policies
   - Position qualifications including education and experience requirements
   - Training requirements and training records
   - Position descriptions
   - Expectations on ethical behavior
   - Consequences of poor performance, unethical behavior or any activity that might misrepresent the quality of the organization's work.

2. REVIEW AND ASSESSMENT

   2.1. Procedures on how data are reviewed, evaluated and reported.

   2.2. Policies concerning how non-standard or unacceptable results are handled.

   2.3. Procedures describing how the entire quality system is monitored (audited) at the technical and managerial level.

   2.4. Policies and procedures on how external audits are reviewed and used.

   2.5. Policies and procedures on how the outcomes of all audits are handled including initiating and monitoring both corrective and preventive actions.

      2.5.1. Identification of key personnel who are responsible for ensuring that the system is evaluated and for issuing audit reports and follow-up corrective/preventive action summaries.

   2.6. Identification of key personnel who review such reports and are in a position to make decisions about the effectiveness of the quality system.

   2.7. Policies and procedures on how to deal with activities that did not follow the organization's procedures.

   2.8. Policies and procedures on how to document the use of procedures that are different from those in the DEP SOPs or are new technology.

3. CLIENT SERVICES

   3.1. Policies and procedures that are used to review requests for services.

   3.2. Policies and procedures relating to how customer concerns or complaints about any activity addressed in the DEP SOPs are handled. This must include but is not limited to conducting audits and initiating corrective actions.

   3.3. When applicable, policies and procedures to ensure and protect client confidentiality.

4. PROCUREMENT: These policies must reflect the specifications and requirements of the DEP SOPs as well as any additional considerations an organization might impose on how purchases are made.

4.1. Policies and procedures describing how equipment, supplies and other services are obtained including:

4.1.1. Specifications for equipment, containers, testing equipment, reagents and other supplies; and

4.1.2. Specifications and procedures for obtaining laboratory services.

FA 3200. Quality Assurance Responsibilities

1. Each individual in an organization has a responsibility for ensuring that their assigned tasks meet the organization's stated quality assurance goals, policies and procedures.

2. The following discussions assign certain tasks to various levels of responsibility. DEP recognizes that the organization structure within a company may vary. With the exception of the QA Officer, the duties specified below may differ from suggested job titles and may be assigned to more than one person.

3. All tasks outlined below must be performed by an individual or individuals within the organization.

FA 3210. QUALITY ASSURANCE OFFICER

1. The role of the Quality Assurance Officer (QAO) is one of oversight. In addition to coordinating and overseeing data quality activities, monitoring adherence to company policies and procedures and corrective actions, the QAO must have the ability and authority to recommend and implement immediate corrective measures, without going through chains of command. Therefore, organizational and functional position of QAO cannot be placed in direct lines of authority.

2. The Quality Assurance Officer must be able to objectively evaluate data and perform audits without outside influences. The responsibilities of the QAO may be divided among several individuals (i.e. corporate QAO, regional QA managers) and the designated QA Officer may be assigned other duties (e.g., project management). Any other responsibilities of a QAO cannot bias the performance of any of the following tasks.

3. The QAOs (however named) must :

3.1. Review quality control data to determine if data are acceptable;

3.2. Perform annual systems audits to ensure compliance with all quality assurance plans and standard operating procedures;

3.2.1. Distribute results of internal and external audits to management and all affected individuals;

3.2.2. Oversee responses to internal and external audits;

3.2.3. Oversee and recommend corrective actions as a result of the audits;

3.2.4. Verify corrective action implementation.

3.3. Oversee administration of performance audits;

3.4. Coordinate preparation of quality assurance reports to management, clients and regulatory agencies;

3.5. Coordinate and oversee the preparation of quality manuals and quality assurance project plans;

3.6. Review new or proposed procedures to determine appropriate use. Also reviews associated method validation information;

3.7. Review, in writing, initiated corrective actions to assure effectiveness. Recommend additional measures if necessary.

FA 3220. TECHNICIAN LEVEL

The field technician or sample collector must:

1. Perform field measurement tests according to DEP SOPs including calibrations;

2. Verify that all calculations (e.g., purge volume) are correct;

3. Collect samples following the DEP SOPs (or company SOPs) using appropriate equipment;

4. Ensure that sample containers are properly and accurately labeled;

5. Ensure that appropriate preservatives are added and that appropriate sample containers are used to collect required fractions;

6. Legibly and fully document all activities in field logs or field data sheets;

7. Ensure that all field information is accurately recorded;

8. Identify and/or document potential quality control problems (e.g., unacceptable calibrations, environmental conditions, procedure and equipment variances, etc.); and

9. Maintain equipment and test instruments in working condition, and document all preventative maintenance and repairs.

10. Implement any corrective action procedures that are a result of any type of audit.

FA 3230. SUPERVISORS AND/OR SUBSECTION/SECTION MANAGEMENT

These individuals must:

1. Ensure that all activities (either sampling or field or laboratory testing) are performed according to methods and protocols specified in any quality planning document, sampling and analysis plan and the DEP SOPs.

2. Review all field and laboratory generated data by:

   2.1. Checking documentation for completeness and proper sample identification

   2.2. Checking raw data for calculation, interpretation or clerical errors

   2.3. Assuring that produced quality control data are acceptable

3. Coordinate analytical work or field activities to assure completion of all tasks within established time frames.

4. Oversee preventative maintenance activities.

5. Evaluate and implement changes in methodology and quality control measures.

6. Identify quality control problems and takes measures to correct or eliminate the problem source.

7. Monitor and/or implement any corrective action procedures that are a result of any audit type.

8. Assume the responsibility for validating all field generated documentation and data and ensure that final field reports are accurate before final review by management.

FA 3240. PROJECT MANAGEMENT

1. Acts as a liaison between the client and the organization.

2. Oversees and coordinates project activities including workplans, quality assurance plans, data quality objectives, standard operating procedures and scheduling.

3. Ensures that there are adequate qualified personnel, equipment, and time to produce a completed project of a specified quality.

4. Reviews project data prior to final report to assure that all data (field and laboratory) are acceptable and within specified project objectives.

FA 3250. MANAGEMENT

These individual(s) are responsible for overall operation of the organization including fiscal resources and personnel. They must:

1. Ensure that all organizational activities are conducted according the organization's established quality system, quality manual and standard operating procedures and that all policies and procedures are consistent with the quality manual.

2. Conduct management reviews at regularly scheduled intervals, not to exceed 12 months:

   2.1. The review and the procedures for such a review must be documented.

   2.2. The review must assess the organization's quality system, and related activities to determine the effectiveness of the system, and its continuing suitability. The review must include, but is not limited to:

   - Policy and procedures review
   - Outcome of internal and external audits
   - Corrective and preventative actions
   - Reports from managerial and supervisory staff
   - Changes in volume and type of work
   - Client feedback
   - Complaints and their resolution
   - Staff training

   2.3. The findings and recommendations of this management review must be documented, as well as any actions that are the result of the review.

3. Ensure that there is sufficient managerial, technical and support staff with the authority and resources (equipment, etc.) to perform their stated duties.

4. Establish procedures to ensure that all personnel are free from any undue internal or external commercial, financial and other pressures or influences that adversely affect the performance and quality of their work.

5. Ensure that the staff has the necessary education, experience and/or training to perform their stated duties.

FA 3300. Quality Manual

Each organization must have a quality manual that outlines their current quality system, quality assurance policies and quality control procedures. All topics specified in FA 3100 and 3200 must be addressed by descriptive discussions or reference to specific policies and procedures.

At a minimum, the quality manual must address the following:

1. A title page signed by the quality assurance officer(s), and the highest level of management responsible for field activities with:

- Document Title
- Organization's full name, address and telephone number
- Identification of all major organizational units covered by the document
- The effective date of the version.

2. A table of contents, and applicable lists of references, glossaries, appendices, tables and figures.

3. A statement of policy which must outline the organization's commitment to generating data through the use of sound Quality Assurance and Quality Control management practices.

4. An ethics statement which must outline (or make reference to) the organization's ethics policy and employee training on ethics.

5. ORGANIZATIONAL TOPICS:

5.1. A discussion on the organizational structure, including lines of authority, identification of key personnel and their responsibilities, the relationship of all units (including administration, management and support services) to the quality system.

5.2. Stated job descriptions for all staff or reference to such information.

5.3. A list of all approved signatories (e.g., Professional Geologist, Professional Engineer, Quality Assurance Officer).

5.4. Discussion on or reference to procedures and policies dealing with employee credentials and training.

6. DOCUMENTATION

6.1. Discussion on or reference to procedures and policies concerning how records are generated, retained, and stored.

6.2. Discussion on or reference to procedures dealing with how documentation is controlled and maintained.

6.3. Discussion on or reference to the types of documents/reports that are generated by the organization.

6.4. Discussion on or reference to procedures to ensure accurate sample identification and data integrity.

6.5. Discussion on or reference to procedures to protect client confidentiality (when applicable).

7. CAPABILITIES

7.1. Specify the organization's capabilities. This must include the types of sampling, sampling matrix and laboratory and field testing relevant to execution of the DEP SOPs, and may include other services such as hydrology, engineering, etc.

7.2. Reference to the specific sampling procedures to be used.

7.3. List all field and laboratory test methods.

7.4. List the types of field and laboratory instruments and equipment used by the organization for implementation of the DEP SOPs.

7.5. Reference to or discussion on how samples are handled and transported/submitted to a laboratory.

8. EQUIPMENT AND INSTRUMENTS

8.1. Discussion on or reference to procedures used for calibrating instruments; source, preparation and documentation of standards; and procedures used to generate, assess and document calibrations.

8.2. Discussion on or reference to routine procedures used to maintain analytical instruments and sampling equipment and the associated documentation.

9. REVIEW AND ASSESSMENT

9.1. Reference to or discussion on the types of quality control measures to be used. Include:

9.1.1. Types and frequency of field generated quality controls (blanks, replicates, etc.);

9.1.2. Types and frequency of any ongoing quality control program to ensure the accuracy of laboratory data;

9.1.3. The criteria against which each quality control measure will be assessed;

9.2. Discussion on or reference to procedures to be used to review and assess raw data, laboratory data, and project data. At a minimum include:

9.2.1. Data reduction: how raw data are reviewed and assessed (including criteria for accepting initial and continuing calibrations), and the formulas for calculating final sample results.

9.2.2. Data verification: how data are assessed with respect to calculations (are the correct values reported?) and to quality control (were the systems in control according to all QC criteria?).

9.2.3. Data validation: how project data are reviewed and assessed, including the content of any reports.

9.3. Discussion on or reference to the criteria for determining when corrective action must be initiated for each QC measure and the procedures used to implement corrective action.

9.4. Discussion on or reference to procedures to be used in the case of deviations from the documented policies and procedures.

9.5. Discussion on or reference to the types of performance, systems, and management audits to be performed including the frequency, the participants, and the process.

10. CONSUMER RELATIONS

10.1. Discussion on or reference to policies and procedures regarding review of proposed work to ensure adequate personnel and equipment.

10.2. Discussion on or reference to policies and procedures for dealing with complaints.

FA 4000. AUDITS AND DATA VALIDATION PROCEDURES

FA 4100. Regulatory Requirements

All field and laboratory procedures conducted in accordance with the DEP SOPs or approved alternative procedures are subject to audits and data validation per the DEP Quality Assurance Rule, 62-160.650 & .670, F.A.C.

FA 4200. Auditing Procedures

All organizations must conduct internal audits to verify compliance with the DEP SOPs. Advisory checklists are included in Appendix FA 1000.

FA 4300. Initial Demonstration of Proficiency for Biological Community Assessment Procedures

Auditing protocols in this section are applicable to biological procedures described in the following DEP SOP series:

- FS 7000
- FT 3000
- LT 7000

FA 4310. PROFICIENCY CRITERIA FOR STREAM AND RIVER HABITAT BENTHIC MACROINVERTEBRATE SAMPLING

1. SCOPE AND APPLICABILITY

This auditing protocol is applicable to stream and river benthic macroinvertebrate sampling procedures described in FS 7410 and FS 7420.

1.1. Personnel must complete the training topics in FA 5710 and FA 5720 prior to requesting an audit.

1.2. Personnel anticipating performing the procedures in FS 7410, Rapid Bioassessment (Biorecon) Method and FS 7420, Stream Condition Index (D-Frame Dip net) sampling for the purpose of determining biological indices as calculated per LT 7100, Biorecon Determination and LT 7200, Stream Condition Index (SCI) Determination should be audited by DEP according to the auditing protocol described in section 2 below and produce a satisfactory evaluation and score according to the audit and scoring criteria listed below in sections 3 & 4 prior to collecting samples.

2. Auditing PROTOCOL FOR STREAM AND RIVER BENTHIC MACROINVERTEBRATE SAMPLING

2.1. General Auditing Protocols

2.1.1. Audits are conducted in an appropriate physical field setting selected by DEP.

2.1.2. Audit candidates are required to provide proper equipment in good working order necessary to conduct sampling.

2.1.3. Audit candidates will be asked a series of questions designed to evaluate their conceptual knowledge of appropriate sampling methods.

2.1.4. Audit candidates are expected to demonstrate satisfactory skill in performing the procedures detailed in the Biorecon and SCI sampling SOPs.

3. AUDITING EVALUATION CRITERIA FOR STREAM AND RIVER BENTHIC MACROINVERTEBRATE SAMPLING

Personnel must demonstrate a satisfactory working knowledge of and demonstrate the ability to perform the following:

3.1. Identify the best available habitats in a 100-meter stream reach (snags, leaf packs, roots, aquatic plants, limerock).

3.1.1. Identification of best available habitat must include the following:

- Length of inundation considered
- Siltation and sedimentation effects considered
- Leaf packs partially decayed
- Flow considerations taken into account

3.2. Discuss and recognize circumstances where SCI or Biorecon sampling should be postponed, (e.g., in the event of recent increase in water level or during flooding).

3.3. Know correct number of dip net sweeps for SCI (20) and Biorecon (4).

3.4. Properly apportion dip net sweeps to available habitats.

3.5. Efficiently capture invertebrates during dip net sweeps while properly agitating substrates with at least 3 passes of the dip net along a 0.5 meter sample sweep length (sweep length sampled is 0.5 meters, plus or minus 0.1 m, absent consistently high or low bias).

3.6. Sample only productive portions of habitats while not diluting sample with unproductive detritus.

3.7. Properly transfer sampled material to sample container (SCI) or pick pan (Biorecon) without sample loss.

3.8. Biorecon Sorting

3.8.1. Dispense proper density of detritus into pick pan for sorting efficiency.

3.8.2. Methodically search for organisms in pick pan.

3.8.3. Efficiently capture organisms using forceps and pipets.

3.8.4. Process entire dip net contents.

3.8.5. Attain >95% picking efficiency (1 point; between 90% and 95% efficiency, 0.5 point; < 90%, no points, non-attainment).

4. AUDIT EVALUATION SCORING FOR BENTHIC MACROINVERTEBRATE SAMPLING

For mastery of each component in section 3 above, 1 point is awarded. Only 0.5 point is awarded if the applicable component is evaluated as partially correct. To pass, only 0.5 point can be missed. No item can be found partially correct more than once (see section 3.8.5 above also).

FA 4320. PROFICIENCY CRITERIA FOR LAKE CONDITION INDEX (LCI) SAMPLING

1. SCOPE AND APPLICABILITY

This auditing protocol is applicable to Lake Condition Index (Lake Composite) sampling procedures described in FS 7460.

1.1. Personnel anticipating performing the procedures in FS 7460, Lake Condition Index (Lake Composite) Sampling for the purpose of determining the LCI (biological index), as calculated per LT 7300, Lake Condition Index (LCI) Determination should be audited by DEP according to the auditing protocol described in section 2 below and produce a satisfactory evaluation and score according to the audit and scoring criteria listed below in sections 3 & 4 prior to collecting samples.

2. AUDITING PROTOCOL FOR LAKE CONDITION INDEX (LCI) SAMPLING

2.1. General Auditing Protocols

2.1.1. Audits are conducted in an appropriate physical field setting selected by DEP.

2.1.2. Audit candidates are required to provide proper equipment in good working order necessary to conduct sampling.

2.1.3. Audit candidates will be asked a series of questions designed to evaluate their conceptual knowledge of appropriate sampling methods.

2.1.4. Audit candidates are expected to demonstrate satisfactory skill in performing the procedures detailed in the LCI sampling SOP.

3. AUDITING EVALUATION CRITERIA FOR LAKE CONDITION INDEX (LCI) SAMPLING

Personnel must demonstrate a satisfactory working knowledge of and demonstrate the ability to perform the following:

3.1. Appropriately subdivide lake into sampling units, using a map, GPS and landmarks (12 subunits in lakes less than 1000 acres, 2-4 subunits in larger systems).

3.2. Discuss and recognize circumstances where LCI sampling is not appropriate and should be replaced by wetlands sampling procedures, i.e., aquatic system with greater than 50% emergent macrophyte cover and depth less than 2 meters.

3.3. Follow correct sampling procedure using dredges:

- Deploy dredge from correct location on boat.
- Deploy and retrieve dredge to properly sample the benthos.
- Collect samples in the requisite sampling unit from the specified water depth (2 to 4 m).
- Repeat dredge deployment for each designated sampling unit.

3.4. Correctly process retrieved samples:

3.4.1. Examine the sediment and document visual characteristics on the Composite Lake Sampling Sheet (Form FD 9000-2) or equivalent record.

3.4.2. Check for sample loss from dredge before sieving sample.

3.4.3. Properly sieve sample without losing portions of sample.

3.4.4. Concentrate and transfer sample into collection container without loss.

3.5. Record appropriate location information for collected samples.

4. AUDIT EVALUATION SCORING FOR LAKE CONDITION INDEX (LCI) SAMPLING

For mastery of each component in section 3 above, 1 point is awarded. Only 0.5 point is awarded if the applicable component is evaluated as partially correct. To pass, only 0.5 point can be missed (i.e., no more than one item can be partially correct).

FA 4330. PROFICIENCY CRITERIA FOR LAKE VEGETATION INDEX (LVI) SAMPLING

1. SCOPE AND APPLICABILITY

This auditing protocol is applicable to Lake Vegetation Index (LVI) sampling procedures described in FS 7310.

1.1. Organizations anticipating performing the procedures in FS 7310, Lake Vegetation Index Sampling for the purpose of determining the LVI (biological index), as calculated per LT 7500, Lake Vegetation Index (LVI) Determination should participate yearly in a DEP sponsored field exercise described in section 2 below and produce a satisfactory evaluation and score according to the criteria listed below in sections 3.

2. LAKE VEGETATION INDEX (LVI) SAMPLING FIELD EXERCISE

2.1. General Protocols

2.1.1. DEP will conduct a proficiency field exercise yearly at a minimum of 3 geographically separate (Panhandle, Northern Peninsula, Southern Peninsula) sites throughout the state.

2.1.2. DEP will announce the proficiency test 15 days prior to the beginning of the sampling window, which will be 30 days in length.

2.1.3. Perform an LVI, FS 7310, within the sampling window on one of the lakes identified.

2.1.4. Submit to DEP:

- the final LVI score (as calculated per LT 7500),
- taxa list on form FD 9000-7,
- name of organization,
- name of samplers performing the exercise and
- date the analysis was performed.

2.1.5. DEP will evaluate the scores, per section 3 below, and post the results.

3. EVALUATION CRITERIA FOR LVI SAMPLING

3.1. DEP will determine the LVI score for the lakes announced in section 2.1 above.

3.1.1. The LVI score will be determined within the same sampling period announced in section 2.1.

3.2. The final LVI score for an organization must be within plus or minus 12 points from the DEP determined score to have "passed" the exercise.

3.3. Organizations with scores outside the plus or minus 12 point range will be deemed as failing.

FA 4400. Data Validation (Reserved)

FA 5000. FIELD PERSONNEL QUALIFICATIONS AND TRAINING

Certain procedures described in the DEP SOPs necessitate commensurate levels of expertise for the user. Recommended, minimum qualifications and training for personnel are described below for the indicated procedures.

FA 5100. (Reserved)

FA 5200. (Reserved)

FA 5300. (Reserved)

FA 5400. (Reserved)

FA 5500. (Reserved)

FA 5600. (Reserved)

FA 5700. Qualifications and Training for Biological Procedures

FA 5710. SAMPLING FOR BENTHIC MACROINVERTEBRATES

1. TRAINING FOR BENTHIC MACROINVERTEBRATE SAMPLING: Personnel anticipating performing Stream Condition Index (SCI) sampling according to FS 7420 or Biorecon sampling according to FS 7410 should complete the training specified in FS-7420 Training Checklist included in Appendix FA 1000.

2. QUALIFICATIONS FOR BENTHIC MACROINVERTEBRATE SAMPLING: Personnel performing macroinvertebrate sampling according to FS 7410, Rapid Bioassessment (Biorecon) Method and FS 7420, Stream Condition Index (D-Frame Dipnet) Sampling for the purpose of determining biological indices as calculated per LT 7100, Biorecon Determination and LT 7200, Stream Condition Index (SCI) Determination or, according to FS 7460, Lake Condition Index (Lake Composite) Sampling for the purpose of determining the LCI (biological index), as calculated per LT 7300, Lake Condition Index (LCI) Determination, should successfully complete an audit evaluation administered by DEP according to FA 4310, Proficiency Criteria for Stream and River Habitat Benthic Macroinvertebrate Sampling or FA 4320, Proficiency Criteria for Lake Condition Index (LCI) Sampling, as applicable.

FA 5720. AQUATIC HABITAT CHARACTERIZATION

1. TRAINING FOR HABITAT ASSESSMENT TESTING: Personnel performing Habitat Assessments according to FT 3000 should complete the Habitat Assessment training program specified in FT-3000 Training Checklists included in Appendix FA 1000.

Appendix FA 1000

Tables, Figures and Forms

Table FA 1000-1 Sample Collection Matrices

Table FA 1000-2 Aqueous Sample Collection Analyte Groups

Table FA 1000-3 Non-Aqueous Sample Collection Analyte Groups

Example Audit Checklists (note: additional or revised versions of these **advisory** checklists are found on the DEP Website)

- FD 1000 Audit Checklist
- FQ 1000 Audit Checklist
- FT-Series Audit Checklists
- FS 1000 Audit Checklist
- FS 2000 Audit Checklist
- FS 2100 Audit Checklist
- FS 2200 Audit Checklist

Training Standard Operating Procedure

- FS-7420 Stream Condition Index Training Checklist
- FT-3000 Habitat Assessment Training Checklist

Glossary

Table FA 1000-1
Sample Collection Matrices

NOTE: Matrix terms are organized on the basis of differentiation of sample collection technique and sample source, not analytical matrix.

1. AQUEOUS ENVIRONMENTAL MATRICES

Potable water

Groundwater

Surface water

Rainwater

Soil interstitial (pore) water

Sediment interstitial (pore) water

Stormwater

2. AQUEOUS WASTE MATRICES

Aqueous chemical waste

Aqueous leachate

Aqueous industrial sludge

Aqueous domestic wastewater sludge

Industrial wastewater

Domestic wastewater

3. NON-AQUEOUS ENVIRONMENTAL MATRICES

Soil

Sediment

4. NON-AQUEOUS WASTE MATRICES

Non-aqueous liquid industrial sludge

Non-aqueous liquid chemical waste

Mixed-media liquid industrial sludge

Mixed-media liquid chemical waste

Solid industrial waste

Solid chemical waste

Solid domestic waste

Construction & demolition debris

Refuse-derived fuel

Domestic wastewater sludge cake

Industrial sludge cake

Compost

Table FA 1000-1
Sample Collection Matrices

Screened material

5. BIOLOGICAL TISSUE MATRICES

Finfish

Shellfish

Mammals

Birds

Reptiles

Other animals

Plants

6. AIR MATRICES

Remedial treatment system exhaust

Soil vapor

7. SUBSTRATES

Contaminated surfaces

Natural biological community substrates

Artificial biological community substrates

Table FA 1000-2

Aqueous Sample Collection Analyte Groups

NOTE: Examples are given for most of the analyte groups listed below, but the lists are not comprehensive. The analyte groups are organized according to the following criteria as they apply to sample collection only: 1) uniqueness of the group name to signify common sample collection technique and compatible sampling equipment materials; 2) familiarity of group name and conventional usage; 3) special sampling technique associated with the group name; and 4) brevity in the interest of avoiding a longer list.

1. VOLATILE ORGANICS: Volatile organic aromatics, volatile organic halocarbons, EDB

2. EXTRACTABLE ORGANICS: Base/neutral/acid individual, synthetic organics typically analyzed by GC, GCMS and HPLC (e.g., phenols, PCBs, PAHs, pesticides, herbicides, dioxins, etc.)

3. PETROLEUM HYDROCARBONS AND OIL & GREASE: Samples collected for all Oil & Grease, TRPH and FL-PRO analyses

4. RADIONUCLIDES: Total Alpha and Beta emitters, but not Radon

5. BIOLOGICALS: Aquatic toxicity tests (biotoxicity/whole effluent toxicity), algal growth potential, phytoplankton and chlorophyll

6. METALS

7. ULTRA-TRACE METALS: Metals collected by “clean-hands” sampling techniques for sub-ppb analyses

8. INORGANIC NON-METALLICS: Nutrients and other inorganic anions, residual chlorine, dissolved oxygen, neutral-charge chemical species

9. AGGREGATE ORGANICS: TOX, BOD, COD, TOC, total phenols and surfactants

10. MICROBIOLOGICAL-BACTERIA: Fecal and total coliforms, enterococcus and fecal strep

11. MICROBIOLOGICAL-PROTOZOA: Giardia, cryptosporidium and microscopic particulate analysis (MPA)

12. MICROBIOLOGICAL-VIRUSES

13. VOLATILE INORGANICS: Sulfide, hydrogen sulfide, sulfite

14. PHYSICAL AND AGGREGATE PROPERTIES: Color, conductivity, hardness, alkalinity, odor, residues (solids), turbidity, salinity, asbestos, SOUR test, acidity, hazardous waste characteristics

Table FA 1000-3

Non-Aqueous Sample Collection Analyte Groups

NOTE: This list is applicable to liquid, solid and mixed-phase non-aqueous matrices. Examples are given for most of the analyte groups listed below, but the lists are not comprehensive. The analyte groups are organized according to the following criteria, as they apply to sample collection only: 1) uniqueness of the group name to signify common sample collection technique and compatible sampling equipment materials; 2) familiarity of group name and conventional usage; 3) special sampling technique associated with the group name; and, 4) brevity in the interest of avoiding a longer list

1. VOLATILE ORGANICS: Volatile organic aromatics, volatile organic halocarbons, EDB

2. EXTRACTABLE ORGANICS: Base/neutral/acid individual, synthetic organics typically analyzed by GC, GCMS and HPLC, e.g., phenols, PCBs, PAHs, pesticides, herbicides, dioxins, etc.

3. PETROLEUM HYDROCARBONS AND OIL & GREASE: Samples collected for all Oil & Grease, TRPH and FL-PRO analyses

4. RADIONUCLIDES: Total Alpha and Beta emitters, but not Radon

5. BIOLOGICALS: Benthic macroinvertebrates and periphyton from natural and artificial substrates, toxicity studies conducted in non-aqueous media

6. METALS

7. INORGANIC NON-METALLICS: Nutrients and inorganic anions, neutral-charge chemical species

8. AGGREGATE ORGANICS: TOX, SOD, COD, TOC, total phenols

9. MICROBIOLOGICAL-BACTERIA: Fecal and total coliforms, enterococcus and fecal strep

10. MICROBIOLOGICAL-VIRUSES

11. Volatile Inorganics: Sulfide, hydrogen sulfide

12. PHYSICAL AND AGGREGATE PROPERTIES: Residues (solids), SOUR test, hazardous waste characteristics, particle size, etc.

FD 1000 Audit Checklist

To use this field audit checklist effectively, the auditor must be familiar with FD 1000 (Documentation Procedures) in "DEP Standard Operating Procedures for Field Activities", February 1, 2004 (DEP-SOP-001/01)

Universal Documentation Requirements

Waterproof ink was used for all paper documentation.

Errors in documentation were corrected without obliteration.

All cleaning procedures associated with the project were documented.

All instrument calibrations were properly documented.

Names of all sampling personnel were recorded.

The type(s) of sampling equipment used to collect all samples was recorded in the field record.

Where applicable to the analyte groups collected, the location and use of fuel-powered vehicles or equipment during the sampling project was recorded.

Date of sample collection was recorded for all samples.

Time of sample collection was recorded for all samples having maximum holding times of <24 hours.

Ambient field conditions were recorded for all samples.

A specific description of all sampling locations (sources) was recorded.

Where applicable, latitude and longitude were recorded for all sampling locations.

Where applicable, sampling locations were designated on scaled maps and drawings.

The matrix collected was recorded for all samples.

For composite samples, the number of subsamples, the amount collected for each subsample and the location of collection (sampling point or source) and, where applicable, the time of collection for each subsample was recorded.

The types, number, collection location and collection sequence of all field quality control samples was recorded in the field record.

Preservation information and verification was recorded for each sample, as applicable.

Ancillary records such as photographs, videotapes and maps were archived and linked to the sample unique field identification codes and the date of the sampling project.

Each sample container or group of containers was tagged or labeled with a unique field identification code that distinguishes the sample from all other samples.

Sample containers and labels were attached so as to prevent contact between the sample and the label or tag when pouring or dispensing from the container.

The unique identification codes for samples were recorded in a manner that linked the codes to all other field records associated with the samples.

FD 1000 Audit Checklist

To use this field audit checklist effectively, the auditor must be familiar with FD 1000 (Documentation Procedures) in "DEP Standard Operating Procedures for Field Activities", February 1, 2004 (DEP-SOP-001/01)

Groundwater monitoring well purging and sampling

Information about the following topics was recorded for each sample, as applicable:

- Purging equipment
- Purging procedure
- Well casing composition
- Well diameter
- Water table depth
- Depth of well
- Volume of water in the well
- Equipment dimensions and volumes for pumps, tubing and flow containers (flow cells)
- Purge volume calculations
- Total volume of water purged
- Total well volumes or equipment volumes purged
- Date of purging
- Starting and ending times for purging
- Purging rate (pumping or flow rate) and associated calculations
- Flow meter readings
- Stabilization measurements for purge completion criteria
- Elapsed time for one well volume or equipment volume purge at stabilized flow rate
- Water level drawdown measurements during purging (depth to water table)

Groundwater sampling of plumbing systems (groundwater sources)

Information about the following topics was recorded for each sample, as applicable:

- Plumbing and tap material construction
- Purging rate (flow rate)
- Total purge time at stabilized purge rate (flow rate)
- Flow rate at time of sample collection
- Identification number for public supply system, if applicable
- Name, address and emergency phone number of public supply system, if applicable

FD 1000 Audit Checklist

To use this field audit checklist effectively, the auditor must be familiar with FD 1000 (Documentation Procedures) in "DEP Standard Operating Procedures for Field Activities", February 1, 2004 (DEP-SOP-001/01)

Soil and Sediment Sampling

Information about the following topics was recorded for each sample, as applicable:

- Sample collection depth
- Areal location of sample
- Sample collection devices
- Tare weight of VOC vials, if applicable (EPA method 5035)
- Weight of VOC sample and vial, if applicable (EPA method 5035)

Surface Water Sampling

Information about the following topics was recorded for each sample, as applicable:

- Depth of all samples and subsamples
- Beginning and ending times for all timed composites
- Type of composite sample

Biological sampling

Physical and chemical characterization information was documented for each waterbody assessment, as applicable.

Stream or river habitat assessment information was documented for each waterbody reach, as applicable.

Lake habitat assessment information was documented for each waterbody or lake sector, as applicable.

Biorecon (rapid bioassessment) information was documented for each waterbody or lake sector, as applicable.

Field-Testing Instrument Calibrations

Information about all calibration standards and reagents used for field testing were linked to the calibration information associated with the field testing measurements for the project.

The concentration or other assay value, the vendor catalog number and the description of the standard or reagent were recorded for all preformulated solutions, neat liquids and powders.

Certificates of assay, grade and other vendor specifications for all standards and reagents were retained and recorded for the standards and reagents linked to the sampling project.

For standards formulated in-house for use on the sampling project, the dates of preparation and all calculations used to prepare calibration standards and reagents were recorded.

For standards formulated in-house for use on the sampling project, the records of preparation for all related calibration standards and reagents were linked to indicate the source of parent standards or reagents and any dilutions performed.

FD 1000 Audit Checklist

To use this field audit checklist effectively, the auditor must be familiar with FD 1000 (Documentation Procedures) in "DEP Standard Operating Procedures for Field Activities", February 1, 2004 (DEP-SOP-001/01)

Expiration dates for all calibration standards and reagents used on the sampling project were recorded.

Verified analyses (calibration acceptance) were recorded for all expired standards and reagents used on the sampling project.

Preparation steps in all procedures used for preparation of standards or reagents in-house were documented either by description or reference to an SOP (DEP SOP or internal SOP).

All acceptable initial calibrations and calibration verifications were documented and linked to the field measurements for the sampling project.

Manufacturer-certified calibration specifications were retained for all factory-calibrated instruments used for the sampling project.

For each instrument unit used for the sampling project, the following information was recorded for all calibrations:

- Unique identification (designation code) for the instrument calibrated
- Date and time of each calibration or calibration verification
- Instrument reading or result (display value) for all calibration verifications, with appropriate measurement units
- Names of analysts performing each calibration for the instrument
- Designation of each calibration standard used to calibrate or verify the instrument, linked to the associated records for the calibration standard
- The acceptance criteria for each calibration and verification used to accept the instrument calibration or verification
- The assay specifications or acceptance criteria for any QC standard or sample used to independently verify the calibration of the instrument
- Positive indication in the record of acceptable (successful) initial calibration and acceptable initial and continuing calibration verifications
- Positive indication of all failed calibrations or verifications
- All corrective actions performed on the instrument prior to attempting re-verification or recalibration of the instrument are linked to the records required for preventive maintenance
- Any instances of discontinuation of use of the instrument due to calibration or verification failures
- A description or citation of the specific calibration and verification procedures used for the instrument (DEP SOP or internal SOP)

FD 1000 Audit Checklist

To use this field audit checklist effectively, the auditor must be familiar with FD 1000 (Documentation Procedures) in "DEP Standard Operating Procedures for Field Activities", February 1, 2004 (DEP-SOP-001/01)

Field Testing Measurements (Field Analysis of Samples)

All field measurement tests and related data were recorded and linked to the project, the date and the sample source.

All field measurements were recorded with the appropriate reporting units, the value of the test result, the parameter measured or tested, the name of the analyst performing the test, the time of the measurement and the unique identification for the test instrument used.

Transmittal of Samples and Sample Information to a Laboratory or Other Party

For all samples, the following information was transmitted to the analyzing lab or other party.

- Site name and address
- Client code substituted for but linked to site name and address, where applicable
- Date and time of sample collection
- Name of sampler responsible for sample transmittal
- Unique field identification code for each sample container or group of containers
- Total number of samples transmitted
- Required analyses for each sample container or group of containers
- Sample preservation used for each container or group of containers
- Comments about samples, sample sources or other relevant field conditions
- Identification of common carrier used to transport the samples, when applicable

Shipping invoices and related records from common carriers were archived with the field records, when applicable.

Decontamination of equipment and sample containers

Cleaning steps in all procedures used for decontamination were documented either by description or reference to an SOP (DEP SOP or internal SOP).

Certificates of cleanliness provided by vendors supplying cleaned equipment or sample containers were archived and linked to the date of the sampling project and the types of equipment or sample containers used for the project.

For equipment decontaminated on-site in the field, the date and time of the cleaning procedure associated with the affected equipment was recorded in the field records.

If sampling kits (sample containers, sampling equipment and ancillary supplies) were provided to another party, the following information was recorded for the kit:

- Quantity, description and material composition of all containers, container closures or closure liners

FD 1000 Audit Checklist

To use this field audit checklist effectively, the auditor must be familiar with FD 1000 (Documentation Procedures) in "DEP Standard Operating Procedures for Field Activities", February 1, 2004 (DEP-SOP-001/01)

- Intended application for each sample container type indicated by approved analytical method or analyte group(s)
- Type and concentration of preservative added to clean sample containers and/or shipped as additional preservative
- Intended use of any additional preservatives or reagents
- Description of any analyte-free water (i.e., deionized, organic-free, etc.)
- Date of analyte-free water containerization
- Date of sampling kit preparation
- Description and material composition of all reagent transfer implements (e.g., pipets) shipped in the sampling kit
- Intended use of all implements
- Quantity, description and material composition of all sampling equipment
- Tare weight of VOC vials, as applicable (this item is necessary in cases where EPA 5035 VOC sample vials are provided by a third party supplier)

Documentation for reagents and other chemicals used for cleaning and sample preservation

The lot numbers and inclusive dates of use were recorded for all reagents, detergents, solvents and other chemicals used for decontamination and preservation of samples.

Documentation of equipment and instrument maintenance

Each applicable instrument or equipment unit (inventory item) was identified with a unique designation or identification code that distinguishes the unit from all others.

The following information was recorded for all equipment associated with the sampling project:

- Maintenance and repair procedures for equipment or instrument unit
- Routine cleaning procedures for each unit
- Filling solution replacement for probes
- Parts replacement for instruments or probes
- Calendar date for each procedure performed on each unit
- Names of personnel performing maintenance and repair tasks for each unit
- Description of malfunctions associated with any maintenance and repair for each unit

Vendor service records were retained for all affected equipment or instruments associated with the sampling project.

FD 1000 Audit Checklist

To use this field audit checklist effectively, the auditor must be familiar with FD 1000 (Documentation Procedures) in "DEP Standard Operating Procedures for Field Activities", February 1, 2004 (DEP-SOP-001/01)

The inclusive rental dates, types and unique descriptions of rental equipment associated with the sampling project were recorded.

Manufacturers' operation & maintenance manuals and instructions were retained for all equipment and instruments associated with the sampling project.

FQ 1000 Audit Checklist

To use this field audit checklist effectively, the auditor must be familiar with FQ 1000 (Field Quality Control Requirements) in "DEP Standard Operating Procedures for Field Activities", February 1, 2004 (DEP-SOP-001/01)

Equipment blanks or field blanks were collected at a rate of 5% of the number of field samples collected over the life of the project for each reported test result and matrix combination.

At least one equipment blank or field blank was collected for each test result and matrix combination for each year of the project.

Field-cleaned equipment blanks were collected if equipment was decontaminated in the field.

Precleaned equipment blanks were collected if equipment was cleaned by the sampling organization or if equipment vendors did not certify cleanliness of equipment for the specific uses for the project.

Field blanks were collected when the sample containers were used as the sampling device.

Field blanks were collected if no equipment was cleaned by the sampling organization.

Where applicable to the project, one trip blank was transported in each storage container, shipping container or ice chest containing empty, clean VOC sample containers or VOC samples.

FT 1000 – FT 2200 Audit Checklists

To use this field audit checklist effectively, the auditor must be familiar with FT 1000 to FT 2200 (Field Testing and Measurement) in "DEP Standard Operating Procedures for Field Activities", February 1, 2004 (DEP-SOP-001/01)

General Requirements for Calibration Activities (FT 1000)

All field-testing equipment and instruments brought to the field appeared to function properly.

All sample measurements were chronologically bracketed between acceptable calibration verifications.

All sample measurements were quantitatively bracketed with an appropriate choice of calibration standards for calibrations or verifications.

Historical, instrument-specific data justified calibration verification intervals of greater than 24-hours.

Instruments failing to meet calibration verification acceptance criteria were recalibrated or removed from service.

Sample measurements were qualified as estimated ("J" data qualifier code) when the instrument calibration could not be verified.

An explanatory narrative was provided in the field record for all sample "J" values.

The time interval between calibration verifications did not exceed one month, or, if less, the life of the sampling project (except for temperature measurements).

pH (FT 1100)

The pH meter and electrode system met DEP SOP specifications for accuracy, reproducibility and design.

All measurements were corrected for temperature (manual or automatic).

The temperature sensor calibration was verified according to FT 1400.

A pH 7 buffer was used as the first calibration standard for the initial calibration.

All sample measurements were chronologically bracketed with acceptable calibration verifications.

All sample measurements were quantitatively bracketed with an appropriate choice of at least two calibration buffers for calibrations or verifications.

All calibration verifications met the acceptance criteria of + 0.2 standard pH units.

The meter system was checked on a weekly basis to ensure a >90% theoretical electrode slope.

The pH electrode was rinsed with deionized or distilled water between buffer solutions and between sample measurements.

The instrument pH readings stabilized before pH values were recorded.

Conductivity (FT 1200)

The specific conductance meter and electrode system met DEP SOP specifications for accuracy, reproducibility and design.

FT 1000 – FT 2200 Audit Checklists

To use this field audit checklist effectively, the auditor must be familiar with FT 1000 to FT 2200 (Field Testing and Measurement) in "DEP Standard Operating Procedures for Field Activities", February 1, 2004 (DEP-SOP-001/01)

All sample measurements were quantitatively bracketed with an appropriate choice of calibration standards for calibrations or verifications.

All continuing calibration verifications were performed using standards within the range of sample measurements.

All calibration verifications met the acceptance criteria of + 5% of the verification standard value.

All measurements were corrected for temperature (manual or automatic).

The temperature sensor calibration was verified according to FT 1400.

The conductivity electrode was rinsed with deionized or distilled water between standard solutions and between sample measurements.

The instrument conductivity readings stabilized before measurement values were recorded.

Temperature (FT 1400)

The temperature measurement device met DEP SOP specifications for design and measurement resolution.

All sample measurements were quantitatively bracketed with calibration verifications of the temperature measurement device at a minimum of two temperatures using the NIST-traceable thermometer.

All sample measurements were chronologically bracketed with acceptable calibration verifications.

Historical, device-specific data justified calibration verification intervals of greater than one month (extended chronological calibration bracket).

The temperature device readings stabilized before measurement values were recorded.

Groundwater samples were measured in situ (downhole) or by using a flow-through container.

Dissolved Oxygen (FT 1500)

The dissolved oxygen meter and electrode system met DEP SOP specifications for accuracy, reproducibility and design.

All sample measurements were chronologically bracketed with acceptable calibration verifications.

All calibration verifications met the acceptance criteria of + 0.3 mg/L dissolved oxygen when compared to the table of theoretical values for water-saturated air.

All measurements were corrected for temperature (manual or automatic).

The temperature sensor calibration was verified according to FT 1400.

All measurements were corrected for salinity, where applicable (manual or automatic).

The salinity (conductivity) sensor calibration was verified according to FT 1200 or FT 1300.

FT 1000 – FT 2200 Audit Checklists

To use this field audit checklist effectively, the auditor must be familiar with FT 1000 to FT 2200 (Field Testing and Measurement) in "DEP Standard Operating Procedures for Field Activities", February 1, 2004 (DEP-SOP-001/01)

The dissolved oxygen electrode was rinsed with deionized or distilled water between sample measurements.

The dissolved oxygen electrode was stored in a water-saturated air environment when not in use.

The instrument dissolved oxygen readings stabilized before measurement values were recorded.

Turbidity (FT 1600)

The turbidimeter met DEP SOP design specifications.

Alternative design turbidimeters used for groundwater stabilization measurements met DEP performance criteria.

All sample measurements were chronologically bracketed with acceptable calibration verifications.

All sample measurements were quantitatively bracketed with an appropriate choice of calibration standards for calibrations and verifications.

Initial calibration of the turbidimeter was performed using formazin or styrene divinylbenzene primary standards, whichever was required by the manufacturer of the instrument.

All calibration verifications met the DEP SOP acceptance criteria applicable to the NTU ranges associated with the verification standard values. FT 1600 section 3.2

The sample cells (optical cuvettes) were inspected for scratches and discarded or coated with a silicone oil mask, as necessary.

The sample cells (optical cuvettes) were optically matched for calibrations and sample measurements.

The sample cells (optical cuvettes) were cleaned with detergent and deionized or distilled water between standard solutions and between sample measurements, as applicable.

The sample cells (optical cuvettes) were rinsed with deionized or distilled water between standard solutions and between sample measurements, as applicable.

The sample cells (optical cuvettes) were rinsed with sample prior to filling with sample for measurement.

The exterior of the sample cell (optical cuvette) was kept free of fingerprints and dried with a lint-free wipe prior to insertion in the turbidimeter.

FS 1000 Audit Checklist

To use this field audit checklist effectively, the auditor must be familiar with FS 1000 (General Sampling Procedures) in "DEP Standard Operating Procedures for Field Activities", February 1, 2004 (DEP-SOP-001/01)

Preliminary Activities

Equipment construction was appropriate for the analytes of interest.

Equipment was brought precleaned to the field.

Dedicated equipment was decontaminated prior to use.

Sample container construction and materials were appropriate for the analytes collected.

All containers and container caps were free of cracks, chips, discoloration and other features that might affect the integrity of collected samples.

Contamination Prevention

Every effort was made to prevent cross-contamination of samples and contamination of environment.

Sampling originated from the least contaminated or background location (source or site) first and progressed to the most contaminated location.

Samples were segregated during storage, transport and shipping where cross-contamination potential was suspected.

Samples for different analyte groups were collected in the appropriate order, unless field conditions or the sampling plan required an alternative collection sequence.

Composite Samples

Composite samples were collected according to the sampling plan, permit or other DEP program requirements.

Composite subsamples or aliquots were collected from each designated sampling point (source, location or depth).

Equal amounts of each subsample or aliquot were collected in appropriate cleaned sample containers.

Approximate or measured amounts of each aliquot or subsample collected were recorded in the field documentation, if applicable to the sampling plan.

Soil and sediment samples were collected without mixing, if required by the sampling plan.

The analyzing laboratory was instructed to mix the composite sample, if required by the sampling plan.

Use of protective gloves

Gloves were worn by all samplers handling purging equipment, sampling equipment, measurement equipment and sample containers as applicable.

Care was taken to avoid contact with samples and sample container interiors.

New, clean unpowdered gloves were used for each glove change.

FS 1000 Audit Checklist

To use this field audit checklist effectively, the auditor must be familiar with FS 1000 (General Sampling Procedures) in "DEP Standard Operating Procedures for Field Activities", February 1, 2004 (DEP-SOP-001/01)

Gloves were worn and changed as needed to avoid sample contamination and personal exposure.

Use of fuel-powered equipment and vehicles

All fuel-powered equipment was placed and vehicles were parked downwind of or well away from sampling locations where fuel contamination of samples, purging equipment or sampling equipment interfered with representative sample collection.

Samplers wore disposable gloves while handling fuel powered equipment and disposed of fuel contaminated gloves downwind or well away from the sampling location.

Sampling activities were interrupted while fueling of vehicles or storage tanks occurred near the sampling location.

Preservation of samples

All sample preservation conformed to DEP SOP requirements.

All grab samples were preserved within 15 minutes of collection.

Handling of hazardous waste (HW) and other investigation-derived waste (IDW)

Wastes generated as a result of the sampling project were containerized and stored for proper disposal according to applicable local, state and federal regulations.

All HW and IDW containers were properly labeled.

Collection of VOC samples

VOC sample containers were kept removed and protected from any fuel sources and fuel-powered equipment.

VOC sample containers remained capped until just prior to sample collection and remained capped after sample collection.

Preventive Maintenance and Repair of Equipment and Instruments

Manufacturers' suggested maintenance activities and any repairs are performed and documented for all applicable equipment and instruments.

Each equipment or instrument unit requiring documented maintenance or repair is assigned a unique identification code or designation.

FS 2000 Audit Checklist

To use this field audit checklist effectively, the auditor must be familiar with FS 2000 (General Aqueous Sampling) in "DEP Standard Operating Procedures for Field Activities", February 1, 2004 (DEP-SOP-001/01)

Contamination prevention and equipment rinsing

Samples were collected starting at the downstream location and progressed to the upstream location, if applicable.

Intermediate collection devices were rinsed with ample amounts of site water prior to collecting the sample.

Rinse water from intermediate devices was discarded away from and downstream of the sampling location.

Sample containers containing premeasured preservatives were not rinsed with sample prior to collection.

Sample containers for oil & grease or TPH samples were not rinsed with sample prior to collection.

Sample preservation and preservation verification

All samples requiring pH adjustment were tested for proper pH preservation during first-time sampling for the project.

One sample per analyte group requiring pH adjustment was tested for proper pH preservation during repeat sampling for the project.

One sample per analyte group requiring pH adjustment was tested for proper pH preservation once per month for sampling projects repeated weekly.

One sample per analyte group requiring pH adjustment was tested for proper pH preservation once per week for sampling projects repeated daily.

pH paper was not inserted into sample containers.

VOC samples were dechlorinated, if applicable, with chemical preservative added to the VOC vial prior to addition of the sample.

Dechlorinated VOC samples were preserved with acid after dechlorination and prior to complete filling to convex meniscus.

All composite samples collected with automatic samplers were preserved within 15 minutes of collection of the last composite subsample.

Applicable samples collected with automatic samplers were chilled on wet ice or refrigerated at 4 °C.

Sample filtration

Applicable samples were filtered within 15 minutes of collection, before addition of chemical preservatives.

Unless otherwise specified by the sampling plan, applicable samples were filtered using a 0.45 um pore size for the filter.

FS 2000 Audit Checklist

To use this field audit checklist effectively, the auditor must be familiar with FS 2000 (General Aqueous Sampling) in "DEP Standard Operating Procedures for Field Activities", February 1, 2004 (DEP-SOP-001/01)

Collection of VOC samples

Bubbles present in the VOC sample comprised a combined volume of less than 5mm in diameter (pea-sized).

Unacidified VOC samples were collected where effervescence or large bubbles were observed after addition of acid.

Collection of bacteriological samples

Unless specified otherwise in the sampling plan, all samples were collected as grab samples.

All samples were collected in properly sterilized containers.

Sterilized caps were used with all bottles and vials used to contain samples.

All sterilized containers remained sealed until just prior to filling with sample and remained sealed after filling with sample.

Sample containers were not prerinsed with sample.

At least 125 ml of volume was collected for each sample.

Caution was taken to avoid contacting the opening (mouth) of sample containers or cap interiors.

Where applicable, samples were collected with rigid containers using standard surface water grab-sample techniques.

Where applicable, samples were collected with Whirlpak bags from surface water by immersing the closed Whirlpak and opening the bag underwater.

Where applicable, samples were collected with Whirlpak bags from surface water by immersing the closed Whirlpak upstream of the hands and fingers and opening the bag into (facing) the current.

Where applicable, samples were collected with Whirlpak bags from surface water by opening the Whirlpak before attaching it to an extension pole, plunging the bag opening downward below the surface (and towards the current) in a continuous sweeping arc before returning to the surface.

Where applicable, samples were collected from taps, spigots and faucets without interruption of flow from the plumbing.

Where applicable, samples were collected with an intermediate device without interruption of flow as the sample was poured or drained from the device.

Bacteriological samples were collected as the last analyte group in the collection sequence in order to maximize available holding time.

Headspace was left in each sample container after sample collection.

Where applicable, samples were dechlorinated by addition of sodium thiosulfate to the sample container to achieve a final sodium thiosulfate concentration of 100 mg/L.

FS 2000 Audit Checklist

To use this field audit checklist effectively, the auditor must be familiar with FS 2000 (General Aqueous Sampling) in "DEP Standard Operating Procedures for Field Activities", February 1, 2004 (DEP-SOP-001/01)

Collection of Oil & Grease or TPH samples

All oil & grease samples were collected as discrete grab samples.

Unless specified otherwise by the sampling plan, samplers avoided surface skimming when collecting oil & grease or TPH samples.

The sample containers or intermediate sampling device were not pre-rinsed with sample water.

Automatic samplers were not used for sample collection.

Collection of Cyanide Samples

Cyanide samples were tested for the presence of sulfides and pretreated, if necessary, before preservation with sodium hydroxide.

Untested or untreated cyanide samples are designated with a holding time of 24 hours.

Contamination prevention, selection of sampling location and general cautions

Samples were collected starting at the downstream location and progressed to the upstream location, where applicable.

The bow of the motorized watercraft was pointed upstream, where applicable.

Samples were collected at or near the bow of the watercraft, away and upwind from the watercraft engine and any other fuel or oil sources.

When wading, samples were collected upstream and away from the body.

Care was exercised to not disturb bottom sediments during sample collection.

Water samples were collected prior to sediment sampling at the same location or sample source.

Representative sampling locations and depths were selected to account for homogeneous and heterogeneous conditions in the water body.

Unless directed by permit or other regulation, samples were collected away from artificial structures such as bridges, docks, weirs, dams, etc.

Manual sampling using sample containers as the collection device

Pre-preserved (pre-dosed) containers were not used as the sample collection device.

Sample containers were submerged neck first, inverted into the oncoming direction of flow where applicable, slowly filled leaving headspace and returned to the surface for preservation, if appropriate.

Pole samplers were used in a fashion similar to that described above, as practical.

Use of intermediate vessels as the collection device

The use of intermediate collection devices was avoided when sampling for VOCs, oil & grease or microbiologicals, where practical.

FS 2100 Audit Checklist

To use this field audit checklist effectively, the auditor must be familiar with FS 2100 (Surface Water Sampling) in "DEP Standard Operating Procedures for Field Activities", February 1, 2004 (DEP-SOP-001/01)

Intermediate collection devices were constructed of material appropriate for the analytes to be measured.

Intermediate collection devices were rinsed with ample amounts of site water prior to collecting the sample.

Rinse water from intermediate devices was discarded away from and downstream of the sampling location.

For depth sampling, the following procedures were performed:

- The water column was measured for maximum depth or was otherwise determined from reference information.
- The sampling point depth was accurately determined and recorded.
- Care was exercised to keep bottom sediments undisturbed during the depth-sampling procedure.

If double-valve bailers were used, care was taken to determine the appropriateness of use for the sampling application and discrete depth samples were not required.

Bailers were slowly lowered through the water column to allow maximum flushing of the bailer during descent.

Use of pumps as sample collection devices

VOC samples were not pumped through the roller assembly (pump head) of the peristaltic pump and the "straw technique" was used.

Oil & grease, FL-PRO and TRPH samples were not collected with pumps.

The pump and tubing assembly was flushed with site water to allow at least 3 volumes of the pump and tubing to pass through the system prior to collecting the sample.

For surface collection, the pump tubing intake was placed 6-12 inches below the water surface.

For depth sampling, the following procedures were performed:

- The water column depth was measured or determined from reference sources.
- The sample collection depth was determined and recorded.
- The pump or tubing intake placement at the required depth was accomplished by appropriate weighting or anchoring with non-contaminating materials to ensure unobstructed flow at the intake.

Well head inspection and water level measurement

Standing water present in the wellhead was removed.

Water levels were measured to the nearest 0.01 foot.

The well bottom was not sounded with the measuring tape.

General purging procedures

Well volume was correctly determined.

FS 2200 Audit Checklist

To use this field audit checklist effectively, the auditor must be familiar with FS 2200 (Groundwater Sampling) in "DEP Standard Operating Procedures for Field Activities", February 1, 2004 (DEP-SOP-001/01)

Equipment volume was correctly determined.

The pump, tubing or bailer was not allowed to drop to the bottom of the well.

Depth to groundwater was measured at frequent intervals during purging.

The placement of the pump or tubing intake was correctly determined according to the position of the water level in relation to the well screen interval and the purging procedure used.

The placement depth of the pump or tubing intake was recorded for each instance of positioning.

Purging with bailers

The bailer was lowered and raised at the rate of 2 cm/sec into the top of the water column.

The clean bailer was kept in protective wrap until just before use or was decontaminated immediately prior to use.

At least one well volume was removed prior to measuring stabilization parameters.

At least ¼ well volume of additional water was purged from the well prior to each subsequent (successive) measurement of stabilization parameters.

A minimum total of at least 1½ well volumes was purged prior to collecting samples.

General procedures for purging with a pump

Drawdown was stabilized so that the pumping rate matched the formation recharge rate.

Purging minimal (equipment) volumes with a pump from the middle of a fully submerged well screen interval

- The well screen interval (length) was <10 feet.
- The pump or tubing intake was placed within the middle of the screen interval.
- A minimum total of at least 3 equipment volumes was purged.
- The purging pump was also used to collect the samples.

Purging from the top of the water column with a pump

- The pump or tubing was placed at the top of the water column above the submerged well screen and a minimum total of 1½ well volumes was purged.
- The pump or tubing was placed at the top of the water column in the partially submerged well screen interval and a total of at least one well volume was purged prior to commencing measurement of stabilization parameters.

Purging in the middle of the partially submerged screen interval with a pump

- The pump or tubing was placed within the middle of the submerged portion of the screen interval and a minimum total of at least one well volume was purged prior to commencing measurement of stabilization parameters.
- The purging pump was also used to collect the samples.

FS 2200 Audit Checklist

To use this field audit checklist effectively, the auditor must be familiar with FS 2200 (Groundwater Sampling) in "DEP Standard Operating Procedures for Field Activities", February 1, 2004 (DEP-SOP-001/01)

Frequency of measurement for purge stabilization parameters

A flow cell was used to measure stabilization parameters during pumping.

Downhole measurements were used for wells purged by bailing.

If the well was purged from the top of the water column above a fully submerged screen, at least one well volume was purged prior to commencing purge stabilization measurements and at least ¼ well volume was purged at the stabilized pumping rate between consecutive purge stabilization measurements.

If the well was purged from the top of the water column in a partially submerged screen interval, at least one well volume was purged prior to commencing purge stabilization measurements and at least 2 minutes of continuous purging at the stabilized pumping rate elapsed between consecutive purge stabilization measurements.

If the well was purged from the middle of a fully submerged screen interval, at least one equipment volume was purged prior to commencing purge stabilization measurements and at least 2 minutes of continuous purging at the stabilized pumping rate elapsed between consecutive purge stabilization measurements.

Determination of purging completion

Three (3) consecutive measurements of the three parameters listed below were within stated limits

- Temperature: ±0.2° C
- pH: ±0.2 standard pH units
- Specific Conductance: ± 5.0% of reading

Measured dissolved oxygen and turbidity were below the following thresholds.

- DO <20% saturation at the measured temperature
- Turbidity <20 NTU

For wells where DO and turbidity thresholds could not be met for justified reasons, consecutive measurements were within the above stated limits for pH, conductivity and temperature; and, DO and turbidity measurements were within the following stated limits.

- DO: ±0.2 mg/L or 10%, whichever is greater
- Turbidity: ±5 NTUs or 10%, whichever is greater

For wells failing to meet stabilization criteria after five (5) well volumes, testing instrumentation, calibrations, purging flow rate, flowcells and all tubing connections were determined to be functional and acceptable for measuring stabilization parameters.

Dry-purged wells were purged only once according to FS 2212, section 3.4.1

Purging Low Permeability Wells

The well was known to purge dry due to low formation permeability and the samplers determined that the well could not be purged according to FS 2212 and FS 2213.

FS 2200 Audit Checklist

To use this field audit checklist effectively, the auditor must be familiar with FS 2200 (Groundwater Sampling) in "DEP Standard Operating Procedures for Field Activities", February 1, 2004 (DEP-SOP-001/01)

Very small diameter Teflon, PE or PP tubing and the smallest possible pump chamber and flow cell volumes were used.

The pump tubing wall was thick enough to minimize oxygen transfer.

The pump or tubing intake was placed within the well screen interval.

The purging flow rate was <100 mL/min.

Pump rate was adjusted to minimize drawdown.

A minimum total of at least 2 equipment volumes was purged before stabilization parameters were measured and samples were collected.

Temperature, pH, conductivity, DO and turbidity were measured once immediately prior to collecting the samples during stabilized pumping after at least 2 equipment volumes were purged.

The same pump was used to purge and collect the samples.

Collecting samples from Low Permeability Wells

The same pump and tubing was used to purge and collect the samples.

The purge position of the pump or tubing intake was maintained throughout sample collection.

The stabilized purge pumping rate was maintained throughout sample collection unless pumping was ceased to allow formation recharge.

Samples were collected immediately after purging was completed while continuing a stabilized pumping rate or as soon as sufficient recharged sample water was available.

Maximum elapsed times between purging and sampling

Stabilization parameters were re-measured if the start of sample collection began more than one hour after completion of purging.

The well was re-purged if the second set of stabilization measurements exceeded the original measurements by more than + 10%.

Dry-purged wells were allowed to recharge after one purge before measuring stabilization parameters and collecting samples.

Samples were collected within 6 hours of purging completion.

General Requirements for Sample Collection Equipment

Pumps were decontaminated or replaced between wells.

Pump tubing was decontaminated or replaced between wells.

Reusable bailers were decontaminated between wells.

Material construction of pumps, tubing and bailers conformed to requirements of Tables FS 1000-1 through FS 1000-3 and Table FS 2200-1 for the analytes collected.

Collecting samples with pumps

FS 2200 Audit Checklist

To use this field audit checklist effectively, the auditor must be familiar with FS 2200 (Groundwater Sampling) in “DEP Standard Operating Procedures for Field Activities”, February 1, 2004 (DEP-SOP-001/01)

Collection of volatile organic (VOC) samples with peristaltic pumps employed the “straw technique” for collection from the well and either gravity flow or reverse pumping for container filling.

Collecting samples with bailers

Bailers were used to collect samples under the conditions specified in Table FS 2200-3.

The bailer was lowered and raised at the rate of 2 cm/sec into the top of the water column.

VOC samples were poured or drained into sample vials with no aeration or agitation.

Samples for sulfites, sulfides or hydrogen sulfide were poured or drained into sample vials with no aeration or agitation.

Filtering groundwater samples for metals

The metals sample filtration procedure was preapproved by the DEPDEP project manager for the site or project.

A 0.45 µm filter was used for filtering constituents other than metals.

A 1µm in-line filter was used for filtering metal samples.

All oxygen (air) was flushed from the in-line filter and any connected tubing prior to sample filtration.

The equipment configuration for filtering metals conformed with prohibitions in FS 2225 section 1.4.

Purging and sampling wells with in-place plumbing, air strippers or other plumbed remedial systems

The purging and sampling point was located upstream of storage or pressure tanks where possible.

Hoses, aerators and filters removed were removed prior to purging and sampling where possible.

The plumbed system was purged at the selected purge point (valve or spigot) until the purge completion criteria listed in FS 2212 section 3 were met.

Air strippers and other remedial systems were purged for a minimum of one minute.

The flow rate was reduced to less than 500 mL/minute (1/8"" stream) or approximately 0.1 gal/minute before collecting samples.

FS-7420 Training for Stream Condition Index Sampling Checklist

Checklist to Document Training for Stream Condition Index Sampling

One copy of this document will exist for each Trainee. The Trainee (or their supervisor) must retain the document. The Trainee will be required to provide this document as proof of completion of these training requirements.

Prerequisite/Concurrent Training Signoffs

FT-3000 FT 3000 Aquatic Habitat Characterization Training Checklist

Introduction

This sampling procedure requires specific training and a demonstration of competency due to the expert judgment exercised during field sampling. It is recommended that individuals conducting this procedure train with qualified staff (who have passed the DEP Stream Condition Index audit) and successfully obtain all required training and evaluation signatures.

In an effort to establish standardization and consistency, individuals performing the training are required to adhere to the competencies and principles detailed in this document. Following these training protocols will encourage the establishment of an equal foundation among samplers performing the Stream Condition Index. The items below do not need to be completed in any particular order, nor do they need to be completed in a single event. However, each training or evaluation event must be identified in the Training Event Log, regardless of whether a competency was completed or not.

First, trainers will follow the items described in the Training Activities Section and initial upon completion.

Evaluators will then follow the Evaluation Activities and initial upon completion. Evaluators should not sign off on an item unless the trainee has demonstrated complete competency.

The same individual may be both a trainer and an evaluator.

Objective

To provide trainers and trainees a standardized set of training and evaluation activities for performing a SCI. Trainers and trainees must understand, convey, discuss and demonstrate (where applicable) the proper techniques and principles for performing a SCI, to include the following:

1. Identify appropriate and applicable SOPs and forms used or referenced for performing a SCI.
2. Previously or concurrently completes training for Aquatic Habitat Characterization.
3. Discuss and recognize circumstances when the SCI should be postponed or not used.
4. Identify, measure and mark the 100-meter length sampling area.
5. Complete Form FD 9000-4, Stream/River Habitat Sketch Sheet.
6. Complete Form FD 9000-3, Physical/Chemical Characterization Field Sheet.
7. Complete Form FD 9000-5, Stream/River Habitat Assessment Field Sheet.
8. Identifies best available habitats to include snags, leaf material, roots, aquatic plants, rock/rubble.
9. Considers length of inundation when choosing habitats to sample.
10. Discusses flow considerations to take into account.
11. Knows correct number of sweeps for SCI (20).
12. Properly apportions sweeps to habitats available.

FS-7420 Training for Stream Condition Index Sampling Checklist

13. Demonstrates ability to capture invertebrates during sweep, including proper agitation of substrates. Completes at least 3 passes with net, sampling an area equivalent to a sweep length of 0.5 meters times the width of the net for each pass.
14. Samples only productive portions of habitats, does not dilute sample with unproductive detritus.
15. Area sampled with each sweep is equivalent to 0.5 ± 0.1 meters times the width of the net. Note if consistently high or low.
16. Properly transfers sampled material to jug without sample loss.
17. During at least twelve (12) separate training sessions, performs objectives 3-16.

Training Activities

The trainer will discuss, convey, instruct and demonstrate (where applicable) each of the following items. Once completed to satisfaction, the trainer will initial and date the item. The trainee will also initial in the appropriate area to signify the item was demonstrated to them and they have received an understanding and developed competency.

1. Identify the required SOPs and supporting references.
   a. DEP-SOP-001/01 FT 3000 Aquatic Habitat Characterization
   b. DEP-SOP-001/01 FS 7420 Stream Condition Index (D-Frame Dip net) Sampling
   c. "Sampling and Use of the Stream Condition Index (SCI) for Assessing Flowing Waters: A Primer", FDEP, Environmental Assessment Section, Bureau of Laboratories, DEP/EA/002/07, June 2007
   d. Obtains the documentation required for the sampling.
      i. Go to the Bureau of Laboratory Library Files (http://www.floridadep.org/labs/library/index.htm), scroll down to Standard Operating Procedures (SOPs), click External SOPs, then selects either or SOP Documents Listing or SOP Forms Listing.
      ii. Print out the form DEP-SOP-001/01 FD 9000-3 Physical/Chemical Characterization Field Sheet.
      iii. Print out the form DEP-SOP-001/01 FD 9000-4 Stream/River Habitat Sketch Sheet.
      iv. Print out the form DEP-SOP-001/01 FD 9000-5 the Stream/River Habitat Assessment Field Sheet.
2. Discuss circumstances when the SCI should be postponed (or not used).
   a. List the normal stream factors to consider for the determination of representative sample as continuous water flow, availability of substrate and accessibility for sampling.
   b. Determine if the stream flow has remained continuous and has not been intermittent or stagnant.
      i. Determine stream height either from recent rainfall data or from gaging stations.
   c. If intermittent, do not sample until continuous flow is reestablished.
   d. Do not sample if dry conditions occur. Wait 3 months (90 days) after the stream returns to normal flow to sample. This lets the organisms re-establish populations in the habitats.
   e. If flood conditions occur (> 0.5 meter above normal), wait 28 days or until the water recedes, normal flow returns and the habitats become accessible. Organisms are not destroyed, but their normal habitats are not accessible due to high water.
   f. If water levels are ≤ 0.5 meter above normal, sample habitats at the normal stream shoreline, not the flooded shoreline.
   g. Sampling for SCI is not used for Ecoregion 76, the Southern Florida Coastal Plain, where few natural streams exist and for which the SCI is not calibrated.
3. Measure and mark the 100-meter reach.
4. Complete habitat sketch on Form FD 9000-4.

FS-7420 Training for Stream Condition Index Sampling Checklist

5. Complete Physical/Chemical Characterization Field Sheet, FD 9000-3.
6. Perform a habitat assessment and record information on Form FD 9000-5.
7. Discuss the productive habitat substrates and the conditions that make them productive.
   a. Productive means the habitat is currently or can sustain invertebrate populations.
   b. Must be in contact with the water.
   c. Minimum of 2 square meters in the entire reach to be counted as present.
   d. Do not count smothered portions of habitats.
   e. Identify the major habitats to include snags, leaf material, roots, aquatic macrophytes, rock/rubble.
   f. List the characteristics for productive snag habitat.
      i. Count only woody debris, not herbaceous.
      ii. Count only snags greater than thumb size in diameter.
      iii. Count portion of wood directly in contact with water, not out of water or smothered.
      iv. Preferentially, sample only in the normal, continuous stream flow.
      v. Count old snags as more productive than young snags.
      vi. Avoid new snags.
      vii. Look for snag bark that is malleable, old and decayed, with lots of crooks and crannies.
   g. List the characteristics for productive leaf material substrate.
      i. Count only leaf litter that is in contact with water.
      ii. Sample leaf packs and leaf mats only in the normal, continuous stream flow.
      iii. Define a leaf pack as leaves packed up against an obstruction at surface or in water.
      iv. Define a leaf mat as piles of leaf material on the stream bottom.
      v. Generally, leaf packs are better than leaf mats due to higher flow and dissolved oxygen.
      vi. Count leaf packs/mats as productive only if partially decayed.
      vii. Sample only the top 2 cm of leaf mats as a productive aerobic habitat.
      viii. Describe anaerobic versus aerobic conditions.
      ix. Do not count anaerobic (no oxygen) leaf litter.
      x. State that leaf material such as pine needles is not considered productive.
   h. List the characteristics for productive roots.
      i. Count only roots less than thumb size in diameter.
      ii. Count roots only in contact with the water.
      iii. Count only if in the normal, continuous stream flow.
      iv. Indicate that finer roots are more productive.
      v. Count woody, adventitious roots hanging into the water.
      vi. Do not count the herbaceous roots of aquatic macrophytes or roots from herbaceous vegetation overhanging the water. These are instead counted as aquatic macrophytes.
      vii. Do not count if silt is excessive to the point where the roots are clumped together or the root material is not visible.
      viii. Do not count undercut banks as a productive substrate if productive roots are not present.
   i. List the characteristics for productive aquatic macrophytes.
      i. Count only aquatic vegetation in contact with water.
      ii. Count only aquatic vegetation in normal, continuous flow.
      iii. Do not count non-aquatic macrophytes that are temporarily inundated.
   j. List the characteristics for productive rock/rubble habitat.
      i. Count rocky outcrops or rocks in contact with the water.
      ii. Count rocks only in the normal, continuous stream flow.

   iii. Count only if greater than 5 cm of productive surface.
   iv. Indicate rougher surfaces as more productive than smooth surfaces.
   v. State concrete is considered a rock if weathered and present for a long time.
   vi. Do not count asphalt (possibly toxic) or pipe clay (not stable) as productive substrates.
   k. Identify minor habitats as sand, muck, silt, mud.
8. Identify that older rather than younger substrates are preferred because the older ones allow time for organism communities to develop and flourish.
9. Flow must be considered when assessing the productivity of habitat. Habitats in good flow should be sampled over habitats in lesser flow.
10. Identify that the SCI consist of a total of 20 sweeps.
    a. A sweep is defined as a sampled area equivalent to the width of the dip net by 0.5 meter length.
11. Apportion the 20 sweeps based on the number of productive habitats in the reach.
    a. In 1 productive habitat, perform 10 sweeps in the major productive habitat and 10 sweeps in the minor.
    b. In 2 productive habitats, perform 7 sweeps in the major productive habitats and 6 sweeps in the minor.
    c. In 3 productive habitats, perform 5 sweeps in the major productive habitats and 5 sweeps in the minor.
    d. In 4 productive habitats, perform 4 sweeps in the major productive habitats and 4 sweeps in the minor.
    e. In 5 productive habitats, perform 3 sweeps in the major productive habitats and 5 sweeps in the minor.
    f. Generally, sweeps in the minor habitat should be performed in sand or sand/muck areas with good flow.
    g. If less then 2 square meters of a snag, leaf matter, roots, macrophytes or rock is in the stream reach and was therefore not counted as “major” habitat; perform as many sweeps as possible and count as “minor” sweeps.
12. Demonstrate ability to capture invertebrates during sweep, including proper agitation of substrates.
    a. Disturb, agitate, or dislodge organisms from substrates by using hands, feet, brush or other tool.
    b. Position the dip net as closely to and no more than 0.5 m downstream of the substrate in order to capture organisms. In low velocity areas, create a current into the net while agitating the substrate.
    c. If using a brush, brush into the net and not to the side to capture all organisms that are dislodged.
    d. Complete at least 3 passes with net over the sample area.
    e. If possible, submerse fine roots and removable snags into net, then agitate and scrub.
    f. When sampling a leaf pack, place all material into dip net.
    g. For large removable snags, position net to capture organism when removing snag from water.
    h. In heavily vegetated areas, place the net at the base of the vegetation and dislodge organisms using your hand.
    i. If there is not enough substrate at one location to complete a full sweep, go to the same substrate at an alternative location to complete the sweep. These partial sweeps are combined to complete the full sweep.
    j. Once collected, pull dip net up and wash water through to dislodge, silt, etc.

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   k. When discarding large pieces of substrate from the dip net, individually scrub each piece before discarding.
   l. Visibly inspects collected materials for organisms.
13. Sample only productive portions of habitats, do not dilute sample with unproductive detritus.
   a. Collect only top 2 cm of leaf mats, sand, silt, mud, or muck.
   b. Sample only in the normal flow of the stream.
14. Sample an area equal to 1 dip net wide and 0.5 meters long.
   a. Use the width of the dip net and the marked dip net handle or other measuring device to determine sampling area.
   b. For thick, 3-dimensional habitats such as roots and leaf packs, visually spread out the substrate to a thickness of 2 cm.
   c. Completely sweep the 0.5 meter sample area within 0.1 meters during each pass.
15. Transfer material to jug and preserve. Once collected, pull dip net up and wash water through to dislodge, silt, etc.
   a. When discarding large pieces of substrate from the dip net, individually scrub each piece before discarding.
   b. Visibly inspect collected materials for organisms.
   c. Transfer sample into 4 liter wide mouth jug without losing any organisms (e.g. put jug in net to transfer handfuls of material, then invert the remaining material in the net into jug).
   d. Wash down/transfer from dip net to jug using a squirt bottle, turkey baster, etc.
   e. Preserve with 10% buffered formalin. 1:10 dilution. Either add 1 part buffered formalin to 9 parts site water or fill the whole jug with already mixed 10% formalin solution.
16. Observe and critique trainee for items 2-15 above at twelve (at least) separate training sites; include at least four (4) good sites (minimally disturbed), four (4) poor sites (disturbed or altered) and three (3) non-wadeable systems.

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Evaluation Activities

The trainee will convey and/or demonstrate (where applicable) a mastery of the following items. Once completed to satisfaction, the Evaluator will initial and date the item.

1. Identify appropriate and applicable SOPs and forms used or referenced for performing an SCI.
   a. DEP-SOP-001/01 FT 3000 Aquatic Habitat Characterization
   b. DEP-SOP-001/01 FS 7420 Stream Condition Index (D-Frame Dip net) Sampling
   c. DEP-SOP-001/01 FD 9000-3 Physical/Chemical Characterization Field Sheet.
   d. DEP-SOP-001/01 FD 9000-4 Stream/River Habitat Sketch Sheet.
   e. DEP-SOP-001/01 FD 9000-5 the Stream/River Habitat Assessment Field Sheet.
   f. "Sampling and Use of the Stream Condition Index (SCI) for Assessing Flowing Waters: A Primer", FDEP, Environmental Assessment Section, Bureau of Laboratories, DEP/EA/002/07, June 2007
2. Completed training for Habitat Assessment, TT-3000.
3. Recognize circumstances when the SCI should be postponed or not used.
   a. Lists the normal stream factors to consider for the determination of representative sample as continuous water flow, availability of substrate and accessibility for sampling.
   b. Determines if the stream flow has remained continuous and has not been intermittent or stagnant.
   c. Determines stream height either from recent rainfall data or from gaging stations.
   d. If intermittent, does not sample until continuous flow is reestablished.
   e. Does not sample if dry conditions occur. Waits 3 months (90 days) after the stream returns to normal flow to sample.
   f. Demonstrates an understanding of when the SCI should be postponed. If flood conditions occur (>0.5 meter above normal), waits 28 days until the water recedes, normal flow returns and the habitats become accessible.
   g. If water levels are ≤0.5 meter above normal, samples habitats at the normal stream shoreline, not the flooded shoreline.
   h. Sampling for SCI is not used for Ecoregion 76, the Southern Florida Coastal Plain, where few natural streams exist and for which the SCI is not calibrated.
4. Measures and marks the 100-meter reach.
5. Completes habitat sketch on Form FD 9000-4.
6. Completes Physical/Chemical Characterization Field Sheet, FD 9000-3.
7. Performs a habitat assessment and records information on Form FD 9000-5.
8. Identifies the productive habitat substrates and the conditions that make them productive.
   a. States productive means the habitat is currently sustaining or has the potential to sustain invertebrate populations.
   b. Understands habitats must be in contact with the water to be considered productive.
   c. States a minimum of 2 square meters in the entire reach is needed to be counted as present.
   d. Does not count smothered portions of habitats.
   e. Identifies the major habitats to include snags, leaf material, roots, aquatic macrophytes, rock/rubble.
   f. Lists the characteristics for productive snag habitat.
      i. Counts only woody debris, not herbaceous.
      ii. Counts only snags greater than thumb size in diameter.
      iii. Counts portion of wood directly in contact with water, not out of water or smothered.
      iv. Prefers snags in the normal, continuous stream flow.
      v. Counts old snags as more productive than young snags.

vi. Avoids new snags.
vii. Looks for snag bark that is malleable, old and decayed, with lots of crooks and crannies.

g. Lists the characteristics for productive leaf material substrate.
   i. Counts only leaf litter that is in contact with water.
   ii. Samples leaf packs and leaf mats only in the normal, continuous stream flow.
   iii. Defines a leaf pack as leaves packed up against an obstruction at surface or in water.
   iv. Defines a leaf mat as piles of leaf material on the stream bottom.
   v. Understands leaf packs are better than leaf mats due to higher flow and dissolved oxygen.
   vi. Counts leaf packs/mats as productive only if partially decayed.
   vii. Considers only the top 2 cm of leaf mats as a productive aerobic habitat.
   viii. Does not count anaerobic (no oxygen) leaf litter.
   ix. States that leaf material such as pine needles is not considered productive.
h. Lists the characteristics for productive roots.
   i. Counts only roots less than thumb size in diameter.
   ii. Counts roots only in contact with the water.
   iii. Counts only if in the normal, continuous stream flow.
   iv. Indicates that finer roots are more productive.
   v. Counts woody, adventitious roots hanging into the water.
   vi. Does not count the herbaceous roots of aquatic macrophytes or roots from herbaceous vegetation overhanging the water. These are instead counted as aquatic macrophytes.
   vii. Does not count roots where silt is excessive to the point where the roots are clumped together or the root material is not visible.
   viii. Does not count undercut banks as a productive substrate if productive roots are not present.
i. Lists the characteristics for productive aquatic macrophytes.
   i. Counts only aquatic vegetation in contact with water.
   ii. Counts only aquatic vegetation in normal, continuous flow.
   iii. Does not count non-aquatic macrophytes that are temporarily inundated.
j. Lists the characteristics for productive rock/rubble habitat.
   i. Counts rocky outcrops or rocks in contact with the water.
   ii. Counts rocks only in the normal, continuous stream flow.
   iii. Counts only if greater than 5 cm of productive surface.
   iv. Identifies rougher surface as more productive than smooth surfaces.
   v. States concrete is considered a rock if weathered and present for a long time.
   vi. Does not count asphalt or pipe clay as productive substrates.
k. Identifies minor habitats as sand, muck, silt, mud.

9. Prefers older rather than younger substrates because the older ones allow time for organism communities to develop and flourish.
10. Considers flow conditions when assessing the productivity of habitat. Habitats in good flow should be sampled over habitats in lesser flow.
11. Identifies that the SCI consist of a total of 20 sweeps.
    a. Defines a sweep as the width of the dip net by 0.5 meter length.
12. Apportions the 20 sweeps based on the number of productive habitats in the reach.
    a. In 1 productive habitat, performs 10 sweeps in the major productive habitat and 10 sweeps in the minor.

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b. In 2 productive habitats, performs 7 sweeps in the major productive habitats and 6 sweeps in the minor.
c. In 3 productive habitats, performs 5 sweeps in the major productive habitats and 5 sweeps in the minor.
d. In 4 productive habitats, performs 4 sweeps in the major productive habitats and 4 sweeps in the minor.
e. In 5 productive habitats, performs 3 sweeps in the major productive habitats and 5 sweeps in the minor.
f. Identifies that sweeps in the minor habitat should be performed in sand or sand/muck areas with good flow.
g. If less then 2 square meters of a snag, leaf matter, roots, macrophytes or rock is in the stream reach and was therefore not counted as “major” habitat; performs as many sweeps as possible and count as “minor” sweeps.

13. Demonstrates ability to capture invertebrates during sweeps, including proper agitation of substrates.
    a. Disturbs, agitates or dislodges organisms from substrates by using hands, feet, brush or other tool.
    b. Positions the dip net as closely to and no more than 0.5 m downstream of the substrate in order to capture organisms. In low velocity areas, creates a current into the net while agitating the substrate.
    c. If using a brush, brushes into the net and not to the side to capture all organisms that are dislodged.
    d. Completes at least 3 passes with net over the sample area.
    e. When sampling a leaf pack, places all material into dip net and not just agitates leaves.
    f. If possible, submerses fine roots and removable snags into net, then agitates and scrubs.
    g. For large removable snags, positions net to capture organism when removing snag from water.
    h. In heavily vegetated areas, places the net at the base of the vegetation and dislodges organisms using the hand.
    i. If there is not enough substrate at one location to complete a full sweep, goes to the same substrate at an alternative location to complete the sweep.
    j. Once collected, pulls dip net up and washes water through to dislodge, silt, etc.
    k. When discarding large pieces of substrate from the dip net, individually scrubs each piece and visibly inspects for organisms before discarding.
    l. Visibly inspects collected materials for organisms.
14. Samples only productive portions of habitats, does not dilute sample with unproductive detritus.
    a. Collects only top 2 cm of leaf mats, sand, silt, mud, or muck.
    b. Samples only in the normal flow of the stream.
15. Samples an area equivalent to 1 dip net wide and 0.5 meters long.
    a. Uses the width of the dip net and the marked dip net handle or other measuring device to determine sampling area.
    b. For thick, 3-dimensional habitats such as roots and leaf packs, states that the habitats should be visually spread out to a thickness of 2 cm.
    c. Completely sweeps the sampled area for a length of 0.5 meter ± 0.1 meter during each pass.
16. Transfers material to jug without loss of organisms and preserves.
    a. Once collected, pulls dip net up and washes water through to dislodge, silt, etc.

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   b. When discarding large pieces of substrate from the dip net, individually scrubs each piece and visibly inspects for organisms before discarding.
   c. Transfers sample into 4 liter wide mouth jug without losing any organisms (e.g. put jug in net to transfer handfuls of material, then invert the remaining material in the net into jug).
   d. Washes down/transfer from dip net to jug using a squirt bottle, turkey baster, etc...
   e. Preserves with 10% buffered formalin. 1:10 dilution. Add 10% buffered formalin to full jug of site water.

17. Performs training at twelve (at least) separate sites; including at least four (4) good sites (minimally disturbed), four (4) poor sites (disturbed or altered) and three (3) non-wadeable systems.

Training Event Log

1. Trainer or Evaluators are the only ones authorized to make an entry into this table.
2. Indicate the type of training event conducted by checking the TR column for training events or the EV column for evaluation events.
3. Initial and date the entry.
4. Write a brief description of the training. Describe the activities performed, site name, habitats swept, etc.

FT-3000 Training for Stream Habitat Assessment Checklist

Checklist for Documenting Training for FT 3000 – Stream Habitat Assessment

One copy of this document will exist for each Trainee. The Trainee (or supervisor) must retain the document. The Trainee will be required to provide this document as proof of completion of these training requirements.

By signing this card, the Trainee and Supervisor attest to the completion of ALL competencies outlined in this SOP.

Introduction

This sampling procedure requires specific training and a demonstration of competency due to the expert judgment exercised during field sampling. It is recommend that individuals conducting this procedure train with qualified staff (who have passed the DEP Stream Condition Index audit) and successfully obtain all required training and evaluation signatures.

In an effort to establish standardization and consistency, individuals performing the training are required to adhere to the competencies and principles detailed in this document. Following these training protocols will encourage the establishment of an equal foundation among samplers performing the Habitat Assessment. The items below do not need to be completed in any particular order, nor do they need to be completed in a single event. However, each training or evaluation event must be identified in the Training Event Log, regardless of whether a competency was completed or not.

First**, trainers** will follow the items described in the **Training Activities Section** and initial upon completion.

Evaluators will then follow the **Evaluation Activities** and initial upon completion. Evaluators should not sign off on an item unless the trainee has demonstrated complete competency.

Objective

To provide trainers and trainees a standardized set of training and evaluation activities for performing a Habitat Assessment. Trainers and trainees must understand, convey, discuss and demonstrate (where applicable) the proper techniques and principles for performing a Habitat Assessment, to include the following:

1. Identify appropriate and applicable SOPs and forms used or referenced for performing a Habitat Assessment.
2. Discuss and recognize circumstances where a Habitat Assessment should be postponed, e.g., in the event of recent increase in water level or during flooding.
3. Identify, measure and mark the 100-meter length sampling area.
4. Complete Form FD 9000-4, Stream/River Habitat Sketch Sheet.
5. Complete Form FD 9000-3, Physical/Chemical Characterization Field Sheet.
6. Complete Form FD 9000-5, Stream/River Habitat Assessment Field Sheet.
7. During at least twelve (12) separate training sessions, perform objectives 1-6 above.

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Training Activities

The trainer will discuss, convey, instruct and demonstrate (where applicable) each of the following items. Once completed to satisfaction, the trainer will initial and date the item. The trainee will also initial in the appropriate area to signify the item was demonstrated to them and they have received an understanding and developed competency.

1. Identify the appropriate and applicable SOPs and forms used or referenced for performing a Habitat Assessment. This includes DEP-SOP-001/01:
   a. FT 3000 Aquatic Habitat Characterization,
   b. FS 7000 General Biological Community Sampling
   c. Form FD 9000-3 Physical/Chemical Characterization Field Sheet
   d. Form FD 9000-4 Stream/River Habitat Sketch Sheet
   e. Form FD 9000-5 Stream/River Habitat Assessment Field Sheet
2. Discuss and recognize circumstances where a Habitat Assessment should be postponed.
   a. List the normal stream factors to consider for the determination of representative sample as continuous water flow, intact and available substrate, and accessibility for sampling.
   b. Determine if the stream flow has remained continuous and has not been intermittent or stagnant.
   c. In flood or high water conditions, wait until habitats become accessible, the water recedes, normal flow returns, and/or the habitats have reestablished (approximately 28 days).
   d. Look for flood or high water evidence (locate recent high water mark).
   e. Look for evidence of disturbed vegetation and branches, substrates that have been relocated, high water has scoured and stripped substrates, new sand and silt piles, new flow patterns, and smothered habitat.
   f. In dry conditions, do not sample; wait a minimum of 3 months after the stream returns to normal or sets a new normal level. This allows the habitat and the macroinvertebrate community to reestablish.
3. Identify, measure and mark the 100-meter length sampling area.
   a. State that the stream is commonly broken up into 10 meter intervals for sketching purposes.
   b. State that the downstream end of the stretch is the beginning or the 0 meter mark.
   c. State that the upstream end of the stretch is the end or the 100 meter mark.
   d. State that the left and right banks are determined by facing upstream from the 0 meter mark.
   e. State that the sketch always uses the downstream end as the start position and is marked as the 0 meter interval.
   f. Extend tape measure from 0 meter mark to the 100 meter mark.
   g. Place flagging tape on visible substrates to signify the 0, 50, and 100 meter intervals.
   h. Note that it is common to place additional flags every 10 meters.
   i. Note that it is common to place a double flag at the 0, 50, and 100 meter intervals.
4. Complete Form FD 9000-4, Stream/River Habitat Sketch Sheet
   a. Record name, date, site name, site location, and county.
   b. Enter a legend symbol for each habitat encountered (snags, roots, leaf material, macrophytes and 3 “other”).
   c. State the major habitats as snags, roots, leaf material, macrophytes, and rocks.
   d. State the minor habitats as sand, silt, muck, and mud.
   e. State that the stream sketch should map the observable (by sight or touch) location and amount of each productive substrate type in the 100 meter stretch. The habitats are

drawn 2-dimensionally, but the sketch is understood as a 3-dimensional representation (ex., full coverage floating aquatic vegetation does not equal 100% habitat).

f. Start at the downstream end (0 meter mark) and proceed upstream.
g. Stand within the first meter, and look upstream to obtain the basic layout of the stream banks, stream width and curves; select an appropriate scale for sketching the stream.
h. Sketch the stream banks within the first 10 meter interval of the stream to approximate scale.
i. Locate the major and minor productive habitats present.
j. Identify minor habitats as sand, muck, silt, mud.
k. Discuss the productive habitat substrates and the conditions that make them productive.
    i. General Considerations
        a) Productive means the habitat is currently sustaining or has the potential to sustain organisms.
        b) Must be in contact with the water.
        c) Minimum of 2 square meters in the entire reach to be counted as “present”.
        d) Ideally positioned in the flow areas with adequate water velocity to support sufficient oxygenation.
        e) Do not count smothered portions of habitats.
    ii. Snags
        a) Count only woody debris, not herbaceous vegetation.
        b) Count only snags greater than thumb size in diameter.
        c) Count portion of snag directly in contact with water.
        d) Do not count smothered portion of snags.
    iii. Roots
        a) Count only roots less than thumb size in diameter.
        b) Count portion of roots directly in contact with water.
        c) State that finer (feathery or hairy) roots are usually more productive.
        d) State that roots may contain silt as long as silt is not excessive to the point where the roots are clumped together or the roots are not visible.
        e) Count woody, adventitious roots hanging into the water.
        f) Do not count the herbaceous roots of aquatic macrophytes or roots from herbaceous vegetation overhanging the water. These are instead counted as aquatic macrophytes
        g) If the banks are undercut, determine if roots are actually present.
        h) Do not count undercut banks as a productive substrate if roots are not present.
    iv. Leaf Material
        a) Count leaf litter directly in contact with water.
        b) Count leaf packs and leaf mats positioned in flow areas with adequate water velocity to support sufficient oxygenation.
        c) Define a leaf pack as leaf material suspended up against an obstruction in the water column.
        d) Define a leaf mat as an area of leaf material settled on the stream bottom.
        e) State that leaf packs are more productive than leaf mats.
        f) Describe anaerobic versus aerobic conditions for leaf packs/mats.
        g) Count leaf packs as productive only if partially decomposed and aerobic.
        h) Count leaf mat as productive only if partially decomposed and aerobic.
        i) State that the top 2 cm of aerobic leaf mats can be counted as productive habitat.
        j) State that leaf material such as pine needles is not considered productive.
    v. Aquatic Macrophytes
        a) Count aquatic vegetation directly in contact with water.

b) Count only aquatic vegetation in normal, continuous flow.
c) Large mats of vegetation may not receive sufficient flow in the center to be considered productive.
d) Do not count non-aquatic (terrestrial) macrophytes that are temporarily inundated.

vi. Rock
a) Count rocky outcrops or rocks directly in contact with the water.
b) Count only rock in normal, continuous flow.
c) Count only if greater than 5 cm of productive surface.
d) State rougher surfaces as more productive than smooth surfaces.
e) State that concrete is considered rock if weathered and present for a long time.
f) Do not count asphalt (possibly toxic) or pipe clay (not stable) as productive substrates.

l. Using the established legend symbol, draw to scale each habitat encountered for the first 10 meter interval.
m. Repeat the sketch process in each 10 meter stream section of the stream, being careful to reevaluate (and compensate for) stream width.
n. Using the grid on the map, count the number of grid spaces for each productive substrate type.
o. Divide each of these substrate numbers by the total number of grid spaces contained within the site sketch and multiple by 100 to get the percentage of productive habitat.
p. If portions of the system are not observable (e.g., due to depth), include only the number of grids where observations were possible as the denominator in this calculation.
q. Indicate on the sketch where the velocity measurement is taken.
r. Indicate areas on sketch where sand or silt smothering is present.
s. Indicate areas on sketch with unstable or eroding banks.
t. Indicate areas on sketch where natural vegetation along banks is altered or eliminated (riparian buffer zone width).
u. Record the common vegetation (aquatic and/or terrestrial) present at the stream site.
v. Record any additional comments that assist in site characterization.

5. Complete Form FD 9000-3, Physical/Chemical Characterization Field Sheet.
a. Fill in the information requested at the top of the Physical/Chemical Characterization Field Sheet (FD 9000-3), including the STORET station number, sampling date, sampling location, field identification and receiving body of water. Much of this information can be recorded prior to field sampling. Record the time of sampling when water quality samples are first taken or when the assessment begins. If available, use a GPS tool to identify the latitude and longitude of the sampling location.
b. Observe and estimate the percentage of land-use types in the watershed that drain to the site, including all that potentially affect water quality. Examination of maps prior to field sampling is a necessary component of this determination.
c. Rate the potential for erosion within the portion of the watershed that affects your site.
d. “Local non-point-source pollution” refers to contamination introduced by stormwater runoff. Estimate this input and record this information.
e. When sampling a 100 meter section of a river or stream, measure or estimate the width of the system, from shore to shore, at a transect representative of the site.
f. Take three measurements of water depth across this transect using the ruled dip net handle or ruled rope of the Secchi disk and record this information.
g. Take three measurements of water velocity (one at each of the locations where water depth was measured) using either a flow meter or the ruled dip net handle, watch/stopwatch, and a floating leaf or other object. Record this information on the data

sheet. If there is no water velocity to measure, note that on the form. In some systems, the velocity will depend upon tidal cycle. Note the velocity during sampling and relate that to where it occurs in the tidal cycle.

h. Measure the vegetated riparian buffer zone width on each side of the stream or river; this is the distance from the edge of the water to where clearing or other human activities begin. Record the distance for the least buffered side or point of the system. If the vegetated buffer zone width for the least buffered side or point is greater than 18 m, record ">18 m."
i. Indicate whether or not the area in the vicinity of the sampling station has been artificially channelized and to what extent the system has recovered.
j. Indicate the presence or absence of impoundments in the area of the sampling station that potentially alter the natural flow regime or the movement of biota.
k. Where applicable, estimate and record the vertical distance from the current water level to the peak overflow level. Peak overflow level is indicated by debris hanging in bank, floodplain vegetation, or deposition of silt or soil. When bank overflow is rare, a high water mark may not be apparent. Add this distance to the current water depth (see letter f above) to determine the distance of the high water mark above the streambed and record this value.
l. Check the box for the percentage range that best describes the degree of shading in the sampling area. This percentage should be an integration over the entire 100 meter reach and is not influenced by the season (for example, in the fall or winter when leaves are not present on surrounding trees, this is not to be interpreted as "open" canopy cover).
m. Note any odors associated with the bottom sediments and check the appropriate box. Note the presence or absence of oils in the sediment. For this step, it may be helpful to observe the extent of sheen on the water after the substrate has been disturbed. Finally, note any deposits in the area, including the degree of smothering by sand or silt.
n. Indicate the type of aquatic system being sampled. If the station is in a stream or river, indicate stream order.
o. Note the presence and types of any noticeable water odors and check the appropriate box. Note the term that best describes the relative coverage of any oil on the water surface.
p. Based on visual observation, check the term that best describes the amount of turbidity in the water before it was disturbed by sampling.
q. Check box for the term that best describes the color of the water, indicating whether the water is tannic, green, clear or other. If "other" is checked, indicate what the color is.
r. Describe the weather conditions during the time of sampling, particularly the relative amount of sunshine/cloud cover, temperature, and wind speed and direction. Record any other conditions/observations that are helpful in characterizing the site.
s. Estimate and record the relative abundances of the following: periphyton, fish, aquatic macrophytes, and iron/sulfur bacteria. Note that periphyton and fish are very seldom absent from most systems. Abundant periphyton can be thick enough to prevent macroinvertebrate colonization on habitats.
t. Sign and date the form.

6. Complete Form FD 9000-5, Stream/River Habitat Assessment Field Sheet.
   a. Fill in the information requested at the top of the Stream/River Habitat Assessment Field Sheet (FD 9000-5), including the STORET station number, sampling date, sampling location, field identification and receiving body of water. Record the time of sampling as described in FT 3001, section 2.1.

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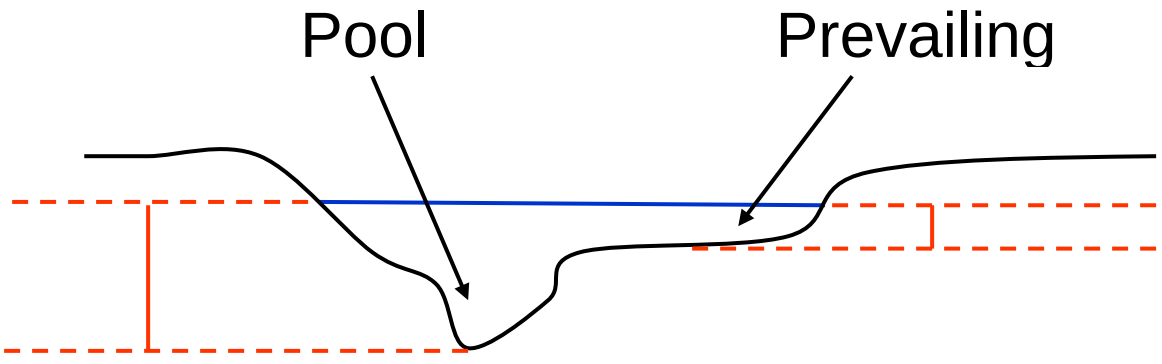
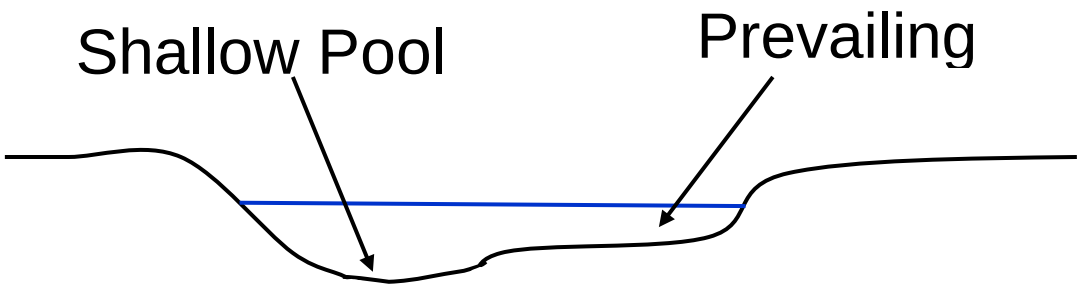
b. Follow the criteria given on the data sheet within each category to determine the appropriate score for that category.
c. Score the **Substrate Diversity** by evaluating the number of different kinds of productive substrates present. Refer to the Stream/River Habitat Sketch Sheet (FD 9000-4) and the Physical/Chemical Characterization Field Sheet (FD 9000-3). The following substrates are considered productive: snags (woody debris or logs larger than thumb diameter); roots (less than thumb diameter, with finer roots usually being more productive); aquatic vegetation (in contact with the water); leaf material in association with flow (leaves must be partially decomposed to be better habitat; leaf mats at the bottom may be productive if sufficient oxygen is present, but anaerobic leaf mats are not considered productive habitat); rocky substrate (rock diameters greater than 5 cm). Once the number of substrates has been determined, assign a score for substrate diversity in the appropriate spot on the sheet. (Higher values indicate a better condition than lower values.) The quality of the substrates present should then be given consideration in the scoring process. For example, partially decomposed leaf packs and "old" snags are better than fresh substrates and should be given higher scores within the same category. A minimum occurrence of two square meters of a particular substrate in the reach is necessary to count that substrate as being "present".
d. **Substrate Availability** is the relative spatial abundance of productive habitats present. Refer to the entry on FD 9000-3, as determined from FD 9000-4. A minimum occurrence of two square meters of a particular substrate in the reach is necessary to count that substrate as being "present". Include only productive habitats in the mapping and scoring process. Score substrate availability on the data sheet based on the sum of the percentages of productive habitats in the stream reach.
e. Using the ranges given on the data sheet, assign a **Water Velocity** score based on the maximum velocity observed at the typical cross-section of stream or river. Note that in the majority of Florida streams, velocities over 1 m/s are considered unusually high, and should be included in the "poor" category. An exception to this policy would be in narrow or shallow areas of streams with natural limestone bottoms, where velocities approaching 1 m/s may be normal and, thus, would be scored in the "optimal" category.
f. The **Habitat Smothering** parameter is an assessment of sand and silt deposition onto what would otherwise be productive habitats. Scoring is a two-step process. Assign a habitat smothering score as determined by the following two steps:
   i. First, determine (by referring to FD 9000-4) if adequate pools are present. A pool is defined as an area where the depth is at least 2 times the prevailing depth.



A natural system should have 1 to 2 pools every 12 times the width of the stream. (For large rivers it may be more appropriate to base estimates on the amount of smothering present on the actual habitats rather than the number of pools.) For example, a 3 meter wide stream should have at least 1 pool every 36 meters or a total of 3-6 pools per 100

meter reach (100m/36m = 2.8 segments). If there are no pools; i.e., the stream depth is nearly the same throughout the 100m reach, assign a score in the "poor" category. For large rivers, if there are minimal (less than 1 pool every 12 times the width) or shallow pools (a shallow pool is any pool where the depth is much less than 2 times the prevailing depth), score the stream in the "marginal" category.



Pools should occur on the outside of curves in the stream and on the downstream side of large, woody debris. A score in the "suboptimal" or "optimal" categories should be assigned to a stream with adequate pools based on the percent smothering as described in II. below.

ii. Second, check for deposition of sand or silt on visible habitats. While a light dusting of sand or silt is normal, excessively thick coatings will reduce habitability of the substrate. Sand smothering on visible habitats is indicated if sand is present on a substrate in an amount greater than a light dusting (3-5 mm). Silt smothering is indicated if a substantial turbidity plume results from agitating the substrate, especially fine roots and leaf packs. Silt smothering can sometimes also be determined by direct observation of the silt coating. Determine a percentage value for visible habitats that are not habitable due to sand and/or silt smothering.

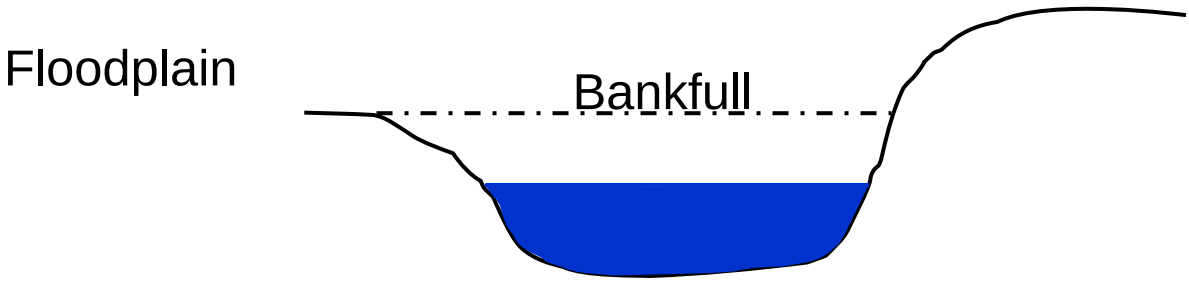
g. Add the scores for the primary habitat components (see sections c - f above) and record this primary score on the form. The primary habitat components refer to in-stream features.

h. Observe whether or not the reach of stream or river in the sampling area is artificially channelized. Assign a score for **Artificial Channelization** using the following guide:
   i. Poor - A highly altered system with ALL of the following; straightened stream channel, box-cut banks and a monotypic depth. Spoil banks or other indications of dredging may be visible.
   ii. Marginal - An altered system with some sinuosity in stream channel, often developed within the old dredged area, OR some diversity in depth but no pools as defined in 2.6 above. Spoil banks may be visible.
   iii. Suboptimal - Good sinuosity has developed within and outside of the old channelized area AND the bottom has a diversity of depths approaching what's expected of a non-dredged system (1 to 2 pools every 12 times the width of the stream). Spoil banks may be visible, but have established vegetation growing on them.
   iv. Optimal - A system with good stream channel sinuosity AND a diversity of depths as defined in section f. above. No evidence of dredging or straightening.

i. Refer to FD 9000-4 for areas along the bank that have eroded or have the potential for bank sloughing. Score artificially stable banks such as concrete according to bank stability, not according to natural vs. artificial stability. Determine the extent of erosion

potential for the site and assign a Bank Stability score for each bank (The "left bank" is on your left when you are looking upstream).

i. First, determine where "bankfull" is in relation to the height of each bank. Bankfull is defined as the stage at which channel maintenance is most effective and occurs on average every 1-2 years. For most natural Florida streams, bankfull is the height of the lowest bank, where the stream is connected to the floodplain.



Other indicators of bankfull (especially in larger systems) are the tops of point bars, staining and vegetation lines. If the substrate at bankfull is limestone, pipe clay or concrete, then automatically score the bank in the "optimal" category and skip sections II. and III. below. Ideally, bankfull should be greater than 60% of the bank height or above the woody root zone. If this is the case, the bank gets a "plus" for this subcomponent. Otherwise, bankfull is less than 60% of bank height and below the woody root zone and it should receive a "minus".

ii. Second, determine the slope of the bank. The more gentle the slope the more stable the bank. Score a bank with a slope less than 60° with a plus for this subcomponent. A bank with a slope of greater than 60° warrants a minus.

iii. Third, determine if bankfull is above or below the root zone. If bankfull is above the root zone and there are few raw or eroded areas, score this subcomponent a plus. Otherwise, score it a minus. Woody vegetation/roots are more stable than herbaceous and should be scored accordingly.

iv. Lastly, count up the number of pluses from each subcomponent (a total of 3 possible) and score within each category as described below:
   a) Poor- 0 pluses
   b) Marginal- 1 plus
   c) Suboptimal- 2 pluses
   d) Optimal- 3 pluses

j. Assign a score for the Riparian Buffer Zone Width that best characterizes the width of vegetation on each side of the channel. This zone is measured from the edge of the stream bank to where clearing or other adverse human activity begins. A native vegetated buffer zone of greater than 18 meter (approximately 60 feet) is currently considered optimal. Adjust scores accordingly if human activities encroach on some part of the 18 m buffer. For example, if approximately 20 meters of the stream bank is cleared but the other 80 m has the required buffer, the score should be reduced by approximately 20%.

k. Identify the plants in the riparian zone, determining the extent of coverage and whether the vegetation is native or exotic. Look for these classes of plants: bottomland or mesic hardwoods, understory shrubs and non-woody macrophytes. Assign a Riparian Zone Vegetation Quality score based on the classes of plants present, the degree of bank vegetative cover, and how closely the plant community at the site approaches that expected of an undisturbed community in the region.

l. Add the scores for the secondary habitat components (see sections h - k) and record this secondary score on the form. The secondary habitat components refer to morphological and riparian zone features.
m. Add the primary score (see section g) and the secondary score (see section l) to get the habitat assessment total score. Record the habitat assessment total score on the form.
n. Sign and date the form.

7. Observe and critique trainee for items 2-6 above at twelve (at least) separate training sites; include at least four good sites (minimally disturbed), four poor sites (disturbed or altered), and 3 non-wadeable systems.

Evaluation Activities

The trainee will convey and/or demonstrate (where applicable) a mastery of the following items. Once completed to satisfaction, the Evaluator will initial and date the item.

1. Identifies the appropriate and applicable SOPs and forms used or referenced for performing a Habitat Assessment. This includes DEP-SOP-001/01:
   a. FT 3000 Aquatic Habitat Characterization
   b. FS 7000 General Biological Community Sampling
   c. Form FD 9000-3 Physical/Chemical Characterization Field Sheet
   d. Form FD 9000-4 Stream/River Habitat Sketch Sheet
   e. Form FD 9000-5 Stream/River Habitat Assessment Field Sheet.
2. Discusses and recognizes circumstances where a Habitat Assessment should be postponed.
   a. Lists the normal stream factors to consider for the determination of representative sample as continuous water flow, intact and available substrate, and accessibility for sampling.
   b. Determines if the stream flow has remained continuous and has not been intermittent or stagnant.
   c. In flood or high water conditions, waits until habitats become accessible, the water recedes, normal flow returns, and/or the habitats have reestablished (approximately 28 days).
   d. Looks for flood or high water evidence (locate recent high water mark).
   e. Looks for evidence of disturbed vegetation and branches, substrates that have been relocated, high water has scoured and stripped substrates, new sand and silt piles, new flow patterns, and smothered habitat.
   f. In dry conditions, does not sample; waits a minimum of 3 months after the stream returns to normal or sets a new normal level. This allows the habitat and the macroinvertebrate community to reestablish.
3. Identifies, measures and marks the 100-meter length sampling area.
   a. States that the stream is commonly broken up into 10 meter intervals for sketching purposes.
   b. States that the downstream end of the stretch is the beginning or the 0 meter mark.
   c. States that the upstream end of the stretch is the end or the 100 meter mark.
   d. States that the left and right banks are determined by facing upstream from the 0 meter mark.
   e. States that the sketch always uses the downstream end as the start position and is marked as the 0 meter interval.
   f. Extends tape measure from 0 meter mark to the 100 meter mark.
   g. Places flagging tape on visible substrates to signify the 0, 50, and 100 meter intervals.
   h. Notes that it is common to place additional flags every 10 meters.
   i. Notes that it is common to place a double flag at the 0, 50, and 100 meter intervals.

FT-3000 Training for Stream Habitat Assessment Checklist

4. Completes Form FD 9000-4, Stream/River Habitat Sketch Sheet
   a. Records name, date, site name, site location, and county.
   b. Enters a legend symbol for each habitat encountered (snags, roots, leaf material, macrophytes and 3 “other”).
   c. States the major habitats as snags, roots, leaf material, macrophytes, and rocks.
   d. States the minor habitats as sand, silt, muck, and mud.
   e. States that the stream sketch should map the observable (by sight or touch) location and amount of each productive substrate type in the 100 meter stretch. The habitats are drawn 2-dimensionally, but the sketch is understood as a 3-dimensional representation (ex., full coverage floating aquatic vegetation does not equal 100% habitat).
   f. Starts at the downstream end (0 meter mark) and proceed upstream.
   g. Stands within the first meter, and looks upstream to obtain the basic layout of the stream banks, stream width and curves; selects an appropriate scale for sketching the stream.
   h. Sketches the stream banks within the first 10 meter interval of the stream to approximate scale.
   i. Locates the major and minor productive habitats present.
   j. Identifies minor habitats as sand, muck, silt, mud.
   k. Discusses the productive habitat substrates and the conditions that make them productive.
      i. General Considerations
         a) Productive means the habitat is currently sustaining or is capable of sustaining organisms.
         b) Must be in contact with the water.
         c) Minimum of 2 square meters in the entire reach to be counted as “present”.
         d) Ideally positioned in the flow areas with adequate water velocity to support sufficient oxygenation.
         e) Does not count smothered portions of habitats.
      ii. Snags
         a) Counts only woody debris, not herbaceous vegetation.
         b) Counts only snags greater than thumb size in diameter.
         c) Counts portion of snag directly in contact with water.
         d) Does not count smothered portion of snags.
      iii. Roots
         a) Counts only roots less than thumb size in diameter.
         b) Counts portion of roots directly in contact with water.
         c) States that finer (feathery or hairy) roots are usually more productive.
         d) States that roots may contain silt as long as silt is not excessive to the point where the roots are clumped together or the roots are still visible.
         e) Counts woody, adventitious roots hanging into the water.
         f) Does not count the herbaceous roots of aquatic macrophytes or roots from herbaceous vegetation overhanging the water. These are instead counted as aquatic macrophytes
         g) If the banks are undercut, determines if roots are actually present.
         h) Does not count undercut banks as a productive substrate if roots are not present.
      iv. Leaf Material
         a) Counts leaf litter directly in contact with water.
         b) Counts leaf packs and leaf mats positioned in flow areas with adequate water velocity to support sufficient oxygenation.
         c) Defines a leaf pack as leaf material suspended up against an obstruction in the water column.

d) Defines a leaf mat as an area of leaf material settled on the stream bottom.
e) States that leaf packs are more productive than leaf mats.
f) Describes anaerobic versus aerobic conditions for leaf packs/mats.
g) Counts leaf packs as productive only if partially decomposed and aerobic.
h) Counts leaf mats as productive only if partially decomposed and aerobic.
i) States that the top 2 cm of aerobic leaf mats can be counted as productive habitat.
j) States that leaf material such as pine needles is not considered productive.

v. Aquatic Macrophytes
a) Counts aquatic vegetation directly in contact with water.
b) Counts only aquatic vegetation in normal, continuous flow.
c) Large mats of vegetation may not receive sufficient flow in the center to be considered productive.
d) Does not count non-aquatic (terrestrial) macrophytes that are temporarily inundated.

vi. Rock
a) Counts rocky outcrops or rocks directly in contact with the water.
b) Counts only rock in normal, continuous flow.
c) Counts only if greater than 5 cm of productive surface.
d) States rougher surfaces as more productive than smooth surfaces.
e) States that concrete is considered rock if weathered and present for a long time.
f) Does not count asphalt (possibly toxic) or pipe clay (not stable) as productive substrates.

l. Using the established legend symbol, draws to scale each habitat encountered for the first 10 meter interval.
m. Repeats the sketch process in each 10 meter stream section of the stream, being careful to reevaluate (and compensate for) stream width.
n. Using the grid on the map, counts the number of grid spaces for each productive substrate type.
o. Divides each of these substrate numbers by the total number of grid spaces contained within the site sketch and multiplies by 100 to get the percentage of productive habitat.
p. If portions of the system are not observable (e.g., due to depth), includes only the number of grids where observations were possible as the denominator in this calculation.
q. Indicates on the sketch where the velocity measurement is taken.
r. Indicates areas on sketch where sand or silt smothering is present.
s. Indicates areas on sketch with unstable or eroding banks.
t. Indicates areas on sketch where natural vegetation along banks is altered or eliminated (riparian buffer zone width).
u. Records the common vegetation (aquatic and/or terrestrial) present at the stream site.
v. Records any additional comments that assist in site characterization.

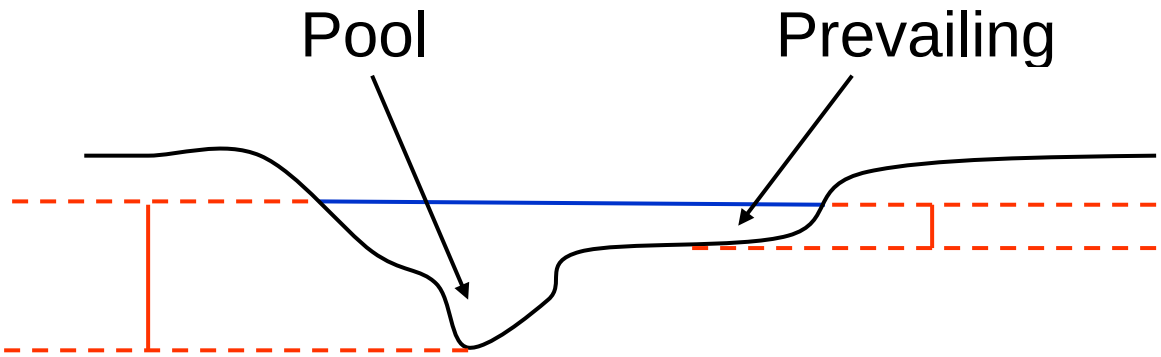
5. Completes Form FD 9000-3, Physical/Chemical Characterization Field Sheet.
a. Fills in the information requested at the top of the Physical/Chemical Characterization Field Sheet (FD 9000-3), including the STORET station number, sampling date, sampling location, field identification and receiving body of water. Much of this information can be recorded prior to field sampling. Records the time of sampling when water quality samples are first taken or when the assessment begins. If available, uses a GPS tool to identify the latitude and longitude of the sampling location.

FT-3000 Training for Stream Habitat Assessment Checklist

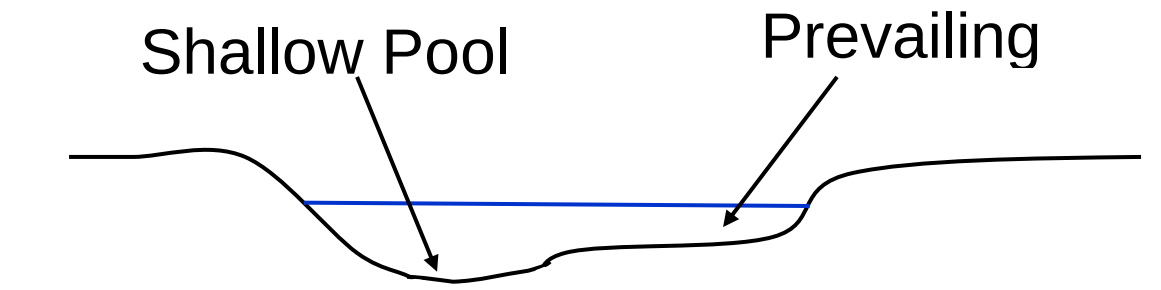
b. Observes and estimates the percentage of land-use types in the watershed that drain to the site, including all that potentially affect water quality. Examination of maps prior to field sampling is a necessary component of this determination.
c. Rates the potential for erosion within the portion of the watershed that affects your site.
d. "Local non-point-source pollution" refers to contamination introduced by stormwater runoff. Estimates this input and records this information.
e. When sampling a 100 meter section of a river or stream, measures or estimates the width of the system, from shore to shore, at a transect representative of the site.
f. Takes three measurements of water depth across this transect using the ruled dip net handle or ruled rope of the Secchi disk and records this information.
g. Takes three measurements of water velocity (one at each of the locations where water depth was measured) using either a flow meter or the ruled dip net handle, watch/stopwatch, and a floating leaf or other object. Records this information on the data sheet. If there is no water velocity to measure, notes that on the form. In some systems, the velocity will depend upon tidal cycle. Notes the velocity during sampling and relates that to where it occurs in the tidal cycle.
h. Measures the vegetated riparian buffer zone width on each side of the stream or river; this is the distance from the edge of the water to where clearing or other human activities begin. Records the distance for the least buffered side or point of the system. If the vegetated buffer zone width for the least buffered side or point is greater than 18 m, records ">18 m."
i. Indicates whether or not the area in the vicinity of the sampling station has been artificially channelized and to what extent the system has recovered.
j. Indicates the presence or absence of impoundments in the area of the sampling station that potentially alter the natural flow regime or the movement of biota.
k. Where applicable, estimates and records the vertical distance from the current water level to the peak overflow level. Peak overflow level is indicated by debris hanging in bank, floodplain vegetation, or deposition of silt or soil. When bank overflow is rare, a high water mark may not be apparent. Adds this distance to the current water depth (see letter f above) to determine the distance of the high water mark above the streambed and records this value.
l. Checks the box for the percentage range that best describes the degree of shading in the sampling area. This percentage should be an integration over the entire 100 meter reach and is not influenced by the season (for example, in the fall or winter when leaves are not present on surrounding trees, this is not to be interpreted as "open" canopy cover).
m. Notes any odors associated with the bottom sediments and check the appropriate box. Notes the presence or absence of oils in the sediment. For this step, it may be helpful to observe the extent of sheen on the water after the substrate has been disturbed. Finally, notes any deposits in the area, including the degree of smothering by sand or silt.
n. Indicates the type of aquatic system being sampled. If the station is in a stream or river, indicates stream order.
o. Notes the presence and types of any noticeable water odors and check the appropriate box. Notes the term that best describes the relative coverage of any oil on the water surface.
p. Based on visual observation, checks the term that best describes the amount of turbidity in the water before it was disturbed by sampling.
q. Checks box for the term that best describes the color of the water, indicating whether the water is tannic, green, clear, or other. If "other" is checked, indicate what the color is.

r. Describes the weather conditions during the time of sampling, particularly the relative amount of sunshine/cloud cover, temperature, and wind speed and direction. Records any other conditions/observations that are helpful in characterizing the site.
s. Estimates and records the relative abundances of the following: periphyton, fish, aquatic macrophytes and iron/sulfur bacteria. Notes that periphyton and fish are very seldom absent from most systems. Abundant periphyton can be thick enough to prevent macroinvertebrate colonization on habitats.
t. Signs and dates the form.

6. Completes Form FD 9000-5, Stream/River Habitat Assessment Field Sheet.
   a. Fills in the information requested at the top of the Stream/River Habitat Assessment Field Sheet (FD 9000-5), including the STORET station number, sampling date, sampling location, field identification and receiving body of water. Record the time of sampling as described in FT 3001, section 2.1.
   b. Follows the criteria given on the data sheet within each category to determine the appropriate score for that category.
   c. Scores the **Substrate Diversity** by evaluating the number of different kinds of productive substrates present. Refers to the Stream/River Habitat Sketch Sheet (FD 9000-4) and the Physical/Chemical Characterization Field Sheet (FD 9000-3). The following substrates are considered productive: snags (woody debris or logs larger than thumb diameter); roots (less than thumb diameter, with finer roots usually being more productive); aquatic vegetation (in contact with the water); leaf packs/mats in association with flow (leaves must be partially decomposed to be better habitat; leaf mats at the bottom may be productive if sufficient oxygen is present, but anaerobic leaf mats are not considered productive habitat); rocky substrate (with rock diameters greater than 5 cm). Once the number of substrates has been determined, assigns a score for substrate diversity in the appropriate spot on the sheet. (Higher values indicate a better condition than lower values.) The quality of the substrates present should then be given consideration in the scoring process. For example, partially decomposed leaf packs and "old" snags are better than fresh substrates and should be given lower scores within the same category. A minimum occurrence of two square meters of a particular substrate in the reach is necessary to count that substrate as being "present".
   d. **Substrate Availability** is the relative spatial abundance of productive habitats present. Refers to the entry on FD 9000-3, as determined from FD 9000-4. States that a minimum occurrence of two square meters of a particular substrate in the reach is necessary to count that substrate as being "present". Includes only productive habitats in the mapping and scoring process. Scores substrate availability on the data sheet based on the sum of the percentages of productive habitats in the stream reach.
   e. Using the ranges given on the data sheet, assigns a **Water Velocity** score based on the maximum velocity observed at the typical cross-section of stream or river. Avoid areas where the run has been obstructed by snags or other material unless this represents the majority of the run Notes that in the majority of Florida streams, velocities over 1 m/s are considered unusually high, and should be included in the "poor" category. An exception to this policy would be in narrow or shallow areas of streams with natural limestone bottoms, where velocities approaching 1 m/s may be normal and, thus, would be scored in the "optimal" category.
   f. The **Habitat Smothering** parameter is an assessment of sand and silt deposition onto what would otherwise be productive habitats. Scoring is a two-step process. Assigns a habitat smothering score as determined by the following two steps:
      i. First, determines (by referring to FD 9000-4) if adequate pools are present. A pool is defined as an area where the depth is at least 2 times the prevailing depth.



A natural system should have 1 to 2 pools every 12 times the width of the stream. (For large rivers, it may be more appropriate to base estimates on the amount of smothering present on the actual habitats rather than the number of pools.) For example, a 3 meter wide stream should have at least 1 pool every 36 meters or a total of 3-6 pools per 100 meter reach (100m/36m = 2.8 segments). If there are no pools; i.e., the stream depth is nearly the same throughout the 100m reach, assigns a score in the "poor" category. If there are minimal (less than 1 pool every 12 times the width) or shallow pools (a shallow pool is any pool where the depth is much less than 2 times the prevailing depth), scores the stream in the "marginal" category.



Pools should occur on the outside of curves in the stream and on the downstream side of large, woody debris. A score in the "suboptimal" or "optimal" categories should be assigned to a stream with adequate pools based on the percent smothering as described in II. below.

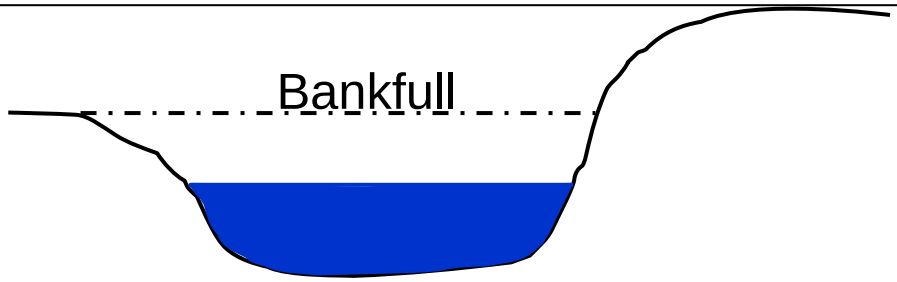
ii. Second, checks for deposition of sand or silt on visible habitats. While a light dusting of sand or silt is normal, excessively thick coatings will reduce habitability of the substrate. Sand smothering on visible habitats is indicated if sand is present on a substrate in an amount greater than a light dusting (3-5 mm). Silt smothering is indicated if a substantial turbidity plume results from agitating the substrate, especially fine roots and leaf packs. Silt smothering can sometimes also be determined by direct observation of the silt coating. Determines a percentage value for visible habitats that are not habitable due to sand and/or silt smothering.

g. Adds the scores for the primary habitat components (see sections c - f above) and record this primary score on the form. The primary habitat components refer to in-stream features.

h. Observes whether or not the reach of stream or river in the sampling area is artificially channelized. Assigns a score for **Artificial Channelization** using the following guide:

i. Poor - A highly altered system with ALL of the following; straightened stream channel, box-cut banks and a monotypic depth. Spoil banks or other indications of dredging may be visible.
ii. Marginal - An altered system with some sinuosity in stream channel, often developed within the old dredged area, OR some diversity in depth but no pools as defined in section h. above. Spoil banks may be visible.
iii. Suboptimal - Good sinuosity has developed within and outside of the old channelized area AND the bottom has a diversity of depths approaching what's expected of a non-dredged system (1 to 2 pools every 12 times the width of the stream). Spoil banks may be visible, but have established vegetation growing on them.
iv. Optimal - A system with good stream channel sinuosity AND a diversity of depths as defined in section f. above. No evidence of dredging or straightening.

i. Refers to FD 9000-4 for areas along the bank that have eroded or have the potential for bank sloughing. Scores artificially stable banks such as concrete according to bank stability, not according to natural vs. artificial stability. Determines the extent of erosion potential for the site and assigns a Bank Stability score for each bank (The "left bank" is on the left when looking upstream).
    i. First, determines where "bankfull" is in relation to the height of each bank. Bankfull is defined as the stage at which channel maintenance is most effective and occurs on average every 1-2 years. For most natural Florida streams, bankfull is the height of the lowest bank, where the stream is connected to the floodplain.



Other indicators of bankfull (especially in larger systems) are the tops of point bars, staining and vegetation lines. If the substrate at bankfull is limestone, pipe clay or concrete, then automatically score the bank in the "optimal" category and skip sections II. and III. below. Ideally, bankfull should be greater than 60% of the bank height or above the woody root zone. If this is the case, the bank gets a "plus" for this subcomponent. Otherwise, bankfull is less than 60% of bank height and below the woody root zone and it should receive a "minus".

    ii. Second, determines the slope of the bank. The more gentle the slope the more stable the bank. Scores a bank with a slope less than 60° with a plus for this subcomponent. A bank with a slope of greater than 60° warrants a minus.
    iii. Third, determines if bankfull is above or below the root zone. If bankfull is above the root zone and there are few raw or eroded areas, scores this subcomponent a plus. Otherwise, scores it a minus. Woody vegetation/roots are more stable than herbaceous and should be scored accordingly.
    iv. Lastly, counts up the number of pluses from each subcomponent (a total of 3 possible) and scores within each category as described below:
        a) Poor- 0 pluses
        b) Marginal- 1 plus
        c) Suboptimal- 2 pluses

d) Optimal- 3 pluses

j. Assigns a score for the Riparian Buffer Zone Width that best characterizes the width of native vegetation on each side of the channel. This zone is measured from the edge of the stream bank to where clearing or other adverse human activity begins. A native vegetated buffer zone of greater than 18 meter (approximately 60 feet) is currently considered optimal.
k. Identifies the plants in the riparian zone, determining the extent of coverage and whether the vegetation is native or exotic. Looks for these classes of plants: bottomland or mesic hardwoods, understory shrubs and non-woody macrophytes. Assigns a Riparian Zone Vegetation Quality score based on the classes of plants present, the degree of bank vegetative cover, and how closely the plant community at the site approaches that expected of an undisturbed community in the region.
l. Adds the scores for the secondary habitat components (see sections h - k) and records this secondary score on the form. The secondary habitat components refer to morphological and riparian zone features.
m. Adds the primary score (see section g) and the secondary score (see section l) to get the habitat assessment total score. Records the habitat assessment total score on the form.
n. Signs and dates the form.

7. Performs training at twelve (at least) separate sites.

Training Event Log

1. Trainer or Evaluators are the only ones authorized to make an entry into this table.
2. Indicate the type of training event conducted by checking the TR column for training events or the EV column for evaluation events.
3. Initial and date the entry.
4. Write a brief description of the training. Describe the activities performed, site name, habitats swept, etc.

Glossary

Acceptance criteria	The numerical limits, prescribed by an approved analytical method, internal data or other preestablished data quality objectives, by which an analytical system or analysis result is verified. Also known as control limits. Acceptance criteria are usually established for calibration, precision, sensitivity and accuracy.
Accuracy	The degree of agreement of a measurement (or an average of measurements of the same thing), X, with an accepted reference or true value, T, usually expressed as the difference between the two values, X-T, or the difference as a percentage of the reference or true value, 100 (X-T)/T, and sometimes expressed as a ratio, X/T. Accuracy is a measure of the bias in a system.
Analyte	Any measured quantity reported in final units of concentration.
Analyte group	A categorical grouping of analytes based on shared sample collection procedure and equipment construction restrictions. See Tables FA 1000-2 and FA 1000-3.
Analyte-free water	Water free of all positive or negative analytical interferences in which all analytes of interest are below method detection limits.
Audit	A systematic check to determine the quality of the operation of a function, procedure or activity.
Best management practices (BMPs)	Procedures designed to mitigate against adverse environmental consequences associated with human activities.
Bioaccumulation	The accumulation of contaminants in the tissue of organisms through any route, including respiration, ingestion, or direct contact with contaminated water, sediment, pore water, or dredged material.
Bioconcentration	A process by which there occurs a net accumulation of a chemical directly from water into aquatic organisms resulting from simultaneous uptake (e.g., by gill or epithelial tissue) and elimination.
Biological tissue	Includes tissues of plant or animal origin. The most common of these are shellfish, finfish and aquatic plants.
Biomagnification	Result of the process of bioconcentration and bioaccumulation by which tissue concentrations of bioaccumulated chemicals increase as the chemical passes upwards through two or more trophic levels. The term implies an efficient transfer of chemical from food to consumer, so that residue concentrations increase systematically from one trophic level to the next.
Blank	An artificial quality control sample of an analytical matrix designed to monitor the introduction of artifacts and interferences into a sample collection or analytical system.
Blind sample	A quality control sample of known composition whose analytical characteristics are unknown to an audited analyst or organization.
Calibration	The process by which the correlation between instrument response and actual value of a measured analyte or parameter is determined.

Glossary

Calibration curve	A curve that plots the concentration of known analyte standards against the instrument response to the analyte. Also known as a standard curve.
Calibration standard	Solutions or purified quantities of a substance or material with a verifiable composition that are used to measure the amount or value of an analyte or parameter in an unknown sample. Calibration standards are used to establish a calibration curve or instrument response factor.
Calibration verification	Analyzing a standard as a sample to confirm that the test instrument remains calibrated.
Chemical waste	Liquid or solid chemicals that are no longer industrially useful.
Chronological bracket	Verifying calibration before and after the measurement of environmental samples.
Comparability	Expresses the statistical confidence with which one data set can be compared to another.
Confidence level	The statistical probability associated with an interval of variance. Usually expressed as percent probability. The result being tested is significant if the calculated probability is greater than 90 percent and is highly significant if the probability is greater than 99 percent.
Continuing calibration standard	A standard analyzed during a measurement process to verify the accuracy of a calibration curve or other instrument calibration.
Continuing calibration verification	Analysis of a standard as if it were a sample to check the status of the test instrument calibration.
Creel census	An assessment of the fish consumption by human populations based on a statistical survey of fish landings by sport and subsistence catches.
Data quality	The features and characteristics of a set of data that determine its suitability for a given purpose. Examples of data quality include accuracy, precision, sensitivity, representativeness and comparability.
Data quality objectives	A set of specifications established for an intended use of a set of data.
Data validation	An audit in which data are evaluated according to predetermined validation criteria established as data quality objectives.
Detection limit	The smallest amount of an analyte that can be measured with a stated probability of significance.
D-frame dip net	Pole with a No.30 mesh bag attached to a “D-shaped” frame used for the collection of aquatic invertebrates.
Drinking water	Includes finished (treated) or raw source water designated as potable water. Drinking water sources may originate from surface or ground water.

Glossary

Environmental sample	Any sample from a natural or other source that is reasonably expected to contribute pollution to or receive pollution from ground waters or surface waters of the state
Equipment blank	Quality control blanks prepared on-site during sampling by pouring analyte-free water through decontaminated field equipment into appropriate sample containers for each matrix and analyte group of interest. Equipment blanks are chemically preserved, stored, transported and analyzed with the collected field samples.
External	Refers to operations, personnel, documents and protocols from a party that is separate from or outside the specified organization.
Field blanks	Quality control blanks prepared on-site during sampling by pouring analyte-free water into appropriate sample containers for each analyte group of interest. Field blanks are chemically preserved, stored, transported and analyzed with the collected field samples.
Field spike	An environmental sample fortified to a known and validated concentration in the field during sampling. These quality control samples are sometimes submitted as blind samples to the analyzing laboratory.
Frotus	A double rake-head with a line attached and used for collecting submerged aquatic vegetation.
Groundwater	Includes all waters found below ground in confined or unconfined aquifers.
Hester-Dendy artificial substrate (HD)	Artificial substrate of known surface area used for the collection of invertebrates over a known amount of time.
Hydrophobic	A hydrophobic or lipophilic chemical having low water solubility and correspondingly high solubility in lipids or nonpolar solvents.
Initial Calibration Verification (ICV)	Calibration verification immediately following initial calibration.
Instrument detection limit	The smallest amount of an analyte of interest that generates an instrument response (signal) under prescribed conditions such that the magnitude of the signal is larger than the absolute uncertainty (error) associated with the signal.
Intensive study	A study of the temporal and spatial variability of specific contaminants found in the tissues of aquatic organisms living in a body of water impacted by pollution.
Interference	Any substance in a sample that fortifies or diminishes the amount of an analyte or otherwise affects the ability to detect and quantify an analyte in the sample.
Internal	Refers to operations, personnel, documents and protocols within the specified organization.

Glossary

Internal standard	A compound having similar chemical characteristics to the compounds of interest but which is not normally found in the environment or does not interfere with the compounds of interest. A known and specified concentration of the standard is added to each sample prior to analyses. The concentration in the sample is based on the response of the internal standard relative to that of the calibration standard and the compound in the standard.
Legal or evidentiary chain of custody	A sample custody protocol in which all personnel, time intervals and supporting activities associated with the collection, possession, handling, processing, analysis, transport, storage and disposal of a specific sample are documented.
Method blank	A blank of an appropriate analyte-free matrix that is processed (digested, extracted, etc.) and analyzed with a specified sample set.
Method detection limit	The smallest amount of an analyte that can be analyzed by a given measurement system under specified conditions of sample processing and analysis and reported with a 99% confidence that the concentration of the analyte in the sample is greater than zero.
Parameter	For the purposes of the DEP SOPs, any measured quantity not reported in units of concentration.
Parent sample	A sample from which aliquots or subsamples are taken for processing or testing purposes.
Performance audit	An audit where quantitative data are independently obtained for comparison with routinely obtained data in a measurement system. Examples of these audits are EPA performance evaluation programs, commercial performance evaluation programs, split sampling programs involving at least two laboratories and/or sampling organizations and blind samples.
Performance evaluation samples	A sample submitted for analysis whose composition and concentration are known to the submittor but unknown to the analyst. Also known as a blind sample.
Periphytometer	Artificial substrate of known surface area used for collection of algae (specifically periphyton) over a known amount of time.
Periphyton	Aquatic algae attached to natural or artificial substrates.
Practical quantitation limit	The smallest concentration of an analyte that can be reported with an associated precision. DEP defines a practical quantitation limit as: PQL= 4 $\times$ MDL.
Precision	A measure of mutual agreement among individual measurements of a parameter or an analyte, usually under prescribed similar conditions. Precision is best expressed in terms of the standard deviation. Various measures of precision are used depending upon the “prescribed similar conditions”.

Glossary

Project audit	An independent review of all sampling and analytical documentation associated with a specific project or event in order to determine if the resulting data are valid and acceptable according to preestablished validation criteria and other data quality objectives. Enough documentation must be available so that a reviewer is able to reconstruct the history of a sample from time of sample collection (or sample container acquisition) through final results and sample disposal.
Quality assurance	The system of management activities and quality control procedures implemented to produce and evaluate data according to preestablished data quality objectives.
Quality assurance plans	An orderly assembly of detailed and specific procedures that delineates how data of known and accepted quality are produced.
Quality assurance project plans	A QA plan written for a specific project outlining data quality objectives, sampling and analytical protocols and QC measures needed to satisfy the intended uses of the data.
Quality control	The system of measurement activities used to document and control the quality of data so that it meets the needs of data users as specified by preestablished data quality objectives.
Quality control check sample	A sample obtained from an independent source for which the level of an analyte has been validated or certified. Also known as a reference material. The sample is prepared and analyzed with a sample set of similar matrix. If the sample has been obtained from the National Institute of Standards and Technology, it is referred to as a Standard Reference Material.
Quality control check standards	Certified and traceable standard solutions or purified materials from a source other than routine calibration standards used to check the accuracy of a calibration.
Quality control checks	Standards or known samples from an independent source that are analyzed at a specified frequency.
Quantitative Bracket	Standards used for calibration or calibration verification that encompass the range of environmental samples.
Reagent blank	An aliquot of analyte-free water or solvent that is analyzed with a sample set.
Reagent spike	Samples of an appropriate analyte-free matrix (deionized water, sand, soil, etc.) that are fortified to a known and validated concentration of analyte(s) before sample preparation and subsequent analysis.
Reagent water	A sample of water that conforms to ASTM grades II, III or IV.

Glossary

Replicate sample	Samples that have been collected at the same time from the same source (field replicates) or aliquots of the same sample that are prepared and analyzed at the same time (laboratory replicates). Duplicate samples are one type of replicate sample. The analytical results from replicates are used to determine the precision of a system. If the concentration of analytes in the sample are below detectable limits, duplicate spike samples may be used to determine precision. Blind replicates (or duplicates) are replicates that have been collected (field replicates) or prepared (laboratory replicates) and are analyzed as separate samples whose replicate nature remains unknown to the analyst or organization.
Representativeness	Expresses the degree to which data for a sampled source accurately and precisely represent a characteristic or variation of the sampled source in terms of a measured analyte or parameter.
Research quality assurance plan	A quality assurance project plan written for research activities where non-standard procedures are used.
Riparian buffer zone	Land directly adjacent to a water body.
Sample custody	All records and documentation that trace sample possession, handling and associated supporting activities from the point of sample collection through transport, storage, processing, analysis and disposal of the sample.
Sample matrix	The natural or artificial medium from which a sample is collected. For the purposes of the DEP SOPs, a matrix is categorized in terms of the sample source and associated collection technique. See Table FA 1000-1.
Sample matrix spike	An environmental sample fortified to a known and validated concentration of analyte(s) before sample preparation and subsequent analysis.
Sampling Kit	A set of sampling accessories that has been assembled for a specified use or project. Examples of sampling accessories include: sample containers, sampling equipment, chemical preservatives, trip blanks, reagent transfer implements (e.g., disposable pipets), calibration standards, indicator papers (e.g., pH paper), reagents, etc.
Screening study	A study where a body of water is being surveyed for the presence of contaminants in the tissues of aquatic organisms without prior knowledge of their presence.
Secchi disk	A large round disk with an alternating black and white pattern used to determine visibility in lakes. The disk is lowered into the water column until the observer can no longer see the pattern.
Sediment	The unconsolidated solid matrix occurring immediately beneath any surface water body. The surface water body may be present part or all of the time.

Glossary

Spiked samples	Any samples fortified with a known and validated concentration of analyte.
Split samples	Replicates of the same sample that are given to two independent laboratories for analysis.
Stream order	A method of classifying stream channels in a watershed. DEP uses Strahler's system where the uppermost channels (headwater streams with no tributaries) are considered first-order streams. The confluence of two first-order streams creates a second-order. Third-order streams start at the confluence of two second-order streams.
Subsample	Refers to any derivative obtained from a sample. Examples of subsamples include: aliquots, filtrates, digestates, eluates, fractions, extracts, reaction products, supernatants, etc.
Surface water	Includes fresh or saline waters from water bodies such as streams, canals, rivers, lakes, ponds, bays and estuaries (natural or manmade).
Surrogate spikes	Samples fortified with a compound having similar chemical characteristics to the analytes of interest, but which is not normally found in environmental samples. Known concentrations of these compounds are added to all samples in the set before sample preparation and subsequent analysis.
System audit	A qualitative on-site review and evaluation of a laboratory or field operation quality assurance system and physical facilities utilized for sampling, sample processing, calibration and measurement or analysis.
Trip blank	Trip blanks are only used for VOC samples. Blanks of VOC-free water are prepared by the organization providing sample containers for VOC collection. These blanks are transported to the site with the empty VOC sample containers and shipped to the analyzing laboratory in the same transport containers as the VOC samples. They remain unopened for the entire trip and are analyzed at the laboratory with the environmental VOC samples.
Trophic level	The different feeding relationships in an ecosystem that determine the route of energy flow and the pattern of chemical cycling.
U.S. No. 30 mesh	Standard U.S. 30 sieve size.
Van Dorn bottle	A water quality sampling device which allows for discrete water samples to be taken at various depths.
Vascular plant	A plant of higher order containing conducting tissues consisting primarily of xylem and phloem. These tissues are also known as vascular tissues.
Wastewater	Includes any influent or effluent associated with domestic or industrial waste treatment facilities.