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Standard Operating Procedures for Conducting Sampling and Sample Bank Audits

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STANDARD OPERATING PROCEDURES FOR CONDUCTING SAMPLING AND SAMPLE BANK AUDITS

by

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Assignment 25

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FOREWORD

This Standard Operating Procedure for Conducting Sampling and Sample Bank Audits was prepared by ICAIR, Life Systems, Inc., under U.S. Environmental Protection Agency Contract 68-03-3136 during the period March 8, 1984 to September 30, 1984. The program was directed by Ms. Cynthia D. Patrick. The technical effort was completed by Mr. Timothy W. Owens and Dr. D. J. Northington.

Mr. Kenneth Brown was the Technical Contact for the Environmental Monitoring Systems Laboratory, Las Vegas, NV 89114.

NOTICE

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ABSTRACT

The U.S. Environmental Protection Agency's (USEPA) Environmental Monitoring Systems Laboratory-Las Vegas (EMSL-LV) is responsible for preparing Standard Operating Procedures (SOPs) for auditing sampling and sample bank activities performed under the Resource Conservation and Recovery Act (RCRA) as well as conducting field audits of these activities when they are performed by EPA and EPA contractors. Although SOPs for auditing analytical methods and laboratory practices have been developed, guidelines for conducting evaluations of sampling and sample bank activities are generally lacking. This SOP provides the Agency with such guidelines for evaluating and auditing sample collection and sample bank activities.

This SOP provides audit personnel with a description of the components and organization of an audit program. Also discussed are administrative and procedural functions necessary to initiate, conduct and complete the audit and suggested qualifications and training requirements for audit personnel. The Appendix of the SOP provides checklists for use in conducting the audit. Checklists are presented for identifying and/or evaluating the use of proper sampling equipment and materials, sampling methodology, packaging, labeling and shipment of samples, quality assurance/quality control (QA/QC) protocols, sampling plans and sampling personnel.

CONTENTS

FIGURES

LIST OF TABLES

SECTION 1

INTRODUCTION

The primary objective of a sampling QA/QC plan is to determine the quality of the reported data and ensure that it is adequate to the degree required for the intended end use of the data. How this objective is met depends upon the purpose of the particular sampling program (Barth and Mason 1984).

Data resulting from any monitoring or sampling program cannot be evaluated and interpreted with confidence unless adequate quality assurance methods and procedures have been incorporated into the program design. Quality assurance/quality control has been used to develop a system for assuring the quality of the results by attempting to either provide control of the various steps in the interpretation or to provide adequate replication for statistically determining and quantifying the sources of variation or error in the chain.

In 1976, the USEPA (USEPA 1976) required that the quality of data considered to be acceptable must be defined as quantitatively as possible. The requirement for a quantitative standard for acceptability requires that a statistical sampling plan be developed that assures the precision, bias, completeness, comparability and representativeness of the sampling effort and of the resulting data.

This document is intended to address the EPA's quality assurance requirement (USEPA 1980a) to audit all sampling and monitoring activities that generate and process environmentally-related data for Agency use. It is not intended to provide peer review of the technical merit or to verify the scientific validity of the monitoring/sampling design, sampling devices or program protocols.

BACKGROUND

This SOP is designed for the process of auditing activities carried out by EPA and EPA contractors as a result of two acts of Congress. The Resource Conservation and Recovery Act (RCRA) (1976) was designed to set standards for the operation and maintenance of hazardous waste treatment, storage and disposal facilities. Section 3007 of the act authorizes EPA to enforce the Act by conducting inspections of facilities that handle hazardous wastes. On the other hand, the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (1980), or "Superfund" program, was designed to discover, study, mitigate and remedy abandoned or uncontrolled hazardous waste sites.

The EMSL-LV is responsible for the preparation of SOPs for auditing RCRA-related sampling and sample bank activities as well as conducting field audits of these activities when performed by EPA and EPA contractors. The object of these sampling activities is to provide the Agency with samples that

can be used for the generation of statistically representative, valid and dependable data. The data must, of course, be scientifically and legally defensible, which means the data must meet certain quality specifications usually defined in the Project and QA Plans. An audit is a systematic check to determine whether the project personnel are adhering to the steps, methods and protocols required by the Project and QA Plan.

The terms QA and QC are often used interchangeably. Quality assurance, however, refers to an integrated program of controls designed to address and certify the quality of data produced for a program or project. Quality control, on the other hand, refers to specific steps taken to monitor the measurement process. The term "quality" as applied to data pertains primarily to the following characteristics:

Accuracy - The degree to which the measurements represent the true or accepted value.

Precision - A measure of how closely individual measurements of the same kind are in agreement with each other, without regard to the true value.

The term Sample Bank refers to a facility used for sample storage, document control (i.e., chain-of-custody, logs, tags, etc.) and shipping of samples as opposed to the activities of actually taking the sample. Sampling activities require adherence to strict protocols as well as documentation of the activity. Sample Bank activities tend to emphasize the latter; as such, auditing these activities primarily involves verifying completeness of records, although Sample Bank activities may include sample preparation procedures (i.e., mixing, sieving, drying, etc.).

Figure 1 depicts a typical audit process flow diagram. The audit process requires considerable preparation to identify the steps and processes that are critical to achieving the goals defined in the Project and QA Plans. Once identified, these critical processes and steps are observed in the field by the audit team to verify that the Plans are being followed. In this way the Agency may be assured that the required quality of data is actually being achieved.

Table 1 provides a suggested schedule for conducting various parts of the audit. Note that this schedule is only an example, and that the time schedules for audits will vary depending on the size and complexity of the operation. A large project that has been going on for a year or more, involving hundreds of sampling points and perhaps thousands of samples, may require several weeks of preparation by six to ten auditors and a week or more to conduct the audit.

PURPOSE

As stated above, the purpose of the audit is to ensure that the protocols required by the Project Plan and QA Project Plan are in place and functioning well.

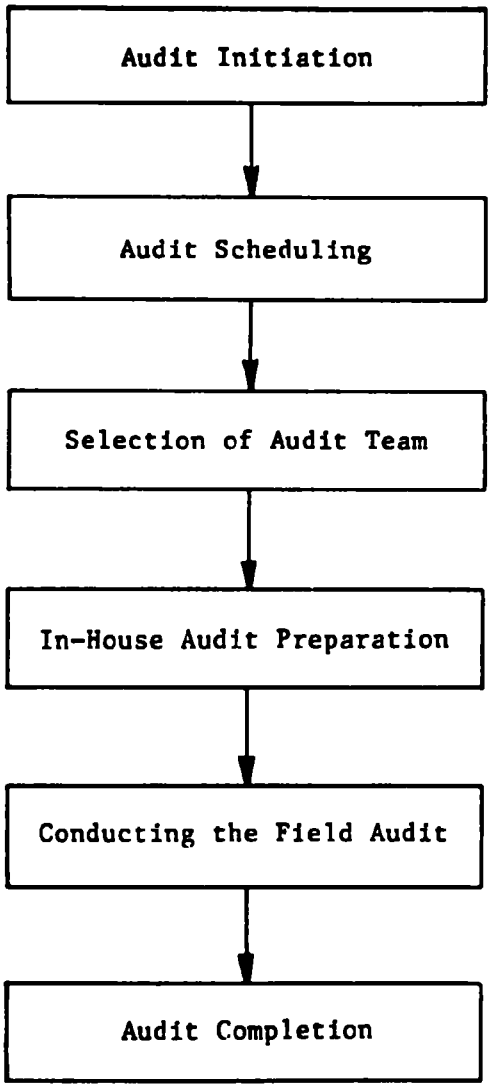


Figure 1. Audit process flow diagram.

Table 1. AUDIT SCHEDULE

Week	Activity
0	• Audit assigned by EMSL-LV Lab Director • Team Leader and members selected • Request Project Documentation
1	• Receipt of Project Documentation
2-3	• Preparation for audit
2	• Auditor arranges schedules with sampling Project Officer
3-4	• Conduct audit
4-6	• Prepare Final Report on audit

Specifically, the audit should (Brown and Hern, 1983):

- Verify that the sampling methodology and QA measures are being performed in accordance with program requirements.
- Verify that project documentation is in order (i.e., records, chain-of-custody forms, analytical tags, log books, work sheets).
- Verify the identity and qualifications of key project personnel.
- Identify QA problems.
- Require corrective actions, if necessary.
- Follow up on previous recommendations.
- Provide a written report of the audit.

It is important to note that this SOP addresses audits of sampling and sample bank activities, not technical audits to verify the scientific validity of sampling devices or protocols being used in a project. It is not an analytical audit, an evidentiary audit or an audit of safety procedures. The technical approach should be reviewed by several well-qualified scientists during the contract award and/or project peer review phase. Of course, if the audit team notes any technical deficiencies, it should discuss them with the Project Officer. Evidentiary audits are carried out through another office within the Agency, the National Enforcement Investigation Center (NEIC) (USEPA, 1980b). Analytical and health and safety audits are performed by others with backgrounds in these areas. In any case, problems in any of these areas should be pointed out to the Project Officer. The real thrust of the audit, however, should be to verify that the procedures specified in the Project and QA Plans are actually being followed.

The audit is designed to be well-announced and planned with the Project Officer of the sampling project, not a surprise inspection. There are several reasons for this:

- Inspectors and observers from EPA Regions and Project Offices are often on site.
- A surprise inspection may cause confusion among the field personnel and the other Agency observers.
- A surprise inspection may hinder the field operations.
- Due to the hazardous nature of many field projects, unannounced visits could increase the risk of accidents.
- Key personnel and/or log books and sampling records may not be available.

An unannounced audit is advantageous only because of the element of surprise. Since it allows little time for correcting any problems or deficiencies that occur, an unannounced inspection should be performed only if there is information indicating that there are serious problems with the sampling program.

SECTION 2

AUDIT TEAM

INTRODUCTION

The audit team should consist of at least two people and usually four or more. The size of the team will depend upon the extent of the operations being audited; however, any operations which are potentially hazardous must be performed using the buddy system.

Since the disciplines required to perform sampling activities are quite varied, the audit team must have a variety of technical expertise. Backgrounds may include the earth sciences, chemistry, engineering, health and safety, biology and environmental science. As far as possible, the team should be composed of specialists having overlapping experience in the various fields of science and engineering related to the project to be audited.

The team must consist of professional individuals. The process of reviewing the work of others and making constructive, objective evaluation is required. The additional aspect of a hazardous environment requires that personnel be alert, safety conscious and possess a high degree of professionalism.

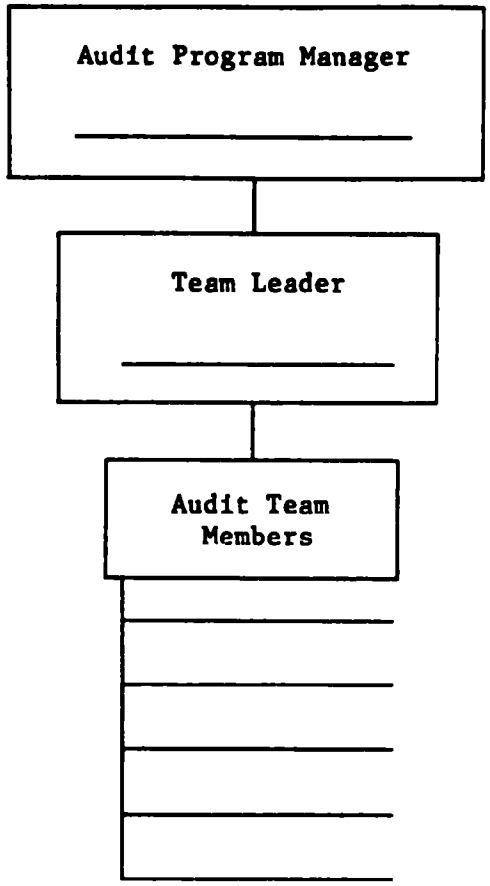
Organization Overview

As shown in Figure 2, the audit team reports to the Audit Program Manager, who has overall responsibility for the audit and final report. The team leader is primarily responsible for leading the team through the preparation, the site visit and the preliminary report preparation.

Training Requirements

This section focuses on the training that auditors should have. Training should be similar to that required for other personnel involved in hazardous waste site/facility investigations (JRB undated, USEPA 1980b). The following subject areas should constitute the personnel training program:

- Performing an audit.
- RCRA/CERCLA Regulations, including the rights of inspectors and owner/operators of hazardous waste sites/facilities (JRB undated).
- Safety protocols, including removal, decontamination and disposal of clothing and equipment used during site visits and use and restrictions of clean areas.
- Safety equipment, including the use of respirators and self-contained breathing apparatus (SCBA) and protective clothing.
- First aid/cardiopulmonary resuscitation (CPR).
- Site-specific contingency and evacuation plans.



Member	Recommended Minimum Qualifications
Program Manager	Bachelor's degree or 3-8 years' experience 3 years' audit experience 1 year as Team Leader
Team Leader	Bachelor's degree or 3-8 years' experience 2 years' audit experience
Team Member	Bachelor's degree or 3-8 years' experience Attended 2 audits as observer

Figure 2. Audit team.

- Legal ramifications of the audit, including requirements of chain-of-custody (Hart, F. C. 1981), preservation of evidence and witness and testimony responsibilities.
- Recognition and evaluation of extent of hazards, methods used to control risks and chemical compatibilities/reactions.
- Personal hygiene, including prohibitions against eating, drinking and smoking (USEPA 1979) and the effect of facial hair on respirator efficiency.
- Certification at the intermediate and/or advanced level of EPA's Health and Safety Training Program (USEPA 1981).

Refresher courses in first aid, CPR, use of safety equipment and safety training should be repeated at least once a year. Hazards specific to a particular site should be discussed at pre-audit meetings.

Medical and Health Requirements

This section presents the minimum medical and health standards that should be met by auditors of hazardous sampling activities and the continuing medical care requirements recommended for these auditors. As with training requirements, the health and medical requirements are similar to those for people who work on-site and are involved in clean-up activities or in other hazardous waste handling activities (JRB undated). An excellent medical program designed for laboratory and field workers exposed to toxic materials is presented in USEPA 1984.

Team members should undergo medical examinations periodically throughout their assignment. An initial examination is required prior to participation in any activity dealing with hazardous materials; follow-up examinations should be performed at least once a year. Additional examinations may be called for if the person has been subjected to uncontrolled or unsafe conditions where he may have been exposed to potentially hazardous material. Finally, an exit examination is required whenever a team member terminates his employment or is reassigned to an unrelated program.

Physicians conducting the examinations must be certified to practice occupational medicine. Records must be kept for thirty years, and the worker must sign a release form authorizing the physician to release all relevant medical records to the Agency in accordance with OSHA's rule on Access to Employee Exposure and Medical Records (29 CFR Part 1910).

The physical examinations should include the following:

- Personal/family history
- Work history
- Standard physical examination
- Visual acuity measurements
- Audiogram
- Pulmonary function tests
- Chest X-ray

- Electrocardiogram
- Urinalysis, including occult blood
- Complete blood count (CBC)
- Sequential multiple analyzer computer-23 (SMAC-23) profile which includes calcium, phosphorus, glucose, uric acid, blood urea nitrogen (BUN), creatinine, albumin, serum glutamic-pyruvic transaminase (SGPT), serum glutamic oxalacetic transaminase (SGOT), lactate dehydrogenase (LDH), globulin, adenosine/guanosine (A/G) ratio, chloride, CO_2, triglycerides, cholesterol and creatinine/BUN ratio

At the physician's discretion, other tests may be performed which are related to possible exposures to hazardous materials. For example, exposure to benzene may require a complete blood count, serum bilirubin and phenol in urine, while exposure to heavy metals may require further tests of the respiratory system, kidney and blood, as well as tests for heavy metals in urine.

A personal emergency card must be completed for each team member and be carried as part of the equipment and supplies that accompany the team to the site. This card should include blood type; allergies to drugs, insect bites or plants; current medical problems and treatments; special problems such as contact lenses; name of personal physician and any other information which may be important in case of an accident.

AUDIT PROGRAM MANAGER

Qualifications

The Audit Program Manager must possess technical as well as managerial talents. Since the team consists of professionals with a variety of scientific and engineering backgrounds, the background of the manager should be as multidisciplinary as possible and preferably be centered around environmental science. At a minimum, the Audit Program Manager should have a bachelor's degree in a scientific or engineering field or have related professional experience, three years' experience as an auditor of related activities (or participation in at least ten audits) and one year's experience (or four audits) as an audit team leader.

Responsibilities

The Audit Program Manager receives the audit assignment from the appropriate EPA Laboratory or Office Director. The Program Manager selects a Team Leader and, with the Team Leader's assistance, the team members; he also makes assignments to individual members, assists the Leader, where necessary, in preparing for the audit and approves all plans and reports. Finally, the Program Manager is responsible for retaining all records and reports of the audit proceedings.

AUDIT TEAM LEADER

Qualifications

The Team Leader should be selected from among those team members who have participated in a number of audits and have demonstrated clear managerial and leadership qualities. It is recommended that, at a minimum, the Team Leader have a bachelor's degree (or three to eight years of applicable work experience) in a scientific or engineering field and two years' experience (or participation in six audits) as an audit team member.

Responsibilities

The Team Leader receives his assignment from the Program Manager. He helps in selecting team members and making assignments and leads the team in preparing, conducting and reporting the results of the audit.

AUDIT TEAM MEMBERS

Qualifications

It is recommended that each member have either a bachelor's degree in an appropriate scientific or engineering discipline or three to eight years of applicable work experience. In addition, he should have at least one year of experience in performing field sampling.

Responsibilities

The team members work with and take direction from the Leader in preparing for, conducting and reporting the results of the audit.

SECTION 3

IN-HOUSE AUDIT PREPARATION

OVERVIEW

Once the assignment has been received and the team selected, members should prepare to conduct the audit by reviewing documents on the project, including protocols and progress reports. In reviewing the documents and preparing for the audit, the audit team should prepare checklists to aid in identifying procedures in the field that are critical to the project goals. Example checklists are presented in the Appendix. This checklist or portions thereof may require modification to account for site-specific factors. Preparations for the field audit/site visit should also include a review of health and safety precautions and of the field equipment needed for the audit. Final preparations should include communications with the Project Officer regarding the anticipated schedule, the activities to be observed, any current problems and assistance with health and safety aspects, including the safety equipment available at the site for the audit team.

The products of the in-house audit preparation should include:

- Assignments for the Team Members during both the preparation and the field audit phase.
- Checklists to identify and verify performance of critical sampling activities.
- List of equipment and supplies needed during the audit.
- Schedule of activities for the site visit, including the introductory meeting with senior field personnel, the various audit activities, a session for the team to prepare for the debriefing and, finally, the debriefing of site personnel.

AUDIT INITIATION

Audit Initiation and Arrangements

This section focuses on the protocol involved in setting up an audit. Generally, the audit is initiated by a written request to the appropriate EPA Office or Laboratory Director (e.g., EMSL-LV) from an EPA Regional Office responsible for a sampling project.

Acceptance of the request, along with the name, address and phone number of the Audit Program Manager, is communicated by the appropriate Agency Laboratory, Office or QA Officer. Further communication is conducted through the Audit Program Manager. Rejection of the request would be routed through the same channels, but without the need to identify a Program Manager. The requesting Office must identify the Project Officer to whom communication should be directed over the course of the audit.

Request and Receipt of Documentation

Once he has been identified to the EPA Regional Officer and the Project Officer, the Audit Program Manager should request background documents, such as those listed below, from the Project Officer.

- Project Plan
- QA Project Plan and QA Reports
- Protocols and Methods
- Chain-of-Custody Procedures and Documents
- Previous Audit Reports from other offices or agencies
- Project and Progress Reports
- Contract and Proposals
- Documents to provide background information on the site (e.g., RCRA permit applications, preliminary assessment reports, groundwater monitoring plans, etc.)
- Health and Safety Plan including contingency and evacuation plans

The Project QA plan must be approved by the requesting office's QA Officer or equivalent before submission to the auditor.

If the project involves a RCRA-regulated site, background documents that may be helpful include Part A and applicable sections of the Part B permit (e.g., Waste Analysis Plan, Groundwater Monitoring Plan, etc.) of the facilities' permit applications. If the project involves a CERCLA site, a preliminary site assessment report or other information may be available.

Once the Audit Program Manager has made initial contact with the Project Officer, he should identify the Team Leader so that further communication may be directed to him.

Prior to the site visit, the Team Leader and/or Health and Safety Specialist should determine what potential health and safety risks may be encountered on site and become familiar with the site layout, various site activities and contingency plans, including evacuation routes. When possible, provisions are made with the Project Officer for field personnel to accompany audit personnel whenever hazardous activities are involved: It will be safer if the audit team members are accompanied by someone who is familiar with the site and the specific hazards the team will face. To lessen the expense and time needed to prepare for the audit, the team may also inquire into the availability of safety equipment and protective clothing. The field personnel should have all the necessary safety equipment for the audit team, but such prior arrangements will ensure availability.

REVIEW AND ASSESSMENT OF DOCUMENTATION

Guidelines

The project documents should be reviewed in order to clarify the overall project goals so that the activities which are critical to those goals may be

audited. Items the auditors should review include: site layout, sampling strategies and methods, QA/QC procedures, any current problems with and/or on-site modifications of sampling methods and techniques of the project.

The Audit Team Manager and Team Leader should make assignments for the team members based upon the site activities to be audited and the available team members' backgrounds. Sampling and sample bank activities may be either chemical, geological or biological in nature. Assignments for the audit in-house preparation and field activities should be matched to the team members whose experience best suits these assignments. For example, some assignments may require more experience in health and safety, or engineering or geology.

Evaluation of Plans and Protocols

Up to two weeks may be required for evaluating the project documentation, planning, modifying checklists and completing those items on the checklists not requiring on-site observation (NOTE: Though some items may not require on-site observation, they should be verified on-site whenever possible).

First, the project activities which are called for in the Project Plan and QA Project Plan and which are critical to the project goals should be identified. Using the checklists in the Appendix as a starting point, the team should identify each critical step in each activity. Whether or not these steps in the procedures and protocols are being followed as prescribed in the Project Plan and QA Project Plan will be verified during the field audit. It should be noted that the technical merit of the methods and protocols should not be addressed unless there are significant problems which will affect the achievement of project goals. The checklists in the Appendix may be comprehensive enough to use in auditing any RCRA or CERCLA site. Realistically, however, situations will be encountered in which the audit team will have to "customize" the checklist to cover the specific sampling activities of a site.

The Project Plan should contain the criteria used to select both the sampling points and the sampling methods. An understanding of these criteria is necessary in determining which steps are critical to the project goals and thus must be observed during the site visit. Other information, such as the contract, proposal and site background document, will also help in understanding the reasoning behind the activities prescribed in the Project Plan.

The QA Project Plan contains specific policies, activities and control procedures which, when followed, should yield data that meet certain quality parameters. This document should contain the parties responsible for the QA program, the QA objectives for the measurement processes, chain-of-custody, sampling, sample custody, calibration, analytical and data reporting procedures, and the frequency of performance audits, preventative maintenance, corrective actions and QA reports (USEPA 1980). In reviewing this document, the measurement processes that are critical to the project goals should be

identified. The necessary checklists which pertain to verifying these steps in the field must be reviewed and/or revised for each of these processes. The checklists should also contain information for verifying that all samples critical for meeting the QA objectives as stated in the QA Plan are being met. Also, samples for determining accuracy and precision must be identified and the records showing frequency of calibration and preventative maintenance measures must be noted. In many cases, the above documents may only reference the literature (i.e., reference methods in the Federal Register), instead of containing complete copies of the detailed protocols and methods to be used in the project. Reviews of these references may be necessary to completely identify the critical steps which should be included in the checklist and verified during the site visit.

Due to available resources and/or time constraints, only a portion of the sampling program may be selected for auditing. For example, if the chain-of-custody procedures were selected for audit, only those methods, forms, document control procedures and security devices (i.e., evidence tape, locks, etc.) would be examined and as such, only checklists addressing these operations would be required.

Previous audit reports and Project Progress Reports may contain problems, changes in procedures and suggested corrective actions which will need to be reviewed. The checklists should identify observations which should be made when following up on these items.

The Team Leader and/or Audit Program Manager should communicate with the Project Officer and QA Officer on questions that surface during audit preparation and inquire about the current status of the project.

Evaluation of Personnel Qualifications

In preparing for the audit and reviewing the Project Plan, a list should be made of key field personnel, their positions and functions within the organization and their qualifications. Key field personnel include levels such as project manager and middle manager, scientific and engineering specialists and consultants and first-line field supervisors. Checklists should include notations of observations which are necessary to verify that these people are still performing their functions and that if any personnel changes have taken place, the replacements have the qualifications necessary to perform their functions.

IN-HOUSE PREPARATION FOR FIELD AUDIT

Planning Meetings

Once the audit team has been assembled, assignments have been made, and team members have studied project documents, a series of planning meetings should be held to:

- Review project documents
- Discuss health and safety considerations

- Review/revise checklists
- Develop lists of equipment and supplies
- Develop a site visit schedule

Safety and Health Considerations

The meeting which is held to review general safety and health protocol should also be used, when appropriate, to review the specific health and safety aspects that the audit team will face when inspecting a particular site.

During initial discussions with the Project Officer, the Team Leader and/or a Health and Safety Specialist assigned to assist the audit team should have determined what health and safety problems the team may face during the site visit. The audit team may need to provide their own safety equipment, or the equipment may be available through the sampling team. This equipment may include boots, goggles, gloves, respirators, coveralls, SCBA, detector tubes, oxygen meter, Geiger counter, combustible gas detector, etc. Necessary equipment may be available through the office or company performing the sampling work, but they should not be relied upon to furnish safety equipment. Arrangements must be made in advance for each piece of equipment the team may need.

Required Equipment/Materials

During the planning meetings, a list should be prepared of equipment and materials that will be required to conduct the audit. One team member should be assigned to obtain all of the necessary safety, sampling and auditing equipment. Figure 3 presents a checklist for identifying the necessary equipment and materials and confirming that they have been assembled.

FIELD AUDIT PREPARATION CHECKLIST

Completed by: _____ Audit Date(s): __/__/__ to __/__/__

Project Name/Description: _____

_____

_____

Equipment/Materials	Required? Yes	Required? No	Obtained and Inspected? Yes	Obtained and Inspected? No	Obtained and Inspected? N/A	Date
Boots	☐	☐	☐	☐	☐	__/__/__
Goggles	☐	☐	☐	☐	☐	__/__/__
Gloves	☐	☐	☐	☐	☐	__/__/__
Respirators	☐	☐	☐	☐	☐	__/__/__
Protective Clothing	☐	☐	☐	☐	☐	__/__/__
Detector Tubes	☐	☐	☐	☐	☐	__/__/__
Oxygen Monitor	☐	☐	☐	☐	☐	__/__/__
Geiger Counter	☐	☐	☐	☐	☐	__/__/__
Combustible Gas Detectors	☐	☐	☐	☐	☐	__/__/__
Decontamination Equipment	☐	☐	☐	☐	☐	__/__/__
First Aid Equipment	☐	☐	☐	☐	☐	__/__/__
Radio Equipment	☐	☐	☐	☐	☐	__/__/__
Snake Bite Kit	☐	☐	☐	☐	☐	__/__/__
Personal Emergency Cards	☐	☐	☐	☐	☐	__/__/__

NOTES: _____

_____

_____

Figure 3. Field audit preparation checklist.

SECTION 4

CONDUCTING THE FIELD AUDIT

OVERVIEW

The Team Leader and the Project Officer should make the final arrangements for the site visit to conduct the audit. Prior to the site visit, a schedule of the audit should be mutually agreed upon which will not substantially interfere with the project. The audit should be conducted in a professional, objective manner. Personality conflicts, personal preferences, biases, and bad manners must not be allowed to detract from an objective audit of the project. Audits are not intended to threaten, intimidate or abuse in any manner the sampling and monitoring performance.

PERFORMING THE AUDIT

Protocol--Do's and Don'ts

The following is a list of items identifying some rules of etiquette that should be followed when conducting the on-site sampling audit:

Do's

- Upon arrival at site, immediately identify audit team personnel to the Project Officer or the most senior project person on site.
- Meet with the project personnel and review the intended work schedule, identifying which on-site personnel and operations will be involved in the audit.
- Review all safety requirements, hazards and the safety equipment which will be used on site.
- Conduct the audit during normal working hours and at the convenience of the owner or manager of the site and the Project Officer.

Don'ts

- Don't verbally render judgment to site personnel.
- During the on-site visit, the audit team members are strictly observers, not participants.
- Don't hinder operations.

Methodology

After the introductory meeting of the audit team with the senior project personnel on-site and a review of the audit schedule and tasks, team members should start performing their audit functions using the checklists.

Whenever possible, it should be verified that the documentation is in order and is sufficient to establish the disposition of any collected sample by inventorying the sample bank records and archived samples. The flow of

specific samples should be traced through the system. Records reviewed should include: chain-of-custody (COC) forms, sample tags, custody seals, shipment forms, logbooks and archived samples. Logs must be clear and concise. Changes to the log books should be made by the field personnel by lining through, so that the original entry is still visible; the change is then initialed. Problems should be documented in the logs.

The use of personnel identified in the Project Plan, QA Plan and contract proposal, including all managers, middle managers, professional specialists and first-line field supervisors, should be verified.

Activities performed by the sample bank custodian(s) should be observed. Before accepting custody of any samples, sample bank personnel should check to make sure that:

- Each sample has a completed sample collection tag attached.
- Each sample is identified on the COC form.
- A sample/site description form or record has been completed for all samples.
- Discrepancies are corrected.

Sampling methods and sample handling procedures should be observed first-hand. A sampling methods audit encompasses proper equipment, sampling locations, location documentation, decontamination, container preparation (i.e., labeling, storing, preserving and COC documentation), field logbooks and notes. Sample handling procedures may include drying, sieving, mixing, compositing, splitting, packaging and shipping.

Use the checklists for documentation while observing the following:

- Housekeeping--safety, decontamination, accident documentation and security
- Sampling equipment and containers
- Cleaning and storage of sampling equipment (USEPA 1980c)
- Preparation of collection procedures
- Frequency of collection of field blanks, replicates, splits and spikes (if any)

POST-AUDIT DEBRIEFING

Responsibilities

The Team Leader should meet alone with the team members to review their results and determine what should be addressed at the debriefing. The review should address the following points, allowing team members to summarize their findings:

- Sampling activities and documentation
- Sample Bank activities and documentation
- QA problems
- Follow-up on previous recommendations
- Summary

The Team Leader should take notes and prepare a presentation for the debriefing.

Audience

The debriefing should be held between the team and the project personnel deemed appropriate by the Project Officer.

Results Presentation

In most cases, the Team Leader should conduct the debriefing and review the team's initial findings. The Leader may choose to let team members comment on their own findings. It should be made clear that the results of the audit are still tentative at this stage, and that the final audit results will be reported in writing within three weeks.

The format of the debriefing may conform to the outline used above in the team meeting. Project personnel should be allowed to make comments after each topic is discussed. The Team Leader should request any further documentation, such as resumes of new people, copies of additional protocols, etc., that he or she may need for the final report.

If any serious problems were discovered during the audit, they should be resolved by discussions with the Project Officer and the Regional EPA Office that requested the audit as soon as possible.

SECTION 5

AUDIT COMPLETION

OVERVIEW

The audit is completed by comparing the findings of the site visit with the project requirements and documenting the results in a written report.

REPORT PREPARATION

Each team member should write a report on his findings and include a copy of his completed checklists. The report is then assembled into a consensus document by the Team Leader and reviewed by the Audit Program Manager. After revisions, the final report, signed by the Team Leader and approved for distribution by the Program Manager, is released to the office requesting the audit and to the sampling Project Officer.

The cover page of the report should be similar to that shown in Figure 4 (USEPA 1983). The report should contain a summary of observations in the following areas:

- Sampling activities and documentation
- Sampling Bank activities and documentation
- QA problems
- Follow-up on previous recommendations
- Summary

The last section should present conclusions and recommendations. The complete checklists should be attached as an appendix.

CORRECTIVE ACTION

Scope

The report should clearly identify the points which require corrective action. These should be in the form of recommendations made to the Office requesting the audit.

Follow-up

If follow-up is desired by the EPA Regional Officer, a schedule can be discussed between the Audit Program Manager and the Regional Office, and then approved by the appropriate Agency Office or Laboratory Director.

AUDIT REPORT

Project Name: _____

_____

Audit Date: _____

Audit Team:
(Name, Affiliation) _____

_____

_____

_____

_____

Project Personnel Contacted

Project Officer: _____

Other Personnel:
(Names, titles,
affiliations) _____

_____

_____

_____

_____

_____

Signatures/Date

Team Leader: _____

Audit Program Manager: _____

Figure 4. Cover page of audit report.

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APPENDIX

SAMPLING AUDIT CHECKLIST FOR RCRA/CERCLA ACTIVITIES

I. GENERAL INFORMATION

Audit Dates: __/__/__ to __/__/__

Arrival Time: _____ ☐ a.m. ☐ p.m.

Departure Time: _____ ☐ a.m. ☐ p.m.

Facility/Site Information

Facility/Site Name: _____

Facility/Site Address or Location: _____

_____

_____

Facility/Site Telephone No.: (____) ____ - _____ ☐ N/A[(a)]

Facility Contact (Name/Title): _____

_____

☐ N/A

Function/Description of Facility/Site: _____

_____

_____

_____

Treatment/Storage/Disposal (TSD) Processes/Units at Facility/Site:

☐ Container
☐ Tank
☐ Waste Pile
☐ Incinerator
☐ Landfill
☐ Land Application
☐ Surface Impoundment
☐ Non-regulated Disposal (spill, dump, etc.)
☐ Other (describe) _____

_____

_____

(a) Not applicable or not available.

Media Being Sampled:

☐ Waste-Liquid ☐ Waste-Slurry
☐ Waste-Solid ☐ Waste-Gas
☐ Soil ☐ Groundwater
☐ Surface Water ☐ Other (describe) _____

_____

_____

Sampling Team Information

Team Contact (Name/Title/Affiliation): _____

_____

_____

Team Members (Name/Title/Affiliation):

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

Team Contact Telephone No.: (____) ____ - _____

Team Contact Address: _____

_____

_____

Brief Description of Sampling Team Efforts/Objectives:

_____

_____

_____

_____

_____

_____

_____

Audit Team Information

Team Leader (Name/Title/Affiliation): _____

_____

Team Members (Name/Title/Affiliation):

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

II. SAMPLING PLAN

1. Is a Sampling Plan available for review? ☐ Yes ☐ No

   Comments: _____

   _____

2. Does the Sampling Plan discuss the objectives of the sampling program to be performed and how the sampling approach(es) will satisfy program requirements? ☐ Yes ☐ No

   Comments: _____

   _____

   _____

   _____

   _____

3. Are levels of precision and confidence levels identified in the Plan? ☐ Yes ☐ No

   Comments: _____

   _____

4. Does the Plan describe the system to be used for identifying, logging and tracking all samples obtained? ☐ Yes ☐ No

   Summarize the tracking system below under Comments.

   Comments: _____

   _____

   _____

   _____

   _____

5. Are criteria used to select sampling methods, including sampling equipment and procedures discussed in the Sampling Plan? ☐ Yes ☐ No

   Comments: _____

   _____

   _____

6. Is a discussion of the limitations of each sample method presented? ☐ Yes ☐ No ☐ N/A

Comments: _____

_____

_____

7. Does the Plan identify criteria used for selecting the media (e.g., soil, groundwater, wastes, etc.) to be sampled? ☐ Yes ☐ No

Comments: _____

_____

_____

_____

8. Does the Sampling Plan identify criteria used for selecting sampling points for each type of unit (e.g., containers, tanks, waste piles, surface impoundment, etc.)? ☐ Yes ☐ No

Comments: _____

_____

_____

_____

_____

9. Does the Sampling Plan provide detailed protocols, identifying the size, number, locations, and types of samples to be collected? ☐ Yes ☐ No

Comments: _____

_____

_____

_____

10. Does the Plan describe procedures for and the extent of compositing or other sample reduction methods? ☐ Yes ☐ No

Comments: _____

_____

_____

_____

11. Are the types of sample containers and methods and materials used to clean these containers identified in the plan? ☐ Yes ☐ No

    If Yes, is the method of cleaning appropriate? ☐ Yes ☐ No

    Comments: _____

    _____

    _____

    _____

    _____

12. Are there separate cleaning procedures for sample containers used for organic and inorganic samples? ☐ Yes ☐ No

    Comments: _____

    _____

13. Are field decontamination procedures and materials for sampling equipment discussed in the Plan? ☐ Yes ☐ No

    Comments: _____

    _____

    _____

III. SAMPLING EQUIPMENT/MATERIALS

A. General

1. Is sampling equipment maintained on regularly scheduled basis?
☐ Yes ☐ No

   If Yes, is this schedule documented? ☐ Yes ☐ No

   Comments: _____

   _____

2. Is sampling equipment inspected prior to each use for defects, proper operation and where applicable calibration? ☐ Yes ☐ No

   Comments: _____

   _____

   _____

3. Are calibration methods identified? ☐ Yes ☐ No ☐ N/A

   Comments: _____

   _____

   _____

   _____

   _____

4. Are records or logs kept identifying:

   ☐ Equipment inspection dates? ☐ Inspection results?
   ☐ Inspector's name? ☐ Corrective actions taken?

   Comments: _____

   _____

   _____

   _____

   _____

5. Are glass containers with Teflon-lined screw caps used to collect the following types of samples:

   a. Water samples for organic analyses? ☐ Yes ☐ No
   b. Soil and sediment samples? ☐ Yes ☐ No
   c. Liquid and solid hazardous waste samples?(a) ☐ Yes ☐ No

   Comments: _____

6. Are polyethylene bottles with solid polyethylene or polyethylene-lined caps used to collect the following types of samples:

   a. Water samples for metal analysis? ☐ Yes ☐ No
   b. Water samples for pH and fluoride analysis? ☐ Yes ☐ No
   c. Water samples for cyanide analysis? ☐ Yes ☐ No

7. Are amber glass or aluminum foil-wrapped glass bottles used for samples suspected of being photosensitive? ☐ Yes ☐ No

   Comments: _____

8. Are equipment decontamination methods and materials described in the Sampling Plan practiced in the field? ☐ Yes ☐ No

   Comments: _____

9. Is all sampling equipment constructed of materials that are compatible with the wastes being sampled? ☐ Yes ☐ No

(a) Highly alkaline wastes and wastes known to contain hydrofluoric acid should be collected in plastic containers. If it is suspected that highly alkaline materials or hydrofluoric acid is present, a small sample should be tested to determine if it reacts with the sample container.

10. Where the nature and identity of the sample(s) material is unknown, is the compatibility of the sample material and sampler material tested prior to obtaining a sample? ☐ Yes ☐ No ☐ N/A

Comments: _____

_____

_____

11. Is any of the equipment plated or painted? ☐ Yes ☐ No

Comments: _____

_____

12. Are mixing containers and tools completely decontaminated or replaced prior to mixing the next sample? ☐ Yes ☐ No

If decontaminated, are decontamination methods adequate? ☐ Yes ☐ No

Comments: _____

_____

_____

_____

_____

13. Where the presence of ignitable materials is suspected are sampling equipment and devices being used spark and/or explosion-proof? ☐ Yes ☐ No

Comments: _____

_____

B. Waste Sampling

1. Are wastes being sampled at this site? ☐ Yes ☐ No

If No, go to Subsection C.

Comments: _____

_____

2. Identify the sampling device(s) used for sampling drums:

☐ Glass tubing
☐ Composite Liquid Waste Sampler (COLIWASSA)
☐ Drum pump or other pump system (describe below)

☐ Syringe
☐ Remote hydraulic penetrating sampler
☐ Other (describe below)

Comments: _____

_____

_____

_____

3. Identify the sampling device(s) used for sampling tanks:

☐ COLIWASSA
☐ Tank Valves
☐ Pump system (describe under Comments)
☐ Weighted bottle sampler
☐ Van Dorn/Nansen bottle
☐ Kemmerer bottle
☐ Other (describe under Comments)

Comments: _____

_____

_____

_____

4. Identify the sampling device(s) for waste pile sampling:

☐ Scoop/spatula
☐ Auger
☐ Core sampler
☐ Sample trier
☐ Other (identify under Comments)

Comments: _____

_____

_____

_____

5. Is the sampler being used to sample waste piles at least twice the diameter of the largest solid particles in the waste pile? ☐ Yes ☐ No

Comments: _____

_____

_____

_____

6. Identify the sampling device(s) used to sample liquids from surface impoundments, lagoons, pits, ponds, etc.:

☐ Pond sampler
☐ Van Dorn/Nansen bottle
☐ Kemmerer water bottle
☐ Air lift sampler
☐ Weighted sample bottle
☐ COLIWASSA
☐ Other (describe under Comments)

Comments: _____

_____

_____

_____

7. Identify the sampling device(s) used to sample sludges from tanks, surface impoundments, lagoons, pits, ponds, etc.:

☐ Eckman, Peterson or Smith-McIntyre grab samplers
☐ Core sampler
☐ Other (identify under Comments)

Comments: _____

_____

_____

C. Soil Sampling

1. Is soil being sampled at this site? ☐ Yes ☐ No

If No, go to Subsection D.

Comments: _____

_____

_____

2. Identify the sampling device(s) used for soil sampling:

☐ Scoop/spatula/shovel
☐ Soil auger
☐ Core sampler
☐ Other

Comments: _____

_____

_____

3. Is any soil or sludge sampling equipment plated or painted? ☐ Yes ☐ No

Comments: _____

_____

4. Does the plating or paint material contain any of the metals and/or organics to be analyzed for in the sample? ☐ Yes ☐ No

Comments: _____

_____

D. Groundwater Sampling

1. Is groundwater being sampled at this site? ☐ Yes ☐ No

If No, go to Subsection E.

2. Identify the sampling device(s) used for groundwater sampling:

☐ Manual bailer
☐ Air-lift sampler
☐ Peristaltic pump
☐ Submersible pump
☐ Eductor pump
☐ Other (identify and describe under Comments)

Comments: _____

_____

_____

3. What are the materials of construction (MOC's) for the well casing?

_____

_____

4. What are the MOC's for the well screen? _____

_____

5. Do the MOC's potentially interfere with or jeopardize analytical results obtained on the groundwater? ☐ Yes ☐ No

Comments: _____

_____

_____

6. Is the device(s) used to measure well depth and depth to the water level thoroughly cleaned prior to use in another well? ☐ Yes ☐ No

If Yes, how is it cleaned?

Comments: _____

_____

_____

_____

_____

7. Are sampling pumps serviced and calibrated after each use? ☐ Yes ☐ No

   If Yes, are maintenance and calibration records available for verification? ☐ Yes ☐ No

   Comments: _____

   _____

   _____

8. Are pump parts and attachments that will come into contact with wastes made of compatible materials? ☐ Yes ☐ No

   Comments: _____

   _____

   _____

9. Are all pumps checked for proper operation prior to use? ☐ Yes ☐ No

10. During sampling are pumps run at the same rate or within the range of which they were calibrated? ☐ Yes ☐ No

    Comments: _____

    _____

    _____

E. Air Sampling

1. Is air being sampled at this site? ☐ Yes ☐ No

   If No, go to Subsection F.

2. Identify the sampling device(s) used for air sampling:

   ☐ Oxygen indicators
   ☐ Combustible gas detectors
   ☐ Hydrocarbon analyzers (identify detector type (e.g., flame ionization, infrared, photoionization, etc.) under Comments)
   ☐ Detector tubes
   ☐ Solid sorbent cartridges/pump
   ☐ Other (identify and describe under Comments)

   Comments: _____

   _____

   _____

   _____

3. Are instruments cleaned, serviced and calibrated after each use? ☐ Yes ☐ No

If Yes, are maintenance and calibration records available for verification? ☐ Yes ☐ No

Comments: _____

_____

_____

4. Are instruments calibrated at the temperature of intended use? ☐ Yes ☐ No

Comments: _____

_____

_____

5. Is all equipment checked for proper operation prior to use? ☐ Yes ☐ No

Comments: _____

_____

_____

6. Are detector solutions for oxygen meters replaced with the frequency specified by the manufacturer? ☐ Yes ☐ No

Comments: _____

_____

7. Are instrument batteries checked for full charge prior to each use? ☐ Yes ☐ No

Comments: _____

_____

8. Are instruments allowed to warm up prior to use? ☐ Yes ☐ No

9. Are oxygen meters calibrated against fresh air? ☐ Yes ☐ No

If No, what is used for calibration?

Comments: _____

_____

_____

10. Are combustible gas meters zeroed in combustible gas-free ambient air? ☐ Yes ☐ No ☐ N/A

Comments: _____

_____

11. If calibrated with a specific gas, are differences in the combustible limits of other gases that may be encountered taken into consideration when recording results (e.g., conversion tables may be available to obtain the low explosive limits (LEL) for combustible gases other than the one used for calibrating)? ☐ Yes ☐ No ☐ N/A

Comments: _____

_____

_____

12. For combustible gas meters with a non-adjustable calibration control, is a calibration curve prepared and applied? ☐ Yes ☐ No ☐ N/A

Comments: _____

_____

13. If in-line filters are used in hydrocarbon detectors, are the frequency of cleaning and cleaning procedures discussed in the Sampling Plan? ☐ Yes ☐ No

If No, briefly describe the frequency and procedures below.

Comments: _____

_____

_____

_____

Are gas concentrations measured within the limits of the calibration curve? ☐ Yes ☐ No If No, how are these data treated?

Comments: _____

_____

_____

_____

14. If solid sorbent cartridges are used to collect air samples and are not prepacked, are the cartridges thoroughly cleaned prior to packing the sorbent? ☐ Yes ☐ No

Are the cleaning procedures described in the Sampling Plan? ☐ Yes ☐ No

Comments: _____

_____

_____

15. Has the solid sorbent being used been selected for its efficiency in collecting the desired contaminant(s)? ☐ Yes ☐ No

Is the applicability of the sorbent in regard to the contaminant(s) referenced? ☐ Yes ☐ No

16. If the solid sorbent cartridges are not obtained prepacked, are procedures for cleaning and conditioning the solid sorbent documented? ☐ Yes ☐ No

Comments: _____

_____

17. If sampling pumps are used, are they calibrated prior to each use? ☐ Yes ☐ No

If Yes, is the calibration method documented? ☐ Yes ☐ No

Comments: _____

_____

18. Are calibration records for pumps available? ☐ Yes ☐ No

Comments: _____

_____

_____

19. If polyurethane foam (PUF) is used as a collection media has it been thoroughly cleaned by Soxhlet extraction using high-grade hexane prior to use? ☐ Yes ☐ No

Comments: _____

_____

F. Biota Sampling

Plankton

1. Identify the type of sampling device(s) used for collecting phyto- and zooplankton:

☐ Kemmerer bottle
☐ Van Dorn/Nansen sampler
☐ Jarday sampler
☐ Pump
☐ Net
☐ Other (identify and describe under Comments)

Comments: _____

_____

_____

Periphyton

1. Identify the type of sampling device(s) used for sampling periphyton:

☐ Artificial substrate sampler (glass or plexiglass slides, contained rocks, etc.)
☐ Scraper (knife, spatula, etc.)
☐ Other (identify under Comments)

Comments: _____

_____

_____

Macrophytes

1. Identify the type of sampling device(s) used for sampling macrophytes:

☐ Rake
☐ Ekman dredge
☐ Petersen dredge
☐ Manual
☐ Other (identify under Comments)

Comments: _____

_____

Macroinvertebrates

1. Identify the type of sampling device used for macroinvertebrate sampling:

☐ Ekman dredge
☐ Smith-McIntyre
☐ Petersen dredge
☐ Core sampler

☐ Ponar grab
☐ Drift nets
☐ Artificial substrate sampler
☐ Other (identify under Comments)

Comments: _____

_____

_____

Fish

1. Identify the type of sampling device used for macroinvertebrate sampling:

☐ Seining
☐ Trawling
☐ Electroshock
☐ Chemical poisoning
☐ Gill/trammel nets
☐ Hoop/trap nets
☐ Other (identify and describe under Comments)

Comments: _____

_____

_____

Vegetation

1. Are vegetative samples collected for analysis? ☐ Yes ☐ No

   Are vegetative subsamples composited? ☐ Yes ☐ No

   Comments: _____

   _____

   _____

2. What sampling approach is used to sample vegetation:

☐ Quadrats
☐ Transects
☐ Loop method
☐ Variable plot method
☐ Random pairs method
☐ Quarter method

Comments: _____

_____

_____

_____

3. Does the sampling approach used satisfy the goals of the study?
   ☐ Yes ☐ No

Comments: _____

_____

_____

_____

_____

4. Are the species of plants collected for analyses recorded in the logbook? ☐ Yes ☐ No

   Comments: _____

   _____

   _____

5. Is the exact location of each vegetative sample collected noted in the logbook? ☐ Yes ☐ No

   Comments: _____

   _____

6. Are the parts of each plant (e.g., root, leaves) collected for analysis identified in the logbook? ☐ Yes ☐ No

   Comments: _____

   _____

7. Is care taken to prevent contamination of vegetative samples by other media (e.g., soil) and improper handling (i.e., collection without use of clean disposable gloves)? ☐ Yes ☐ No

   Comments: _____

   _____

   _____

8. Are vegetative samples thoroughly rinsed with distilled deionized water prior to analysis to remove any potentially contaminated media? ☐ Yes ☐ No

   Comments: _____

   _____

   _____

9. Are vegetative samples placed in clean polyethylene containers?
☐ Yes ☐ No

Comments: _____

_____

10. Are all samples properly tagged and labeled? ☐ Yes ☐ No

Comments: _____

_____

Mammals

1. Are mammals collected for tissue analysis? ☐ Yes ☐ No ☐ N/A

If Yes, identify types under Comments.

Comments: _____

_____

_____

_____

_____

2. Are traps used to collect the animals? ☐ Yes ☐ No

If not, how are animals collected?

Comments: _____

_____

_____

_____

_____

3. Are trapping designs identified?

☐ In a grid system
☐ Parallel lines
☐ Hexagonal layout
☐ Other (describe under Comments)

Comments: _____

_____

_____

_____

_____

4. Is the distance between trapping stations identified? ☐ Yes ☐ No

Comments: _____

_____

_____

_____

5. Are the number of traps set at each station identified and in place?
☐ Yes ☐ No

Comments: _____

_____

_____

_____

6. At a minimum, is the following information entered in the logbook?

☐ Date
☐ Station number and location
☐ Species caught
☐ Sex of each animal
☐ Animal is adult or juvenile

7. Is the time and duration of the trapping program identified? ☐ Yes ☐ No

Comments: _____

_____

_____

IV. SAMPLING APPROACH/METHODOLOGY

A. General

1. The sampling approach specified and utilized for each media and/or unit is identified as:

		Media/Unit									
		Waste							Air		
Sampling Approach		Containers	Tanks	Surface or Lagoons	Waste Pile	Land Treatment	Soil	Ground-Water	Ambient	Contained	Biota
Simple Random											
Stratified Random											
Systematic											
Judgmental											

Comments: _____

_____

_____

_____

_____

_____

2. Were approaches identified in the Sampling Plan employed in the field? ☐ Yes ☐ No

Comments: _____

_____

_____

_____

3. Are specified sampling equipment being utilized? ☐ Yes ☐ No

Comments: _____

_____

_____

_____

_____

4. Where composite samples are taken, are they mixed thoroughly as specified to yield a homogeneous sample? ☐ Yes ☐ No

Comments: _____

_____

5. Is care taken to ensure equal sample sizes or alternatively are samples properly weighted when individual samples are composited? ☐ Yes ☐ No ☐ N/A

Comments: _____

_____

_____

6. Is each sampling device thoroughly decontaminated prior to collecting the next sample? ☐ Yes ☐ No

If not, is an unused, clean sampling device used to collect each sample? ☐ Yes ☐ No

Comments: _____

_____

_____

_____

7. Are disposable sampling devices/containers that have been contaminated disposed of properly (i.e., left in the containerized waste or placed in plastic bags for later disposal)? ☐ Yes ☐ No

Comments: _____

_____

_____

8. Where applicable, are sample collection containers rinsed once with the sample material prior to collection? ☐ Yes ☐ No

Comments: _____

_____

_____

9. If metal devices are being used for sampling drums, tanks or other metal storage or process vessels where ignitable substance may be present, are they being properly grounded? ☐ Yes ☐ No

10. Are sample containers capped immediately following collection of the sample? ☐ Yes ☐ No

Comments: _____

_____

_____

_____

11. Are liquid sample containers filled with sample to at least 90 percent capacity? ☐ Yes ☐ No

Comments: _____

_____

_____

_____

B. Wastes

1. For waste sampling, has an effort been made to use disposable sampling devices where possible? ☐ Yes ☐ No

2. When sampling containers containing waste liquids, is the sample obtained through a top or side bung opening? ☐ Yes ☐ No ☐ N/A

If No, describe sampling procedure under Comments.

Comments: _____

_____

_____

_____

3. If a sample is taken from a side bung opening, are the drum contents gently mixed so that a homogeneous sample will be obtained? ☐ Yes ☐ No ☐ N/A (Note: This may not always be possible or advisable depending on the drum contents.)

Comments: _____

_____

_____

4. Are representative, composite, storage tank samples obtained by collecting and combining samples from at least three sections (e.g., upper, middle, lower) of the tank or by taking a verticle profile sample? ☐ Yes ☐ No ☐ N/A

5. When sampling barrels, fiberdrums, bags, etc., containing powdered or granular wastes, are at least two samples taken by inserting the sampler (grain sampler, sample trier, etc.) at one edge or corner and through the center of the material to the edge or corner diagonally opposite the point of entry? ☐ Yes ☐ No

Comments: _____

_____

_____

_____

6. When sampling surface impoundments, waste piles, or land treatment areas, are all sampling points identified on maps or sketches? ☐ Yes ☐ No

   Comments: _____

   _____

   _____

7. Are liquid samples poured into sample bottles in a manner that minimizes turbulence? ☐ Yes ☐ No

   Comments: _____

   _____

8. Is sufficient ullage allowed for liquid waste samples? ☐ Yes ☐ No

   Comments: _____

   _____

9. When liquid waste samples are being taken, is the sampling device slowly submerged to minimize disturbance of the waste? ☐ Yes ☐ No

   Comments: _____

   _____

   _____

10. When sampling a waste pile, are samples taken by inserting the sampler near the top of the pile at a 0-45 degree angle to a point diagonally opposite the point of entry? ☐ Yes ☐ No

    Comments: _____

    _____

    _____

    _____

11. Are the specified points near the top of the waste pile sampled and composited? ☐ Yes ☐ No

    Comments: _____

    _____

    _____

    _____

12. If the waste pile consists of a solid mass or of primarily large chunks of waste (i.e., < 3 ft), what sample collection methodology is used to obtain a representative sample?

Comments: _____

_____

_____

_____

13. Are any preservation methods other than refrigeration used for waste samples other than surface or groundwater? ☐ Yes ☐ No

If Yes, is the preservation method applicable to one or two specific components known to be present in the waste? ☐ Yes ☐ No

Comments: _____

_____

_____

C. Soils

1. Has a control area been selected? ☐ Yes ☐ No

Comments: _____

_____

_____

2. Does documentation exist showing that a control area if utilized exhibits soil characteristics, depth to groundwater, vegetation type and other characteristics similar to the sample area? ☐ Yes ☐ No

Comments: _____

_____

_____

_____

3. Is the control area selected upwind from the sampling area? ☐ Yes ☐ No

Comments: _____

_____

_____

4. When a soil auger is used, is a collection container also used to prevent the ejected soil sample from contacting the surrounding ground? ☐ Yes ☐ No

   Comments: _____

   _____

   _____

5. Is the depth to which each soil sample is taken logged in the field logbook or on a data sheet? ☐ Yes ☐ No

   Comments: _____

   _____

   _____

   _____

6. Is the exact location of each soil sample identified and logged in the field notebook? ☐ Yes ☐ No. Describe under Comments the method used to identify sampling point locations.

   Comments: _____

   _____

   _____

   _____

7. Are approximate soil sampling locations identified on a sketch of the site drawn in the field log book or on data sheets? ☐ Yes ☐ No

   Comments: _____

   _____

   _____

   _____

8. If contaminant concentrations are desired at specific soil depths, what sampling techniques are used and precautions taken to prevent cross-contamination between the soil levels?

   Comments: _____

   _____

   _____

   _____

9. When soil samples are composited, are they mixed as specified?
☐ Yes ☐ No

Comments: _____

_____

_____

10. Are samples of rinse water, solvents or other materials used for decontamination taken periodically and analyzed for possible contamination? ☐ Yes ☐ No

Comments: _____

_____

_____

11. Are soil and bottom sediment samples properly preserved? ☐ Yes ☐ No

Comments: _____

_____

_____

_____

12. Are equipment swipes and/or rinses taken periodically and analyzed to check for complete decontamination? ☐ Yes ☐ No

Comments: _____

_____

_____

13. Are replicates (duplicates or triplicates) taken as specified?
☐ Yes ☐ No

Comments: _____

_____

_____

14. To establish baseline values, is the number of samples collected and their sampling location within the control area being completed as specified in the Sampling Plan? ☐ Yes ☐ No

Comments: _____

_____

_____

_____

15. For each subsurface soil sample, is a boring or core log completed?
☐ Yes ☐ No

Comments: _____

_____

16. Does the log contain the following:

☐ Soil types and corresponding depth and thickness
☐ Soil structural changes
☐ Presence of anomalies (e.g., rock, sand and gravel lenses, root channels, animal burrows, etc.)
☐ Other (specify under Comments)

Comments: _____

_____

_____

_____

D. Groundwater and Surface Water

1. Are the following preservatives used for surface or groundwater samples:

Measurement	Preservative	Yes	No	N/A
Nitrogen forms	H_2SO_4 to pH2	☐	☐	☐
Phosphorous forms (hydrolyzable)	H_2SO_4 to pH2	☐	☐	☐
Metals	Nitric acid (HNO_3)	☐	☐	☐
Organic samples (COD, oil and grease, organic carbon)	Sulfuric acid (H_2SO_4)	☐	☐	☐
Ammonia, amines	H_2SO_4	☐	☐	☐
Cyanides, organic acids	Sodium hydroxide (NaOH)	☐	☐	☐
Acidity-Alkalinity	Refrigeration	☐	☐	☐
Organic materials	Refrigeration	☐	☐	☐
BOD	Refrigeration	☐	☐	☐
Color	Refrigeration	☐	☐	☐
Odor	Refrigeration	☐	☐	☐
Organic phosphorus	Refrigeration	☐	☐	☐
Organic nitrogen/carbon	Refrigeration	☐	☐	☐
Biological organisms (e.g., coliform)	Refrigeration	☐	☐	☐
Other _____	_____			
_____	_____			
_____	_____			

Comments: _____

_____

_____

_____

2. Are at least 3-5 volumes of water in each groundwater monitoring well casing evacuated prior to collecting a sample? ☐ Yes ☐ No

   If not, how many volumes are evacuated? _____

3. For monitoring wells that can be evacuated to dryness, is the well allowed to recover completely prior to withdrawing a sample? ☐ Yes ☐ No

   Is a measurement taken to verify this? ☐ Yes ☐ No

   Comments: _____

   _____

   _____

   _____

4. For monitoring wells that cannot be evacuated to dryness, is a minimum of 4-5 volumes of water pumped from the well at a rate equal to the well's recovery rate? ☐ Yes ☐ No

   Comments: _____

   _____

   _____

   _____

5. Have the specified number of groundwater monitoring wells been installed downgradient and upgradient of the land storage, disposal, and treatment sites? (e.g., landfills, surface impoundments, land treatment areas and waste piles) ☐ Yes ☐ No ☐ N/A

   Comments: _____

   _____

   _____

   _____

6. Are the monitoring wells located as specified? ☐ Yes ☐ No ☐ N/A

   Comments: _____

   _____

   _____

   _____

7. When a sample is transferred from the sampler to a sample bottle, is care taken to minimize sample agitation and contact with air? ☐ Yes ☐ No

Comments: _____

_____

_____

_____

8. Is the sampler thoroughly rinsed with tap water and then with the first sample from the next well prior to collecting the sample for analysis? ☐ Yes ☐ No

Comments: _____

_____

_____

_____

9. Have the specified number of samples been taken to determine background values? ☐ Yes ☐ No

Comments: _____

_____

10. Is the volume of liquid in the well (i.e., bore-hole volume) calculated prior to purging? ☐ Yes ☐ No

Comments: _____

_____

11. If pumps are used for purging and sample collection are they thoroughly cleaned prior to use in another well? ☐ Yes ☐ No ☐ N/A

12. Are any methods used to verify that well purging is complete? ☐ Yes ☐ No

If Yes, describe.

Comments: _____

_____

_____

13. If a pump is used to collect the sample, is an effort made to withdraw the sample at approximately the same rate as the well refills (i.e., aquifer transmission rate)? ☐ Yes ☐ No ☐ N/A

Comments: _____

_____

_____

E. Air

1. Is the flow rate established during calibration of pumps and/or instruments marked on the rotameter and/or recorded on sampling data sheets for later reference during actual sampling? ☐ Yes ☐ No

Comments: _____

_____

_____

2. Is the calibration flow rate maintained during sampling? ☐ Yes ☐ No

Comments: _____

_____

_____

3. Are calibration and actual sampling conditions within the following ranges of each other:

Condition and Range	Yes	No
Temperature ±15°C	☐	☐
Barometric pressure ±10 mm Hg	☐	☐

Comments: _____

_____

_____

4. If used, are sample cartridges protected from exposure to sunlight prior to and after sample collection? ☐ Yes ☐ No

   If Yes, note method.

   Comments: _____

   _____

5. Are sample cartridges packed in coolers and stored at 4°C prior to analysis? ☐ Yes ☐ No

   Comments: _____

   _____

6. Are sample cartridges analyzed within the holding time specified in the sampling plan? ☐ Yes ☐ No

   Comments: _____

   _____

7. Do compounds sampled using polyurethane foam have vapor pressures less than 1 mm (Hg) at 20°C? ☐ Yes ☐ No

   Comments: _____

   _____

   _____

8. At a minimum, is the following information recorded on a sample sheet or in a sample log book at the start and end of the sampling period?

   ☐ Name of sampler
   ☐ Start & stop times/dates
   ☐ Counter reading
   ☐ Blank number
   ☐ Cartridge number or filter
   ☐ Pump/sampling apparatus number
   ☐ Barometric pressure
   ☐ Ambient temperature
   ☐ Relative humidity

   Comments: _____

   _____

   _____

F. Biota

General

1. When sampling streams, are sampling points located as specified (i.e., on both sides of the stream upstream and downstream of stretches suspected of contamination)? ☐ Yes ☐ No

   Comments: _____

   _____

   _____

2. If specified, are all sampling points located in the main channel out of backwater areas? ☐ Yes ☐ No

   Comments: _____

   _____

Plankton

1. Has the following information been determined in conjunction with plankton sampling efforts:

   ☐ Flow volumes
   ☐ Current velocity, direction
   ☐ Prevailing wind direction
   ☐ Water temperatures
   ☐ Turbidity

   Comments: _____

   _____

   _____

2. Is the frequency of sampling specified being adhered to? ☐ Yes ☐ No

   Comments: _____

   _____

   _____

3. If specified, are sampling points in lakes located at various depths? ☐ Yes ☐ No

   Comments: _____

   _____

4. Does the field log book contain at a minimum the following information on samples:

☐ Weather information (temperature, wind direction and speed, etc.)
☐ Cloud cover
☐ Water surface condition
☐ Water color and turbidity
☐ Total depth at each sample station and depth at which sample was taken
☐ Sampling station locations

Comments: _____

_____

_____

5. Which of the following preservative(s) is used?

☐ Formalin (40% formaldehyde) neutralized with sodium tetraborate
☐ Merthiolate
☐ Other (identify under Comments)

Comments: _____

_____

_____

6. a. Are plankton concentrated prior to counting? ☐ Yes ☐ No

b. If Yes, what method is used for phytoplankton:

☐ Sedimentation
☐ Centrifugation
☐ Filtration

c. Identify the method used for zooplankton.

Comments: _____

_____

_____

Periphyton

1. a. If scrape samples are taken for quantitative analysis, is the area of the scrape carefully measured and recorded? ☐ Yes ☐ No ☐ N/A

   b. Is a minimum of 5-10 mL of scrapings collected? ☐ Yes ☐ No

   Comments: _____

   _____

2. Are samples stored in pre-cleaned glass containers? ☐ Yes ☐ No

   Comments: _____

   _____

3. If chlorophyll analyses are to be performed, are samples stored at 4°C and protected from light sources? ☐ Yes ☐ No ☐ N/A

   Comments: _____

   _____

4. Identify the preservative used:

   ☐ 1-5% Acid-Lugols
   ☐ 5% formalin
   ☐ Other (identify under Comments)

   Comments: _____

   _____

5. Are the depths at which samples are collected consistent at each sampling station? ☐ Yes ☐ No

6. Is care taken to ensure that the size of the area sampled is the same for each sample? ☐ Yes ☐ No

   Comments: _____

   _____

   _____

7. Are triplate samples being taken at each sampling site? ☐ Yes ☐ No

   If Yes, are the samples composited? ☐ Yes ☐ No

   Comments: _____

   _____

   _____

8. Are samples to be used for tissue analysis stored at 4°C up until the time they are analyzed? ☐ Yes ☐ No

   Comments: _____

   _____

9. When artificial substrates are used, are they exposed for at least two (2) weeks? ☐ Yes ☐ No ☐ N/A

   Comments: _____

   _____

   _____

Macrophyton

1. Is sampling quantitative or qualitative? _____

   Comments: _____

   _____

2. Are wet and dry particle size analyses of the inorganic components conducted on one or more samples from each sampling site? ☐ Yes ☐ No

   Comments: _____

   _____

3. Is the depth at which each sample is collected measured and recorded? ☐ Yes ☐ No

   Comments: _____

   _____

4. If specified, is the current velocity at each sampling site determined and recorded? ☐ Yes ☐ No

   Comments: _____

   _____

   _____

5. a. Are samples to be used for tissue analysis placed in glass containers and frozen until analysis as specified? ☐ Yes ☐ No

Comments: _____

_____

b. Are all other samples preserved properly? ☐ Yes ☐ No

Comments: _____

_____

6. When collected samples are sorted, are total numbers of organisms being estimated? ☐ Yes ☐ No

Comments: _____

_____

_____

V. PACKAGING, LABELING, TRANSPORT

1. Are waste samples, whose chemical identity is known (e.g., discarded commercial products), labeled, packaged and shipped according to the hazardous waste classes identified in the 49 CFT 172.101, Hazardous Materials Table? ☐ Yes ☐ No ☐ N/A

   Comments: _____

   _____

   _____

   _____

2. a. Are all non-gaseous hazardous waste samples not considered environmental samples (e.g., off-site samples of low contamination potential) and not taken from closed containers labeled as "Flammable Liquid (or Solid) N.O.S."? ☐ Yes ☐ No ☐ N/A

   b. Are these sample containers placed in a plastic bag and then sealed in a metal can surrounded by a noncombustible and nonreactive absorbent? ☐ Yes ☐ No

   c. Does each metal can bear labels with the following marking?

	Yes	No
"Flammable Liquid, N.O.S." or "Flammable Solid, N.O.S."	☐	☐
Testing laboratory name and address and return address	☐	☐
"Cargo Aircraft Only"	☐	☐
"Flammable Liquid" or "Flammable Solid"	☐	☐
"Dangerous When Wet"	☐	☐

   d. Is the metal can, in turn, placed in a large container (e.g., cooler, fiberboard box) and packed with noncombustible and nonreactive absorbent? ☐ Yes ☐ No

   e. Does the larger shipping container bear the following labels and markings?

	Yes	No
All labels placed on the shipping cans	☐	☐
"Laboratory Samples"	☐	☐
"This End Up" with arrows on all four sides pointing in the appropriate direction	☐	☐

   Comments: _____

   _____

   _____

   _____

3. a. Are unidentified samples, obtained from closed containers or tanks, labeled, packaged and shipped as DOT Poison A material?
☐ Yes ☐ No ☐ N/A

b. Are sample containers with wastes classified as DOT Poison A materials packaged in DOT Spec. 3A1800 or 3AAA1800 metal compressor gas cylinders? ☐ Yes ☐ No

c. Are sample containers packed in the metal cylinders, surrounded by incombustible, absorbent, packaging material? ☐ Yes ☐ No

d. Is a tag wired to the cylinder valve protector or a label affixed to the cylinder that is marked with "Poisonous Liquid N.O.S." and the laboratory name and address and return address? ☐ Yes ☐ No

e. Is a separate label, marked "Poisonous Gas," also affixed to the cylinder? ☐ Yes ☐ No

f. If metal cylinders are placed into the same shipping container, does the container bear the following labels and markings:

☐ All labels/markings placed on the enclosed metal cylinders
☐ "Laboratory Samples" and "Inside Packages Comply with Prescribed Specifications" marked on top of the container
☐ "This End Up" on the top of the container with arrows on all four sides pointing in the appropriate direction

Comments: _____

_____

_____

_____

_____

4. Does packaging of environmental samples meet the following criteria:

☐ All sample containers are placed in a strong outside shipping container capable of containing any leaks from sample containers.
☐ Ice is put into a plastic bag before being placed in the outside shipping container.
☐ The lids of all sample containers are screwed on tightly and taped closed or are placed in a plastic bag which is taped tightly to close.
☐ Glass containers are packed with an inert, absorbent packing material in a manner to prevent contact with other glass containers.

Comments: _____

_____

_____

_____

_____

_____

5. Is sufficient ullage (approximately 10% by volume) allowed in sample containers with liquids? ☐ Yes ☐ No ☐ N/A

Comments: _____

_____

_____

_____

6. Unidentified samples (e.g., DOT Poison A classified) are transported by:

☐ Common, public or commercial ground carrier
☐ Government aircraft
☐ Other (identify under Comments)

Comments: _____

_____

_____

_____

7. When shipping hazardous samples, are bills of lading or manifests marked with the following information?

☐ "Flammable Liquid (or Solid), N.O.S." (not otherwise specified) or for unidentified samples from closed containers or tanks, "Poisonous Liquid, N.O.S."
☐ "Net Weight" or "Net Volume" by item
☐ "Cargo Aircraft Only"
☐ "Limited Quantity"
☐ "Laboratory Samples"

Comments: _____

_____

_____

_____

8. Are arrangements made prior to the start of sampling to ship samples to the laboratory for analysis so that recommended holding times are not exceeded? ☐ Yes ☐ No

Comments: _____

_____

_____

_____

VI. QUALITY ASSURANCE/QUALITY CONTROL

A. Sample Documentation and Chain-of-Custody

1. Is the following information being recorded in the field log book or on data sheets?

- ☐ Project Name and Project Number
- ☐ Purpose of sampling (e.g., quarterly sampling, resample to confirm previous analysis, initial site assessment, etc.)
- ☐ Date and time each sample was collected
- ☐ Date and starting/stopping times (Hr:Min) for air samples
- ☐ Date and well bailing time for groundwater
- ☐ Blank, duplicate and split sample identification numbers
- ☐ Sample description including type (i.e., soil, sludge, groundwater, etc.)
- ☐ Field measurement results (i.e., conductivity, pH, dissolved oxygen, combustible gas (e.g., LEL), radioactivity, etc.)
- ☐ Preservation method for each sample
- ☐ Type and quantity of containers used for each sample
- ☐ Weather conditions at time of sampling
- ☐ Photographic log identifying subject, reason for photograph, date, time, direction in which photograph was taken, number of the picture on the roll
- ☐ Sample destination
- ☐ Analyses to be performed on each sample
- ☐ Reference number from all forms on which the sample is listed or labels attached to the sample (i.e., chain-of-custody, bill of lading or manifest forms, etc.)
- ☐ Name(s) of sampling personnel
- ☐ Signature of person(s) making entries on each page

Comments: _____

_____

_____

_____

_____

_____

2. Is a chain-of-custody record completed for all samples collected?
☐ Yes ☐ No

Comments: _____

_____

3. Is the following information completed on each chain-of-custody record?

- ☐ Sample identification number
- ☐ Sample collector's signature
- ☐ Date and time of collection
- ☐ Place and address of collection
- ☐ Waste sample description
- ☐ Shipper's name and address
- ☐ Name and address of organization(s) receiving sample
- ☐ Signatures and titles of persons involved in chain-of-possession
- ☐ Inclusive dates of possession for each possession

Comments: _____

_____

_____

_____

_____

4. Does a sample analysis request sheet accompany all samples on delivery to the laboratory sample custodian (sample bank)? ☐ Yes ☐ No

Comments: _____

_____

5. At a minimum, has the following information been completed on each sample analysis request sheet?

- ☐ Name of person receiving sample (sample custodian)
- ☐ Laboratory sample number
- ☐ Date of sample receipt
- ☐ Sample allocation
- ☐ Analyses to be performed
- ☐ Collector's name, affiliation name, address and phone number
- ☐ Date and time of sampling
- ☐ Location of sampling
- ☐ Special handling and/or storage requirements

6. Has a field custodian been assigned for sample recovery, preservation and storage until shipment? ☐ Yes ☐ No

Comments: _____

_____

_____

_____

B. Sample Bank Operations

1. Has a sample custodian been assigned to receive all samples? ☐ Yes ☐ No

   Comments: _____

   _____

2. Does the custodian carefully inspect the condition of sample containers and/or packages upon receipt? ☐ Yes ☐ No

   Comments: _____

   _____

3. If damaged or leaking containers and/or packages are received, is this fact documented in a log book or on a data sheet? ☐ Yes ☐ No

   Comments: _____

   _____

   _____

   _____

4. a. Are sample containers and/or packages inspected to see if the sample seal is intact? ☐ Yes ☐ No

   b. If the seal is broken, is the information recorded in the log book or on a data sheet? ☐ Yes ☐ No

   c. Describe the recourse taken when sample containers or packages with broken seals are received.

   Comments: _____

   _____

   _____

   _____

   _____

   _____

5. a. Does the sample custodian check to ensure that the information (i.e., sample number) on the sample label and seal match that on the chain-of-custody record? ☐ Yes ☐ No

   b. If discrepancies are found between the label or seal and the chain-of-custody record, what actions are taken to resolve the problem?

Comments: _____

_____

_____

_____

_____

_____

6. Is a separate laboratory number assigned to each sample received?
☐ Yes ☐ No

Is this number recorded in the log book along with the other information describing the sample? ☐ Yes ☐ No

Comments: _____

_____

_____

_____

7. Has a sample label or tag been applied to each sample container?
☐ Yes ☐ No

Comments: _____

_____

_____

8. At a minimum, has the following information been completed on each sample label or tag?

☐ Collector's name
☐ Date and time of collection
☐ Place of collection
☐ Sample number

9. Has a tamperproof paper seal been attached to each sample package not secured by some other means in such a manner that the seal must be broken when opening the package? ☐ Yes ☐ No

Comments: _____

_____

_____

10. At a minimum, has the following information been completed on each sample seal applied to packages?

☐ Collector's name
☐ Date and time of sampling
☐ Sample number

Does this information match that provided on the sample label?
☐ Yes ☐ No

Comments: _____

_____

_____

11. Are all samples stored in a clean and secure area? ☐ Yes ☐ No

Comments: _____

_____

_____

_____

12. Are samples stored in a way to maintain preservation? ☐ Yes ☐ No

Comments: _____

_____

_____

_____

13. Are sample holding time limitations satisfied? ☐ Yes ☐ No

Comments: _____

_____

_____

_____

14. Do laboratory records demonstrate personnel transferring and receiving samples in the lab? ☐ Yes ☐ No

Comments: _____

_____

_____

_____

C. Quality Control

1. Are any of the following QC samples being generated?

☐ Split sample
☐ Blank samples
  ☐ Field blank
  ☐ Reagent blank
  ☐ Sample bank blank (where applicable)
  ☐ Decontamination blank
☐ Spiked sample
☐ Duplicates

Comments: _____

_____

_____

2. For RCRA sites, are splits for all samples obtained offered to the owner or operator? ☐ Yes ☐ No ☐ N/A

Comments: _____

_____

_____

3. a. Are duplicates generated from composited samples? ☐ Yes ☐ No

b. If No, is care taken to obtain duplicates using identical methods, under identical conditions, and at specified locations? ☐ Yes ☐ No

Comments: _____

_____

_____

_____

4. Are control samples collected by identical methods, under similar conditions, and at the specified location? ☐ Yes ☐ No

Comments: _____

_____

_____

_____

VII. SAMPLING PERSONNEL

1. Are personnel performing on-site sampling operations those described in the Sampling Plan? ☐ Yes ☐ No

   If not, have replacement personnel been trained for the position they have assumed? ☐ Yes ☐ No

   Comments: _____

   _____

   _____

2. Indicate sampling team performance in the following areas observed during the on-site audit. (NOTE: Identify poor work practices and violations of protocol under comments.)

Work Practice	Good	Fair	Poor
Sampling technique	☐	☐	☐
Protective equipment use	☐	☐	☐
Safety procedures	☐	☐	☐
Forbidden personal practices (e.g., smoking, eating in forbidden areas)	☐	☐	☐
Equipment use/maintenance/calibration	☐	☐	☐

   Comments: _____

   _____

   _____

   _____

   _____

   _____