

# Quality Assurance Program Plan

7309

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## Quality Assurance Program Plan Approval Form

Document Title: Enforcement Support Program  
 Quality Assurance Program Plan

Organization: **WaterSmart Environmental, Inc.**

Address: PO Box 26346  
 Shawnee Mission, Kansas 66225-6346

Program Manager: \_\_\_\_\_

Program QA Manager: \_\_\_\_\_

### Plan Coverage:

The Quality Assurance Program Plan describes the quality assurance requirements pertinent to all technical tasks in which documentation is developed or acquired in support of site investigations, design, or evaluation of remedies, and enforcement case preparation. It includes environmental measurements produced and analyzed in support of hazardous site evaluations or monitoring activities. This document is controlled and may not be reproduced without the express written consent of the Program QC Manager.

### Approval for Implementation:

1. Name: \_\_\_\_\_  
 Title: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

2. Name: \_\_\_\_\_  
 Title: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Project Officer TES IV  
 U.S. Environmental Protection Agency

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Quality Assurance Officer  
 Office of Emergency and Remedial Response  
 U.S. Environmental Protection Agency

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

From the Operations Department of  
**WaterSmart**  
**Environmental, Inc.**



## 1.0 INTRODUCTION

This Quality Assurance Manual is intended to be the primary guide to the integration of quality functions into all project organization activities delineated by the project assignment.

The Quality Assurance Manual is the written directive authorized by Corporate Management to accomplish this task and to implement procedures to provide the controls and sound management practices necessary to the execution of our contractual obligations. The Quality Assurance Program is designed to use monitoring, audit, and surveillance functions as tools of management to ensure that all project organization functions are executed in a manner that will protect public health and safety, work toward the success of the project, and meet or exceed contract requirements.

The key to assuring compliance with this directive is the professional approach of utilizing the quality system in all areas of activity and generating a personal commitment on

the part of all personnel toward providing quality service. The quality assurance staff will be experienced and trained professionals with broad scope capabilities to provide maximum flexibility in contribution to overall project goal attainment. Such flexibility will allow them to be more cost effective and further improve communication and coordination.

To provide control details, this manual will be supplemented by approved specific quality control procedures providing descriptions of all quality related activities. These shall describe applicable codes, design inputs, controlling documents, activities, and documentation.

The program will be subject to periodic review and revision to encompass new standards and techniques. Its intent to provide guidance toward the attainment of quality engineering and project management services will not be de-emphasized or unilaterally waived.

## 2.0 GLOSSARY

### 2.1 Definition of Terms

**Accuracy** Degree of closeness of measurements in relation to the "true" quantitative value or absolute standard.

**Chain-of-Custody** Documentation that describes the physical control of a sample, measurement, or document.

**Completeness** The property of a data base that relates to its ability to describe thoroughly, enumerate, or interpret environmental phenomena.

**Defensibility** Ability to document the origin, chain-of-custody, matrix of scientifically acceptable operations performed, reduction, and transcription of data, so that their limitations, representativeness and applicability are known.

**Field Blank** Samples which are obtained by exposing an analyte-free matrix through the decontaminated sampling equipment, placed in the appropriate sample containers for analysis, and preserved in the same manner as the samples.

**Field Duplicates** Independent samples collected in such a manner that they are co-located samples equally representative of the sample matrix at a given point in space and time.

**Laboratory Duplicates** - Two aliquots taken in the laboratory of the same sample with one of the aliquots identified as the duplicate and other aliquot original samples. Each aliquot is treated identically through the laboratory analytical procedure.

**Matrix Spike Sample** - An aliquot of sample to which has been added a known quantity of one or more of the target analytes.

**Precision** - Degree of mutual agreement among individual measurements made under prescribed conditions relative to the data from a single test procedure.

**Quality Assurance** - An auditing and review function carried out by qualified technical QA personnel to ensure legal defensibility, accuracy, and validity of data, procedures, or documents and to assure consistent technical report standards.

**Quality Control** - Review and check processes to ensure that quality work is performed.

**Quality Level:**

- **Level 1:** A high degree of QA coverage is required for projects (work assignments) conducted in direct support of enforcement actions. This level includes a maximum number of audits and chain-of-custody procedures.
- **Level 2:** Projects intended to reduce principles to practice by providing extensive engineering and cost data for design purposes, or scientific data for use in standard setting, require a high degree of QA coverage with regular audits and rigorous QC procedures, but not to the degree of Level 1.
- **Level 3:** Projects intended to evaluate and select basic options, or to perform preliminary assessments of the unexplored areas, require QA and QC levels sufficient to produce scientifically but not legally defensible conclusions. The data must be valid in a relative but not necessarily an absolute way, and must support the technical choices made. Example might include bench or pilot evaluations. The QA is less strict than in Level 2. Level 3 has been assigned to the IAWWT project.

- *Level 4:* Projects performed on paper, on a desktop, or by computer, which involve no data collection or environmental measurements, but simply use data drawn from other sources, require less formal QA/QC coverage. However, conclusions drawn during such projects should take account of the QA/QC merit of such data.

*Replicate Samples* Two portions of a single sample that have been divided during sample gathering activities and submitted to the analytical laboratory as separate samples. The two sample portions must be identical.

*Representativeness* Assurance that presented data are statistically sound and accurately show the physical or chemical state of the parameters tested/measured at a given time and place.

*Standard Operating Procedures* A written, sufficiently detailed set of instructions that facilitates the reproducible and/or cost-effective implementation of each of the elements of work plan, QC, QA, administration, or procurement. Such SOPs are the translation of policy into operation.

## 2.2 List of Abbreviations

CBI:	Confidential Business Information
EPA:	Environmental Protection Agency
NEIC:	National Enforcement Investigation Center
NPDES:	National Pollution Discharge Elimination System
QA:	Quality Assurance
QAPjP:	Quality Assurance Project Plan
QAPP:	Quality Assurance Program Plan
QC:	Quality Control
SOP:	Standard Operating Procedure
TES:	Technical Enforcement Support

## 3.0 PURPOSE/AUTHORITY

WaterSmart Environmental, Inc.'s quality assurance program has been established for the EPA's Technical Enforcement Support (TES) contract to ensure that appropriate technical and procedural standards are met for all reports, data and documentation, prepared under this contract. The program requires participation by the prime contractor and all subcontractors making up the program. An established QA philosophy and QA program are essential for consistent

production of valid, defensible data and documentation in support of site investigations, remedial planning and review of remedial plans, enforcement case preparation, site monitoring and other efforts. The QA program further ensures that capable personnel who are trained in appropriate scientific and engineering disciplines interpret valid data.

## 4.0 OBJECTIVES AND SCOPE

### 4.1 Objectives

The objectives of the QAPP are to ensure that all data and reports prepared under TES are scientifically valid, defensible, and of known and adequate precision and assurance. The level of quality control for any specific data and/or project will be sufficient to support the objectives of the related project and to provide reliable background information for the development of technically sound, cost-effective engineering alternatives.

### 4.2 Scope

This QAPP reflects a major commitment to quality assurance and, as such, addresses the following concerns:

- Provision for and scheduling of an independent review and audit of all technical products to assure that documentation provides accurate and acceptable responses.
- Coordination of quality assurance and quality control (QA/QC) procedures that provide a documentable, appropriate level of quality for environmental measurements.

- Coordination of QA project (work assignments) plan development as an integral part of the work plans for all field work assignments involving sampling and laboratory analysis, and the incorporation of QA provisions in the work plans for other work assignments. Plans are designed to ensure the adequacy of the technical product specified by EPA, both as to technical content and the document control procedures that ensure its integrity.
- Identification of QA/QC deficiencies and coordination of expeditious resolutions.
- Assurance of systematic, timely revisions of QA/QC procedures as needed.

Responsibility for documentation of all data collected, stored, reported, or used as scientifically valid, defensible, and of known, documented, precision, accuracy and origin, to ensure that data and/or information limitations are not exceeded in any use.

## 5.0 QUALITY ASSURANCE POLICY

The policy of the enforcement support program is to maintain an active QA program to provide the appropriate quality data and results to achieve the goals of each activity undertaken. To accomplish this goal, the following WaterSmart Environmental, Inc. Quality Program will include as a minimum, but not be limited to, the following elements.

- The Program QA Manager has technical and administrative responsibility for the overall QA program.
- The Program QA Manager has the authority to require implementation of action to document and correct any situation that creates a negative impact on the quality of data or documentation related to its intended and specified use.
- The Program QA Manager reports weekly (or as necessary) to the Project Director.
- The Program QA Manager refers all QA issues or disputes that cannot be resolved within the program to the Project Director. Direct channels of communication are provided for this function.
- Qualified personnel will implement the QA program.
- Facilities, equipment, and services will be routinely inspected and maintained.

All data must meet the following standards:

- Good Laboratory Practices (GLP) must be used. Environmental data will be collected using SOPs approved for the intended use of the data (for example, NPDES compliance monitoring, NEIC, or Regional EPA sampling and chain-of-custody procedures, or CLP methods

- EPA analytical methodology).
- Work plans flow diagrams must be developed to define the scope of major activities.
- The level of defensibility, documentation, and QA must be defined for all environmental measurements.
- Specific QA procedures must be developed for all major activities that produce or use environmental data.
- Acceptance criteria for the quality of the data must be specified in writing before data are collected.
- The Program Manager may give approval to waive requirements for a written QC procedure when standard operating procedures are specified and available for use.
- The precision, accuracy, representativeness, and completeness of all data are defined and reported and documentation is maintained on file.
- Data processing procedures will be documented, routinely reviewed, and revived (if necessary). All data will be validated according to criteria.
- QA management will implement regularly scheduled audits of all technical operations.
- A corrective action program of identifying QA problems and expediting corrective actions will be maintained for all Work Assignment Teams. The Program QA Manager will work with program management, Operation Managers, and Regional Managers and work assignment managers to develop, revise, and implement mechanisms as needed.

## 6.0 QUALITY ASSURANCE MANAGEMENT

### 6.1 Organization

The Program QA Manager is responsible for effective implementation of the QA program. The QA program depends on organizational independence. Accordingly, the Program QA Manager reports to the Project Director.

This plan complies with EPA requirements for QA Program Plans as described in QAMS-004/80, "Interim Guidelines and Specifications for Preparing Quality Assurance Program Plans." Central to the QA program is the independence of the QA program team.

The Program QA Manager is responsible for providing direction and guidance to each of the Operations Managers, including Subcontractor Management, and for auditing all phases of the technical efforts within the project.

### 6.2 QA Personnel Qualifications

Accurate and precise sampling, analysis, field data collection, data interpretation, engineering analysis and

design, and document preparation can be accomplished only by personnel well-trained and adequately educated in their technical areas and in quality control procedures. Periodic in-service training is conducted to ensure that all staff involved in the QA process maintain a high level of current knowledge and techniques. In addition, selected personnel participate in QA-related seminars, short courses, and professional meetings. Qualifications for the Program QA Manager shall satisfy at least one of the following criteria:

1. An advanced degree, MS or Ph.D. and 4 to 6 years experience in technical/scientific activities; and 2 years of QA experience.
2. A BS degree with 8 to 10 years experience in Technical/Scientific activities.
3. Experience and/or training in several fields of environmental science/engineering; and 10 years of QA experience.

### 6.3 Responsibilities and Authority.

#### Program QA Manager

The Program QA Manager is responsible for development and maintenance of a comprehensive QA program. He/she audits and/or reviews all work performed and issues recommendations about quality to technical staff and management. The Program QA Manager's specific responsibilities include:

- Meeting regularly with the program manager.
- Developing and revising the QA program, as required.
- Supervising the QA responsibilities of other members of the program staff.
- Coordinating and auditing QA review of documentation, as required.
- Providing recommendations and orders, as required, for corrective actions for all aspects of work that do not meet program standards.
- Identifying nonconformance situations to management, as needed.
- Providing guidance for Work Assignment Team QA program development and correcting nonconformance situations.
- Interacting with EPA QA personnel about qualifications of laboratories and subcontractors, and coordinating QA and technical staff compliance with requirements.
- Ensuring and documenting compliance with orders and/or recommendations to Operations Managers regarding corrective action.

#### Operations Managers

The Operations Managers will have the overall responsibility for implementation of this QAPP (subcontractor requirements are further defined in Section 7.0 - Subcontractor Requirements). They will be responsible for the audit and/or review of all work performed to ensure that all QA program requirements are met. The Operations Managers' specific responsibilities include:

- Meeting regularly with the Work Assignment Managers and Regional Managers, and interfacing on a regular basis with the Program QA Manager.
- Implementing the QA program.
- Supervising the QA responsibilities of other members of the program staff, i.e., Work Assignment Managers, Work Assignment Team.
- Compliance with orders and/or recommendations regarding corrective action issued by the Program QA Manager

### 6.4 Work Assignment Manager QC Functions.

The Work Assignment Managers will report to the Regional Managers, and through them to the Program QA Manager

for monitoring and documentation of the quality of all work produced or generated by the Work Assignment Teams. Specific responsibilities are:

- Ensuring that the team completes all QA requirements of the work plan.
- Maintaining and regularly reviewing all QC records.
- Controlling the identification and secure handling of all documentation until it is turned over to the designated document control personnel.
- Verifying field data, field test results, calibrations, and quality control data.
- Monitoring sample preservation, handling, and transport throughout the project.
- Approving all data and documentation before transmittal.
- Establishing and maintaining liaison between the Work Assignment Teams and the Operations Manager.
- Ensuring by personal observation that appropriate sampling, field testing, and field analysis procedures are followed and that correct QC checks are being made.
- Maintaining and updating qualifications records for Work Assignment Team members.

### 6.5 Reports to Management

The Program and QA Manager prepares monthly reports to the Project Director. These reports include:

- QA audit and other inspection results.
- Instrument, equipment, or procedural problems that affect QA.
- Past due and completed corrective actions.
- Objectives from the previous report that were not achieved
- Work planned for next month.

### 6.6 Program Assessment

The QA program requires periodic review to assess the effectiveness of standard operating procedures, identify recurring QA problems, implement corrective action, and monitor the status of corrective actions in progress. Formal annual review by program management is mandatory but portions of the program are reviewed as necessary. The entire program is surveyed quarterly.

Review of Work Assignment Team QC procedures is the responsibility of the Work Assignment Manager and the Operations Manager and is coordinated and approved by the Program QA Manager.

The QA status of environmental measurements and the peer review of deliverable data and documentation is reviewed periodically as specified in the project (work assignment) QA plan. Attainment of QA objectives is also reviewed in terms of the approved QA plan.

## 7.0 SUBCONTRACT REQUIREMENTS

Any subcontractor or consultant retained by WaterSmart Environmental, Inc. will meet, as a minimum, all requirements within the Quality Assurance Program Plan. Subcontractors and consultants are required to acknowledge that they have reviewed and accepted these requirements by sending WaterSmart Environmental, Inc. an acknowledgement to that effect or through submittal of an equivalent (or more stringent) QA plan. Upon receipt of an alternative plan, the Program QA Manager will review the plan to determine its equivalency to this Quality Assurance Program Plan. WaterSmart Environmental, Inc. reserves the right to reject a subcontractor's QA plan if it departs from this plan in such a way as to reduce the quality assurance of the required products.

Primary and Special Resource Subcontractor QA requirements are identical with program QA requirements. Short-term subcontractor QA requirements are identical to the program QA requirements, or as described in the specific QAPjP. To assess properly the quality of subcontractual environmental measurements and other support, a written specific subcontractor QC plan must be approved by the Program QA Manager which will be based on the appropriate quality level. At a minimum, this plan requires:

- Specification of the required limits of precision, accuracy, and representativeness of data, and similar require-

ments for other documentation, to the subcontractor by the prime contractor.

- Specification of specific SOPs and/or EPA approved methods to be used by subcontractors.
- Stipulation that all quality control data be included with the data report to the prime contractor.
- Use of reference materials including matrix spikes, reference samples, and split samples which will be provided by WaterSmart Environmental, Inc., as appropriate.
- Notification to the subcontractor that acceptance of the data requires approval by the program QA staff.
- Additional information and/or procedures that may be required by subcontractors QA staff may include:
  - Inspection of test facilities.
  - Observation of actual work by the Program QA Manager or an Operations Manger.
  - Performance testing for prequalifications.
  - Submittal of the subcontractor's QA program for inspection and approval.

## 8.0 QA OF FACILITIES, EQUIPMENT AND SUPPLIES

### 8.1 Responsibilities

The Work Assignment Managers and Operations Managers have primary responsibility for QC of supplies and equipment. Specification of quality of supplies and capability of equipment as it relates to QA objectives is included in the pertinent SOPs.

### 8.2 Control of Purchased Items--Specifications

Quality performance is dependent on the suppliers' personnel capabilities, physical condition of manufacturing facility and equipment, and management attitude regarding quality. Source evaluation prior to item selection is conducted, with performance history, quality records, and facility surveys, as appropriate. Once a supplier is selected, source verification, receiving inspection, and supplier certificate of conformance are the responsibility of the Work Assignment Team Leaders, based on the specific needs, objectives, and requirements of each work assignment.

### 8.3 Identification of Equipment

Field and laboratory equipment is uniquely identified (e.g., manufacturer's serial number). Records of service, calibration, and use are maintained.

### 8.4 Calibration, Inspection and Testing

Measuring and testing equipment is calibrated, adjusted, and maintained at prescribed intervals or, prior to use, against certified equipment with known valid relationships to

nationally recognized standards. If no standards exist, an alternative basis for calibration is documented.

The method and interval of calibration for each item is based on the type of equipment, stability characteristics, required accuracy, intended use, and other conditions affecting measurement control. This is specified in the appropriate SOP.

An evaluation is made and documented of the validity of previous inspection or test results and of the acceptability of items previously inspected or tested when measuring and testing equipment is found to be out of calibration. Out-of-calibration devices are segregated and are not used until recalibrated. If consistently out of calibration, the device is repaired or replaced. Additional unscheduled calibrations are performed when the accuracy of equipment is suspect.

### 8.5 Control of Nonconforming Items

Identification of nonconforming items and activities is the responsibility of the Work Assignment Managers, Operations Managers, and the Program QA Manager. Nonconformances are documented by responsible personnel and reviewed by management. Technical project and QA personnel evaluate any significant recurring nonconformance to determine its cause. Appropriate changes are instituted in requirements and procedures to prevent further recurrence. When such an evaluation is performed, the results are documented.

## 9.0 DOCUMENT CONTROL SYSTEM

Each regional office will appoint a document control officer whose responsibilities are to ensure that a document control system is established, implemented and maintained in fulfillment of the requirements of each work assignment being supported by that regional office. The document control system will be properly indexed and cross-referenced and, as a minimum, will contain the following:

- All written correspondence between subcontractor personnel, the EPA, other contractors, states, Federal Agencies or suppliers.
- A copy of all reference documents and data. This includes published reports and records as well as relevant data or engineering analyses and process evaluations.
- A record of all project activities. For example, verbal exchanges of information are documented through issuance of project notes or memoranda; working papers and calculation sheets are documented and retained for the record. Also, all telephone conversations, meetings, and trip reports are documented, signed and summarized as project notes or memoranda and inserted into the document control file.
- Project notebooks are kept with each calculation properly identified, signed, and checked.
- Internal memoranda documenting instructions are also included in the document control file.
- All documents generated as a part of the project, with one copy of each document to be maintained in document control at all times. All quality control documents and evaluation reports shall also be maintained. Individual notebooks for calculations used by project personnel are added to the document control file as each notebook is filled or when a staff member ends his/her activities on the program.
- Worksheet heading information and numbering for statistical analysis, engineering calculations, or cost estimates specifically prepared for each work assignment or task but not made a part of calculation

notebooks. Quality control of these worksheets is the responsibility of the originator with review by the Work

- Assignment Manager and, as necessary, the Operations Manger. The same procedure is used when a computer program manipulates data or when the data will be entered into a computerized database. That is, the Work Assignment Manager or designee checks the input data accuracy and program documentation. Upon completion of these reviews by the Work Assignment Manager or his designee will initial and date the documents.
- A copy of all reports produced under the task. In addition, reports that contain review comments from the EPA, WaterSmart Environmental, Inc. team or other outside reviewers will also be maintained in the document control system.
- Where documents pertain to more than one assignment, those documents will be placed in the general Rust project file and file sheets will be included in each assignment to which the document is applicable, citing where the original document has been filed.
- Corporate security will be enforced regarding locking of the files and the use of sign-out sheets when documents are removed. Under no conditions will employees remove original documents from the premises. Also, a separate special file will be maintained for information labeled confidential.
- Specific file heading and other aspects of the Document Control System may vary by project so long as the general procedures and concepts described in this section are followed. It is not the intent of this section to require each project to have identical file systems.

## 10.0 PROGRAM DOCUMENTATION

Specific program documents and formats have been established to ensure that data generated are transferred and/or transmitted in a consistent, accurate manner. Minimum requirements have been developed for these documents, which include work plans, project notes, work assignment notebooks, and deliverables.

### 10.1 Work Plans

Within 15 days after receipt of any work assignment (unless otherwise specified in the work assignment), a draft work

plan containing all of the following information pertinent to the project scope and objectives will be submitted to the Project Officer with a copy to the Contracting Officer.

- 1.0 INTRODUCTION
- 2.0 PROJECT APPROACH - DQO's
- 3.0 DELIVERABLES
- 4.0 WORK SCHEDULE
- 5.0 PERSONNEL

- 6.0 SUBCONTRACTORS/CONSULTANTS
- 7.0 EXCEPTIONS TO THE ASSIGNMENT OR ANTICIPATED PROBLEMS
- 8.0 QUALITY ASSURANCE - QAPjP
- 9.0 CONFLICT OF INTEREST
- 10.0 COST ESTIMATE
- 10.2 Project Notes

It is essential that significant events, decisions and issues that affect the implementation of each work assignment are documented and distributed to the project team members as the project proceeds. For this reason, WaterSmart Environmental, Inc. has established the Project Note (Exhibit 1). The Project Note should use the standard WaterSmart Environmental, Inc. Project Note format and should succinctly summarize the forum for the discussion, (e.g., meeting, telephone call) the date and topics, who was involved, what is to be done/has been done, and who is responsible. Through the project note, meetings where the EPA has not been included but where information needs to be widely distributed are also recorded. The general form is to start with the names of the people involved in the meeting, the time and the place. The items should be numbered and if there are a large number of them, they should be grouped and subject-titled. Where there is a possibility that a change in scope may be involved, this should be noted.

The project notes should be filed chronologically for each work assignment. There should be a complete internal distribution of all project notes in addition to the EPA requirements and the specific team members.

Project notes should also be initiated by the meeting parties when key managers, i.e., Work Assignment Managers,

Operations Managers, Regional Managers are not present, and are submitted to the Work Assignment Manager.

### 10.3 Work Assignment Notebooks

For each work assignment, all technical data for a particular task will be kept in labeled, sequentially numbered bound notebooks maintained by each project staff member. The document control officer in each location will maintain a list of the notebook assignments. The calculation notebook will contain the data itself or will reference the data source. Where the data are referenced, a copy of the data must be in the document control file, and the numbered file location of the data must be written in the site/task notebooks.

### 10.4 Deliverables

The Work Assignment Manager shall prepare draft, final, and letter reports or other deliverables for each activity, or combination, as specified in the work plan. The report should, as a minimum, address the following elements; however, the inclusion of some elements (e.g., recommendations) may not be appropriate for some deliverables:

- Purpose, Objectives and Scope Of The Activity And Relationship To Other Activities.
- Approach and Techniques Used.
- Major Problems Encountered and Solutions Adopted.
- Deviations From Work Plan.
- Detailed Accomplishments and Results Of Study.
- Recommendations.

## 11.0 DATA ACQUISITION AND VALIDATION

### 11.1 Data Sources

Information sources that will be used to obtain data include client personnel and files, Federal, state and local agency personnel, published and unpublished documents, knowledgeable personnel and contacts, and direct measurement or observation. Regardless of the source, sufficient documentation will be required to allow an independent evaluation of the data, including its location, validity, and accuracy. Information obtained from knowledgeable persons should first appear in the site/task notebooks, including information received either over the telephone or in person.

The information can then be disseminated and filed through telephone memoranda, project notes, trip reports, etc.

Where data are obtained through direct field measurements or observation, the values, data, date, time of day, site conditions, monitoring techniques, etc., will be written in the project notebooks. All calculations and engineering analyses will also be written in the notebook. These include engineering assumptions, basis, input data references, methods, sample (or all) calculations, and analysis results.

At the end of each day's entry, the field notebook will be signed and dated.

Information sources used on each project may be primary, secondary, or tertiary. Primary refers to data provided by the EPA or collected by the WaterSmart Environmental, Inc. team. Secondary refers to data collected by other contractors, Federal Agencies or the states and tertiary refers to all other data sources. Secondary and tertiary information sources will be accessed and evaluated first. Data assignments involving comparison of data, a concerted effort must be made to ensure that compared data are sufficiently similar in terms of what is represented and how, when, and where the data were obtained to make the comparison meaningful. It may be necessary to carry out field and lab studies to fill data gaps and resolve any inconsistencies noted.

### 11.2 Data Validation

All data used in task analyses must be validated. Validation of the data will be accomplished via:

- Comparison of the data available in two or more sources of information. Explanation of differences will be based on professional knowledge of data base limitations.
- Identification of unreasonable "outliers" in collected data. If necessary a senior statistician, or equivalent, will be consulted to define what constitutes an "unreasonable" outlier for the data base being evaluated.
- Development and assignment of uncertainty scores to all accessed data (e.g., assignment of high, medium, or confidence values to all accessed and evaluated data).
- Accession and evaluation of data base design and statistical background.
- Use of professionally knowledgeable persons (either within or outside the project) in resolving data inconsistencies, identifying data gaps, and validating all developed data.

## 12.0 CONFIDENTIAL BUSINESS-DERIVED DATA

All information or data identified by the EPA as Confidential Business Information (CBI) will be maintained and used in accordance with the requirements of FAR (Federal Acquisition Requirements) Part 9 and EPAAR (EPA Acquisition Requirements) 1552.235.71 (April 1984). These requirements are incorporated in the WaterSmart Environmental, Inc. CBI SECURITY MANUAL. If a project involves CBI, project personnel will, in accordance with the WaterSmart Environmental, Inc. CBI SECURITY MANUAL, execute a written agreement regarding the limitations of the use of the confidential information received and include a copy of the agreement in the work plan.

For EPA projects under the Resource Conservation and Recovery Act (RCRA), all information identified as RCRA CBI will be maintained in accordance with the requirements of 42 U.S.C. 6927(b), Disclosure of Data (RCRA). The WaterSmart Environmental, Inc. RCRA Confidential Business Information Security Manual incorporates these requirements. No WaterSmart Environmental, Inc. team member may handle, store, or work with RCRA CBI without prior authorization granted by the project officer in adherence with the procedures listed in the WaterSmart Environmental, Inc. RCRA CBI Security Manual. All offices where RCRA CBI is maintained must receive certification by EPA.

For EPA projects, if the data being requested are not already in the public domain, then the business must be given the option to assert a claim that part or all of the information submitted is Confidential Business Information and is

exempt from disclosure pursuant to subsection (a) of Section 552 of Title 5, United States Code, by reason of subsection (6(4) of said section. If such a claim is asserted, the information will be disclosed by EPA only to the extent, and by means of the procedures, set forth in 40 CFR Part 2, Subpart B. If no such claim of confidentiality is made at the time this information is received it may be made available to the public by the EPA without further notice.

Upon receiving the information, the work Assignment Manager of Team Leader will make a written notation in that the notice set out above was given to the source, by whom, in what form, and on what date. Additionally, the Work Assignment Manager will submit to Document Control a list of these sources, identify the information according to the source, and indicate whether the source made any confidentiality claim and the nature and extent of the claim at the time the information is initially submitted to the appropriate program office. Each office will keep all information collected from non-public sources confidential in accordance with the requirements stated above in the WaterSmart Environmental, Inc. CBI SECURITY MANUAL.

It is the responsibility of the Operations Managers to designate a Document Control Officer (DCO) for the office. The DCO's are responsible for the security, control, and distribution of all Confidential Business Information received by the offices within their jurisdiction for the applicable project.

## 13.0 DATA ANALYSIS

### 13.1 Calculations

To ensure defensibility of the record, all calculations should be legible and in logical progression. For calculations performed using a programmable calculator or computer, a sample calculation will be shown (written) in the project notebooks together with a program listing and printout of input data. The calculated results will be attached to the notebook or placed in the document control file and the file location provided in the notebook.

All major calculations will be checked by an engineer or scientist of professional level equal to or higher than that of the originator. A calculation or series of calculations will contain the following, at a minimum, and should be checked as such:

- Task number, date performed, and signature of person who performed the calculation.
- Basis for calculation (i.e., Why is calculation being performed?).

- Assumptions made or inherent in calculation.
- Reference (including page, where applicable) for each piece of input data (e.g., Standard handbook, telephone memorandum, technical paper).
- Methods used for calculations.
- Results (underlined).

After completing the check, the checker will sign his/her name and date immediately below that of the originator in the calculation notebook. Both the originator and checker are responsible for the correctness of calculations.

### 13.2 Computer Analysis

Computer analyses include models, programs, data manipulation, etc. For published software with existing documentation, a test case run will be performed every tenth model session or when there is reason to doubt the results by the Work Assignment Manager to check that the software is running correctly. Input data must be checked sufficiently to provide 95 percent confidence that the computer-input data are correct. If the checking of input data shows an unacceptable number of input errors, then the Operations Manager will perform a detailed analysis of the input methodology. Both systematic and random error analyses will be investigated. Once the problem is identified, a corrective action notice will be submitted to the Program QA Manager.

For in-house developed models and programs, the Work Assignment Manager will review documentation prior to running the system. Documentation will contain at a minimum:

- Description of methodology, engineering basis, and major mathematical operations.
- Flow chart explaining how model (or program) flows.
- Test case(s), sufficiently comprehensive to test all model (or program) operations will be performed on a regularly scheduled basis.

A second requirement of in-house developed models and programs is that the code be easy to read and follow and the model be well structured.

Quality control procedures for checking these models (or programs) will involve reviewing the documentation, running the test case and manually checking those mathematical operations that can be checked relatively easily (e.g., summations or sorting). Each run should have a unique number, data, and time associated with it. The data and time should appear on the printout. Each run and its date/time information will be listed in the calculation notebook. All quality measures will be documented using the appropriate form.

### 13.3 Statistical Analysis

In general, a statistician must be consulted whenever studies are performed to (1) generate new data, (2) assess the correctness of previous data analyses, and/or (3) combine data from various sources. The statistician must be consulted from the initiation of the work assignment to develop a statistically valid approach to data gathering activities and to ensure that sufficient, useful data are collected for analysis. The recommended approaches should be described in the work plan. The statistician and the Work Assignment Manager will discuss why the original data were generated (e.g., the source looked for the average or the worst case), what the new study should do (the rationale for the current project), and any technical functional relationships among the variables. The statistician will check for consistency of the data from the multiple sources (e.g., using student-t or chi square tests) and will review the QA/QC techniques and sampling/survey design of all previous studies. The statistician will determine whether all the necessary variables (or proxies) were collected, whether models appropriately used the functional relations, and whether appropriate statistical techniques were applied. The statistician will provide a memorandum documenting shortcomings in the data and/or previous studies and offer recommendations to the Work Assignment Manager regarding their possible resolution.

## 14.0 REVIEW OF PROJECT DELIVERABLES

Prior to submission to EPA, the senior technical staff and the PMD profession must review all project deliverables to ensure that the work products meet or exceed the technical standards of the. This section describes the procedures and responsibilities that will be associated with this review.

### 14.1 Levels of Quality Review

For this project, three levels of quality review are employed:

**General Review** - Prior to the production of the draft document, all work products undergo review by senior project staff and/or senior staff from the technical disciplines involved in the work.

**QA Review** - a draft of major work products undergoes a quality review by one or more members of the QA Review Committee designated for each project by the Operations Manager. This review is staffed and scheduled as an integral part of the project work plan for all work products.

**Special QA Review** - For certain work assignments, particularly those with a high quality level or that have inordinately high degrees of public attention, difficulty, or complexity, an external review by recognized experts may be conducted before the draft report is presented to the EPA.

## 14.2 Quality Review Criteria

All project deliverables will meet the normal standards of the profession for scientific and engineering work.

## 14.3 QA Review Procedures

At the time the work assignment is assigned to the regional office, the Operations Manager in conjunction with the Program QA Manager will select a quality review team, which will be composed of senior technical staff from WaterSmart Environmental, Inc. and any key subcontractors. The quality review team will typically review work plans, reports, and other project deliverables. Each team member will complete the WaterSmart Environmental, Inc. Quality Assurance Review Form (Exhibit 2)(or a comparable form specified in any contract-specific QA Project Plan) and return

it plus any marked up pages of the draft to the originator. If necessary, the reviewers will meet with the report team to clarify any misunderstood or divergent comments. A copy will also be provided to the Program Manager in accordance with the review schedule.

## 14.4 Quick Turnaround Task Review

For tasks with a duration of one month or less, the normal review process is not practical. For such tasks, the associated documents will be given the first and second levels of review as described in Section 14.1 simultaneously with submittal of the task document to the EPA for their review.

# 15.0 AUDITS

Audits serve four purposes:

1. To determine whether the work is being performed in a systematic, easily understood professional manner. In particular, data gathering and data handling procedures should be audited.
2. To verify that the QA Program Plan and task-specific Project Plans are being implemented.
3. To detect and define problems so that immediate corrective action can begin.
4. To assure that performance is responsive to the EPA's need and objective.

## 15.1 Quarterly Audits

The Program QA Manager, with the assistance of the Operations Managers, will be responsible for ensuring that all program personnel are following the minimum requirements specified in this QAPP and other sound engineering and scientific practices. This will be accomplished through the performance of quarterly QA audits of program activities. The audit need not cover all tasks and activities performed by the WaterSmart Environmental, Inc. Team under all projects but should involve sufficient activities to allow an evaluation of the quality of the work and compliance with the QAPP.

## 15.2 Project Audits

In addition to the Quarterly Audits, the Corporate and the Program QA Manager and the Operations Managers will

jointly plan and schedule additional audits in sufficient frequency and intensity to assure compliance with the objectives of this plan. Some typical audits would include: but all audits shall include items 3 and 4

1. Conducting period field audits of field sampling episodes to ensure that proper collection sample identification and chain-of-custody techniques are being followed.
2. Auditing the training programs to ensure that personnel assigned to field sampling episodes are properly trained in sample collection, health and safety, and chain-of-custody procedures.
3. Supplying duplicate, split, bland or spiked samples provided by EPA to the subcontractor labs and reviewing the results (necessary audit item).
4. Conducting periodic audits of labs used for work assignments to assure the proper analytical methods, documentation, chain-of-custody and other procedures are followed (necessary audit item).

Individuals who are not directly involved in the tasks themselves shall conduct audits. It is expected that the Program Quality Assurance Manager or his designee will lead the quarterly audits and Project Audits.

A memorandum describing the extent of the audit (e.g., number of tasks reviewed), audit results, and any corrective actions will be sent to the appropriate regional Manager, the Work Assignment Manager, the Program Manager and the Senior Vice-President for Quality Assurance.

# 16.0 CORRECTIVE ACTIONS

Corrective actions will be taken upon identification of any problems on the program that affect product quality. The responsible Work Assignment Manager is responsible for identifying the causes of the problem and developing a solution.

The root cause of the problem(s) must first be determined. Then the effects of the problem on the program will be identified for subsequent analysis of the corrective action's effectiveness. The Program QA Manager in conjunction with the Operations Manager will develop a plausible corrective action. The effects of the action will be simulated and tested

to determine whether the action eliminates the problem and associated concerns.

After the initial success of the corrective action is proved, the Operations Manager will write a Corrective Action memorandum that describes the corrective action, how it will

be implemented and the expected results from implementation. A copy of the memorandum will be sent to the Program QA Manager. The Operations Manager will be responsible for the implementation of the corrective measure and will assess its effectiveness after implementation is complete.

## 17.0 QA PROJECT PLANS

Every work assignment that requires monitoring and measurement will have a written QAPjP. The level of detail required for each QAPjP will be a function of the requirements of the work assignment, the identified quality level, and other regional considerations. Each regional office will have a generic QAPjP, which will be incorporated by reference into the work plan for each work assignment. This QAPjP will be augmented with additional QA elements as appropriate for the specific work assignment. After each plan is prepared, the Operations Manager and the Program QA Manager will approve it. The purpose of these plans will present, in detail, quantitative targets for the quality of the sampling, laboratory testing, and data analysis and the procedures to ensure that these targets are met in the final product.

This section describes the required elements of a QA Project Plan and the information to be included in each element. For some elements, reference will be made to EPA standard operating procedures or manuals or company standards.

Each plan consists of 16 elements:

- a) Title page with provision for approval signatures.
- b) Table of contents.
- c) Project description.
- d) Project organization and responsibility.
- e) QA targets for measurement data in terms of precision and accuracy.
- f) Sampling procedures.
- g) Chain-of-Custody.
- h) Calibration procedures and frequency.
- i) Analytical procedures.
- j) Data reduction, validation, and reporting.
- k) Internal quality control checks and frequency.
- l) Performance and system audits and frequency.
- m) QA reports to management.
- n) Preventive maintenance procedures and schedules.
- o) Specific routine procedures to assess precision, accuracy, and completeness of data.
- p) Corrective action.

The QAPjP must include or address all 16 elements. If an element is not applicable, the words "not applicable" should be inserted beside the appropriate element on the contents

page. The reason that this component is not applicable should be stated in the appropriate subsection in the QAPjP.

In an instance where specific QA targets or procedures are addressed as an integral part of a Project Work Plan, Sampling Plan, or Site Health and Safety Plan, it will not be necessary to rewrite them in the QAPjP. These other documents may be referenced by citing the document and the page numbers on which the QA material appears in that document. This citation should be placed in the appropriate subsection of the QAPjP. A "locator page" should then be inserted behind the table of contents of the referenced document. This locator page should list all elements of the QAPjP and should indicate the location of each element by document title and page number.

- a) **Title Page** The title page will list the contract number, project title, the Regional Manager, and the Project QA Manager. A place will be provided for approval signatures by Chuck Steiner.
- b) **Table of Contents** The table of contents will include all elements of the QAPjP, all reference materials and appendices, and a distribution list. An introduction to the plan should be written and placed on the page following the table of contents.
- c) **Work Assignment Description** This section will provide a general description of the work assignment, its background, objectives, and technical approach.

This description may be brief, but must have sufficient detail to allow for proper review and approval of the QAPjP. The following may be included:

- Work flow diagram.
  - Dates anticipated for work assignment start, completion and deliverables.
  - Intended end use of acquired data.
  - Most of this information can be obtained from the Project Work Plan, but should be incorporated by reference.
- d) **Project Organization and Responsibility** A table or chart will show the project organization and line authority. Key individuals should be listed, including those team members who are responsible for ensuring the collection of valid measurement data and the routine assessment of measurement procedures for precision and accuracy. Descriptions of typical key individuals and their responsibilities are as follows:

- *Regional Manager* Responsible for all phases of project execution and for ensuring the collection of valid measurement data.
  - *Quality Assurance Officer - Operations Manager* Responsible for ensuring that appropriate methods and procedures are used in sample collection and control.
  - *Senior Reviewers* Responsible for providing timely, comprehensive review of project deliverables.
- e) **QA Targets for Measurement Data** The QA targets for precision and accuracy of sampling and laboratory testing programs for each major measurement parameter should be stated. When establishing targets, it should be kept in mind that all measurements must be made so that results are representative of the media (air, water, solids) and specific site conditions. Unless otherwise specified, all data must be calculated and reported in generally accepted units. This practice allows for comparison among databases.

Some manuals that describe methods that can be used to establish precision and accuracy targets and methods to estimate the number of samples that should be split and spiked for quality control checks are referred at the end of the sections 3.0.f, 3.0.k and 3.0.o.

In general, the methods are as follows:

#### *Accuracy*

- Establish level of confidence for each constituent to be measured (usually 90 percent is adequate).
- Using EPA's standard deviations, estimate the number of samples to be split and spiked.
- Determine the specific splitting and spiking strategy, using any available presampling knowledge of pollutant concentrations at the site, and considering time and budget constraints.

#### *Precision*

- Decide whether a 0.25 standard error in the standard deviation is acceptable and, if not, re-estimate the number of sample splits and paired samples that are needed.
- For purposes of economy, try to coordinate sampling for precision determination with sampling for accuracy determination.

Also, to ensure the quality of data from field sampling, a certain number of blanks should be submitted to the contract laboratory from each sampling campaign to demonstrate that any pollutants detected in the field samples are not the

result of sample container contamination. Blank samples can consist of reagent grade (uncontaminated) diatomaceous earth, bentonite, or vermiculite for soil and sediment sample sets, or of ultra-pure water for aqueous sample sets. If these substances are unattainable, it might suffice to submit empty sample containers that the analytical laboratory can rinse with ultra-pure water to simulate blank samples. The type and numbers of blank samples should be specified in the QAPjP based on the work assignment objectives and quality level.

- f) **Sampling Procedures** The objective of sampling procedures is to obtain samples that represent the environment being investigated. Trace levels of contaminants from external sources must be eliminated through the use of good sampling techniques and proper selection of sampling equipment. When sampling of air, water, biota, sediments, soils, or wastes is required, a detailed sampling plan should be developed for each field sampling program and appended to the QAPjP. The QAPjP should contain a description of the sampling procedures to be used. When applicable, the following should be included:

- Techniques or guidelines used to select sampling sites.
- Specific sampling procedures to be used (by reference in the case of standard operating procedures and by actual description of the entire procedure in the case of nonstandard procedures).
- Charts, flow diagrams, or tables delineating sampling program operations.
- Containers, procedures, and reagents used for sample collection, preservation, transport, and storage.
- Special preparation of sampling equipment and containers to avoid sample contamination (such as solvent rinsing of containers for organics or acid rinsing of containers for trace metals).
- Collocated samples, spiked, dulers and other QC samples as may be required by the governing guideline.
- A summary of the major source material that can be used to develop sampling plans and specific sampling procedures is provided in Exhibit 3 at the end of this document.

- g) **Chain-of-Custody** WaterSmart Environmental, Inc. must be able to prove that any analytical data presented to Rust accurately represents environmental conditions existing at the time of sample collection. It must be clearly demonstrated that none of the involved samples could possibly have been tampered with during collection, transfer,

storage, or analysis. Therefore, strict chain-of-custody will be followed to trace the possession of each sample from the moment of its collection through its introduction into evidence. A sample is considered in custody if any one of the following requirements is met:

- It is in the actual physical possession of the sampler or laboratory analyst.
- It is in view of the sampler or laboratory analyst.
- It was in the physical possession of the sampler or laboratory analyst and locked up so no one could tamper with it.
- The sample is kept in a secured area that is restricted to authorized personnel only.
- The sample is placed in a container and then sealed with a "custody" seal that must be broken when the container is opened.
- The section should include descriptions of procedures, forms, and methods to be used for recording sample history, sampling conditions, analyses to be performed, sample tracking, and sample custody.

h) **Calibration Procedures and Frequency** This section should include the following information.

- For each piece of equipment used, a reference to the applicable SOP or a written description of the calibration procedure(s) to be used.
- Planned recalibration frequency.
- Calibration standards to be used and their source(s).
- Recording procedures.
- For measurements conducted by WaterSmart Environmental, Inc. staff, SOPs covering calibration will be provided. The procedures specified are consistent with EPA procedures.

i) **Analytical Procedures** Standard analytical procedures (CLB methods) have been established by the EPA. These procedures should be used to the extent possible and referenced in QAPjP. Special analytical procedures required for special tests for lower detection levels of specific contaminants should be described in the QAPjP or Sampling Plan.

j) **Data Reduction, Validation, and Reporting** In this section, the following should be described:

Planned reduction scheme for test results of collected samples.

Principal criteria that will be used to validate data integrity during data collection and reporting.

Methods used to identify and treat outliers (discarded recovery values).

Data flow or reporting scheme from collection of raw data through storage of validated concentrations; a flow chart is usually needed.

Key individuals who will handle the data in this reporting scheme (if this has already been described under project organization and responsibilities, it need not be repeated here).

The QA Manual will present methods of validating and reducing data that can be used in preparing this element of the QAPjP. In general, data reduction will consist of the following essential tasks:

#### *Accuracy*

- Computing percent recoveries for spiked samples.
- Calculating the standard deviation in the overall average recovery value.
- Applying Chauvenet's criterion for detecting bad recovery data.
- Determining the range of uncertainty at a given level of confidence including sampling bias error.
- Adjusting the laboratory data to correct any systematic errors (bias) that are discovered.

#### *Precision*

- Examining split samples and pairs of samples for differences in inter- and intra-sample scatter.
- Validating data on groups of samples, all of which should have the same composition, by examining the scatter in each group in comparison to the overall scatter (invalid data are discarded).
- Computing an overall relative standard deviation that is applicable to all the field investigation data from the particular sampling campaign.

#### *Completeness*

- Computing the fraction of QA test data that remains valid after discarding any invalid accuracy or precision data.

#### *Representativeness and Comparability*

- Determining whether these terms have meaning within the project framework.
- Identifying the appropriate statistical methods.
- Correctly applying the statistical methods and reporting the results.

If a blank sample is reported to contain a quantifiable concentration of any pollutant, the pollutant should be

deleted from the data reduction process and the manager should try to identify the cause. Particular attention should be given to examining the protocol for blank preparation and consulting the institution from which the sample containers were obtained.

If a valid reason for "nonzero" blanks is identified, an attempt should be made to determine if previously obtained data can be validated or if a new field sampling program should be structured that compensates for the nonzero blanks.

k) **Quality Control Checks** This section should describe and/or reference all specific quality control methods to be followed. Examples of control checks to be considered include the following:

- Replicates samples
- Reagent checks
- Internal standards
- Zero and span gases
- Quality control samples
- Surrogate samples
- Calibration standards and devices
- Spiked samples/Split Blanks

Many of these methods will be described in the SOPs. More information and guidance for the selection of these checks are found in the following references:

*Handbook for Analytical Quality Control and Radioactivity Analytical Laboratories* EPA-600/7-77-088. August 1977.

*Handbook for Analytical Quality Control in Water and Wastewater Laboratories* EPA 600/4-79-019.

*Manual of Analytical Quality Control for Pesticides and Related Compounds in Human and Environmental Samples* EPA-600/1-79-008. January 1979.

EPA technical monographs Nos. 15 to 22.

l) **Performance and System Audits** Each QAPjP must describe the internal and external systems and performance audits required to monitor the capability and performance of the sampling and laboratory programs. The system audit will consist of a careful evaluation of both field and laboratory quality control procedures to determine their proper selection and use.

System audits are normally performed either before or shortly after systems are operational and on a regularly scheduled basis during the lifetime of the project or continuing operation. The on-site system audit may be a requirement for formal laboratory certification programs, such as laboratories analyzing public drinking water systems. Specific references pertinent to systems audits for formal laboratory certification programs can be found in the following documents:

*Procedure for the Evaluation of Environmental Monitoring Laboratories* EPA-600/4-78-017. March 1978.

*Manual for the Interim Certification of Laboratories Involved in Analyzing Public Drinking Water Supplied - Criteria and Procedures* EPA-600/8-78-008. August 1978.

After the project is operational and generating data, performance audits will be conducted periodically to determine the accuracy of the total sampling and laboratory programs or their component parts. The WaterSmart Environmental, Inc. team will conduct field audits of sampling procedures to evaluate performance.

m) **QA Reports to Management** QAPPs should outline a system for periodic reporting to management on the performance of sample collection and data quality. As a minimum, these reports should include:

- Periodic assessment of measurement data accuracy, precision, and completeness.
- Results of performance audits.
- Results of systems audits.
- Significant QA problems and recommended solutions.

n) **Preventive Maintenance** The following preventive maintenance items should be considered and addressed in the QAPP:

- Schedule of important preventive maintenance tasks that must be carried out to minimize down time of field equipment.
- List of any critical spare parts that should be on hand to minimize down time.

Procedures for preventive maintenance for field equipment will be provided in SOPs.

o) **Specific Routine Procedures Used to Assess Data Precision, Accuracy, and Completeness** The QAPjP must describe the routine procedures used to assess the measurement data. These procedures should include the equations to calculate precision, accuracy, and completeness, and the methods used to gather data for the precision and accuracy calculations. Statistical procedures are found in the references listed below:

*QA Handbook for Pollution Measurement Systems, Volume I – Principles* EPA-600/9-76-005. March 1976

*QA Handbook for Air Pollution Measurement Systems, Volume II - Ambient Air Specific Methods* EPA-600/4-77-027a. May 1977.

*QA Handbook for Air Pollution Measurement Systems, Volume III - Stationary Source Methods* EPA-600/4-77-027b. August 1977.

*Handbook for Analytical Quality Control in Radioactivity Analytical Laboratories* EPA-600/7-77-088. August 1977

*Manual of Analytical Quality Control for Pesticides and Related Compounds in Human and Environmental Samples* EPA-600/1-79-008. January 1979

*Calculation of Data Quality Indicators* EMSC RTP and Las Vegas USEPA. 1983.

*Environmental Measurement Method Performance Data for Establishing Achievable Data Quality Goals* USEPA 1983.

Examples of these procedures include:

*Central tendency and dispersion measures*

- Arithmetic mean
- Range
- Standard deviation
- Relative standard deviation
- Pooled standard deviation
- Geometric mean

Measures of variability

- Accuracy

- Bias
- Precision, within laboratory and between laboratories

*Significance tests*

- u-test
- f-test
- Chi-square test

*Confidence tests*

*Testing for outliers*

This section must specify any standard data assessment done by subcontract labs as well as how the results are to be shown in the QA reports from the laboratories.

p) **Corrective Action** This section of the QAPjP should include the following elements.

- Predetermined limits for data acceptability beyond which corrective action is required.
- Procedures for corrective action.
- Identification of the individual responsible for initiating the corrective action and the individual responsible for approving the corrective action, if necessary.

# Quality Assurance Program Plan

**WaterSmart Environmental, Inc.**

QAQC0100  
**PROJECT NOTES**

W.A. No. \_\_\_\_\_ Action Date: \_\_\_\_\_ Page \_\_\_\_\_ of \_\_\_\_\_

Confirmation of: \_\_\_\_\_ Conference Date Held: \_\_\_\_\_

Telephone  Other

Date Issued: \_\_\_\_\_

Recorded by: \_\_\_\_\_

Place: \_\_\_\_\_

SUBJECT: \_\_\_\_\_

Participants:

_____	_____
_____	_____
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Item:

Action Required by:

_____	_____
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_____	_____



# Quality Assurance Program Plan

**WaterSmart Environmental, Inc.**

QAQC0200

**QUALITY ASSURANCE REVIEW FORM**

Project No.: \_\_\_\_\_ Client: \_\_\_\_\_

Project Title: \_\_\_\_\_

Project/Task Mgr: \_\_\_\_\_  Draft  Final

Reviewer: \_\_\_\_\_ Date Prepared: \_\_\_\_\_

Signature: \_\_\_\_\_ Date Reviewed: \_\_\_\_\_

<b>RESPONSIVENESS</b>	<b>Yes</b>	<b>No</b>	<b>Comments</b>
Is report responsive to the work assignment & work plan?	<input type="checkbox"/>	<input type="checkbox"/>	_____

<b>CONTENT</b>	<b>Yes</b>	<b>No</b>	<b>Comments</b>
Are analyses/findings/recommendations well reasoned?	<input type="checkbox"/>	<input type="checkbox"/>	_____
Do they make sense?	<input type="checkbox"/>	<input type="checkbox"/>	_____
Are they supported by the data?	<input type="checkbox"/>	<input type="checkbox"/>	_____

<b>PRESENTATION</b>	<b>Yes</b>	<b>No</b>	<b>Comments</b>
Is report well organized?	<input type="checkbox"/>	<input type="checkbox"/>	_____
Well written (grammar, style, flow)?	<input type="checkbox"/>	<input type="checkbox"/>	_____
Is format appropriate and consistent?	<input type="checkbox"/>	<input type="checkbox"/>	_____
Does report look good (graphics, typos)?	<input type="checkbox"/>	<input type="checkbox"/>	_____

**OTHER COMMENTS**

\_\_\_\_\_

\_\_\_\_\_

- OVERALL EVALUATION** (check one)
- Acceptable
  - Acceptable with minor revisions as noted above/in the report
  - Needs substantial revision/rework as noted above/in the report



## SAMPLING REFERENCES

### General

**WaterSmart Environmental, Inc.** Standard Operating Procedures for Field Sampling, Sample Control Including Chain-of-Custody, and Document Control.

**Ford, P., P. Turina, D. Seely.** 1983. *Characterization of Hazardous Waste Sites: A Methods Manual*. Volume II. Available sampling methods. U.S. Environmental Protection Agency. EPA-600/4-83-040. Environmental Monitoring Systems Laboratory, Las Vegas, NV.

**Greenberg, A.E., J.J. Connors, and D. Jenkins** (eds). *Standard Methods for Examination of Waste and Wastewater*. American Public Health Association, Washington, DC. 1268 pp.

**Hiatt, H.** 1981. *Analysis of Fish and Sediment for Volatile Priority Pollutants*, Anal. Chem. 53:1541-1543.

**Plumb, R.H., Jr.** 1981. *Procedures for Handling and Chemical Analysis of Sediment and Water Samples*. Technical Report EPA/CE-81-1. Environmental Protection Agency/Corps of Engineers Technical Committee on Criteria for Dredged and Fill Material, U.S. Army Waterways Experiment Station, Vicksburg, MS. 471 pp.

**Plumb, R.H., Sr.** 1984. *Characterization of Hazardous Waste Sites, A Methods Manual, Volume III*, Available Laboratory Analytical Methods. Prepared for Environmental Monitoring Systems Laboratory. Las Vegas, NV. NTIS PB84-191048.

**Region X Technical Assistance Team.** 1983. *Manual for Sampling Hazardous Materials*. U.S. Environmental Emergency Section, Region X., Seattle, WA.

**Strickland, J.D.H., and T.R. Parsons.** 1972. *A Practical Handbook of Seawater Analysis*. Bulletin No. 167. Fisheries Research Board of Canada, Ottawa, Canada. 310 pp.

**Tetra Tech, Inc.** 1982. *Design of 301(h) Monitoring Programs for Municipal Wastewater Discharges to Marine Waters*. Contract No. 68-01-5906. U.S. EPA, Office of Water Program Operations, Washington, D.C. 135 pp.

**U.S. Department of Interior.** 1977. *National Handbook of Recommended Methods for Water-Data Acquisition*. Prepared under sponsorship of the Office of Water Data Coordination, Geological Survey, U.S. Department of Interior, Reston, VA

**U.S. Environmental Protection Agency.** 1979c (revised March, 1983). *Methods for Chemical Analysis of Water and Wastes*. EPA 600/4-79-020. Environmental Monitoring and Support Laboratory, Cincinnati, OH.

**U.S. Environmental Protection Agency.** 1980b. *Interim Methods for the Sampling and Analysis of Priority Pollutants in Sediments and Fish Tissue*. Environmental Monitoring and Support Laboratory, Cincinnati, OH. 60 pp.

**U.S. Environmental Protection Agency.** 1982a. *Handbook for Sampling and Sample Preservation of Water*

*and Wastewater*. EPA-600/4-82-029. Environmental Monitoring and Support Laboratory, Cincinnati, OH 402 pp.

**U.S. Environmental Protection Agency.** 1982b. *Hazardous Materials Incident Response Operations: Training Manual*. Office of Emergency and Remedial Response, Hazardous Response Support Division. Cincinnati, OH.

**U.S. Environmental Protection Agency.** 1982c. *Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater*. EPA-600/4-82-057. Environmental Monitoring and Support Laboratory, Cincinnati, OH.

**U.S. Environmental Protection Agency.** 1982d. *Technical additions to Methods for Chemical Analysis of Water and Wastes*. EPA 600/4-82-055. Environmental Monitoring and Support Laboratory, Cincinnati, OH.

**U.S. Environmental Protection Agency.** 1982e. *Test Methods for Evaluating Solid Waste*. SW-846 Office of Solid Waste and Emergency Response. Washington. D.C.

**U.S. Environmental Protection Agency.** 1983c. *Field Monitoring and Sampling of Hazardous Materials*. Office of Emergency and Remedial Response, Hazardous Response Support Division. Cincinnati, OH.

**U.S. Environmental Protection Agency.** 1984b. *Guidelines Establishing Test Procedures for the Analysis of Pollutants*. U.S. EPA, Washington, D.C. Federal Register, Vol. 49, No. 209, pp. 43234-43436.

### Sampling Procedures - Groundwater

**Sisk, S.** 1981. *NEIC Manual for Groundwater/Subsurface Investigations at Hazardous Waste Sites*. U.S. Environmental Protection Agency. EPA-330/9-81-002. National Enforcement Investigations Center, Denver, CO.

**U.S. Environmental Protection Agency.** 1980c. *Procedures Manual for Groundwater Monitoring at Solid Waste Disposal Facilities*. SW-611. Office of Water and Waste Management. Washington, D.C. 269 pp.

### General Sampling Procedures - Biology

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