INTEGRAL QUALITY MANAGEMENT PLAN

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ACRONYMS AND ABBREVIATIONS

ANSI	American National Standards Institute
ASQ	American Society for Quality
ASQC	American Society for Quality Control
Board	board of directors
CAR	corrective action report
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
GIS	geographic information system
HAZWOPER	Hazardous Waste Operations and Emergency Response
HR	human resources
Integral	Integral Consulting Inc.
IT	information technology
OSHA	Occupational Safety and Health Administration
PIC	principal-in-charge
PQO	project quality objective
QA/QC	quality assurance/quality control
QAC	quality assurance committee
QAO	quality assurance officer
QAPP	quality assurance project plan
QMP	quality management plan
SAP	sampling and analysis plan
SOP	standard operating procedure
UFP	uniform federal policy

1 INTRODUCTION

This document describes quality management procedures implemented by Integral Consulting Inc. (Integral) to ensure the accuracy and integrity of its work products.

1.1 PURPOSE OF THE PLAN

This quality management plan (QMP) is a quality management tool that documents Integral Consulting Inc. (Integral) guidance for planning, documenting, and assessing the effectiveness of activities supporting projects conducted for company clients. This QMP is an "umbrella" quality assurance document describing the processes and procedures that management and staff follow in the development of project deliverables, specifically including the collection, analysis, and reporting of project data for the U.S. Environmental Protection Agency (EPA). Because a substantial fraction of Integral's work is conducted under the oversight of EPA, this QMP is patterned after a national consensus standard, American National Standards Institute/American Society for Quality Control[1] (ANSI/ASQC) E4-1994 standard, Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs, and EPA guidance documents developed to assist agency contractors in developing their own agency-specific QMPs (http://www.epa.gov/quality/qa_docs.html). Integral has prepared this QMP in accordance with EPA Requirements for Quality Management Plans (QA/R-2), guidance document EPA/240/B-01/002.

1.2 SOURCE DOCUMENTS

The following source documents have been used to assist in the preparation of this QMP:

- ANSI/ASQC E4-1994, Specifications and Guidelines for Quality Systems for Environmental Data Collection and Technology Programs, American National Standards Institute, January 1995. http://e-standards.asq.org/perl/catalog.cgi
- EPA Requirements for Quality Management Plans (QA/R-2), (EPA/240/B-01/002), March 2001
- EPA Requirements for Quality Assurance Project Plans (QA/R-5), (EPA/240/B-01/003), March 2001
- Guidance on Systematic Planning Using the Data Quality Objectives Process (QA/G-4), (EPA/240/B-06/001), February 2006
- Guidance for Preparing Standard Operating Procedures (SOPs) (QA/G-6), (EPA/240/B-01/004), March 2001

[1] Renamed American Society for Quality (ASQ) in 1997.

- Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP), EPA-505-B-04-900A, March 2005.

1.3 SCOPE OF COVERED ACTIVITIES

The activities described in this QMP apply to Integral environmental projects involving data collection, reporting, analysis, modeling, and design activities.

1.4 REVISIONS TO THE PLAN

This QMP is reviewed and updated on an annual basis by the Integral quality assurance officer (QAO). The annual review process is designed to ensure that quality management practices are consistent with any changes in international or federal guidance, corporate policy, project needs, regulatory requirements, and new technology. Recommended changes to the QMP are reviewed and approved by the quality assurance committee (QAC) and a representative of Integral's board of directors (Board). If there are significant changes that make the QMP no longer applicable, a revised QMP will be prepared before the annual revision date.

2 MANAGEMENT AND ORGANIZATION

2.1 INTEGRAL'S MISSION STATEMENT

The mission of Integral is to create and maintain a team-oriented business culture of openness, cooperation, and career opportunities, while applying science and engineering expertise to help our clients make informed decisions, manage risk effectively, and develop optimal solutions to complex technical problems.

2.2 INTEGRAL'S QUALITY POLICY

Integral is committed to delivering high-quality services and continually evaluating and improving our performance. To ensure that all project documents meet the highest standards, Integral relies on project-specific quality assurance project plans (QAPPs) as appropriate for each project, and has an internal quality assurance review process for all project deliverables. Project-specific QAPPs detail the methods used to collect project data and to establish the usability of those data for analyses to be conducted. All deliverables that contain data, analytical results, or other technical findings are subjected to a quality assurance review.

Staff at all levels of the project are responsible for ensuring that their work is accurate and has been quality assured. Additional levels of responsibility are as follows:

- The project manager is responsible for ensuring that 1) project-specific QAPPs have been prepared as appropriate for all work involving environmental data collection; 2) adequate resources are allocated and appropriately qualified staff members conduct data collection, analysis, and interpretation; 3) all deliverables containing technical findings or committing the resources of the firm are subjected to appropriate technical and editorial review prior to external submittal; and 4) adequate resources are allocated and appropriately qualified staff members conduct the technical and editorial reviews. The project manager is responsible for ensuring that the quality assurance reviews are performed adequately and that they meet the goals of the quality assurance policy prior to external release of any written correspondence.
- A technical reviewer is someone, other than the author, who has the appropriate qualifications to conduct a technical review of the written correspondence or key support documentation.
- An editorial reviewer is someone, other than the author, who is qualified to conduct an editorial review of deliverable documents.

2.3 ORGANIZATION

Integral's internal staff management structure is organized around technical disciplines that are intended to support the objective of "people doing what they do best." The intent is to operate as a flat organization with collaboration among staff with all levels of technical expertise, and with open, participatory decision-making.

Client work is conducted through the organization of projects, which may incorporate staff from multiple disciplines and offices. The project management structure is headed by a principal-in-charge (PIC), who is responsible for overall performance of the project. Planning and operation of a project is conducted by the project manager, who reports to the PIC. Depending on the size and complexity of the project, task managers may be designated to oversee specific phases or activities within the project. Project managers are responsible for planning, tracking, and reporting project activities. These responsibilities include ensuring that quality assurance practices are applied appropriately, as described in Section 2.2.

2.3.1 Corporate Roles and Responsibilities

Overall roles and responsibilities of groups and individuals are described below:

- Board—The Board's responsibilities and authority are primarily related to stock transactions, executive employment, and compensation, and to decisions related to the financial viability of the Company.
- Operating Committee—The Operating Committee is responsible for policies and procedures, execution of work, staff organization, performance evaluations and compensation, and hiring and firing decisions. Responsibilities related to execution of work are performed in close coordination with project managers. The Operating Committee consists of the director of operations, office managers, and the human resources (HR) manager.
- Principals—Principals represent the company in business and technical arenas, serve as lead client contacts and client counselors, lead Integral practice areas, lead in developing client opportunities, lead in identifying new practice areas, and mentor future leaders.
- Practice Area Leaders—Practice area leaders provide company-wide technical leadership in core discipline areas (e.g., ecology, toxicology, engineering, and geology/hydrogeology), identify developing technical issues and initiatives, lead business development activities, and facilitate group planning.
- Health and Safety Officer—The corporate health and safety officer is responsible for preparing and updating the corporate health and safety plan, reviewing project-specific health and safety plans, ensuring that staff have necessary health and safety training, and maintaining health and safety records.

- Quality Assurance Officer—The corporate QAO is responsible for leading the QAC and for maintaining Integral's QMP, implementing quality management training, conducting annual quality assurance reviews with Integral management, and facilitating the maintenance of a quality management ethic within the company.
- Office Managers—In addition to performing technical duties consistent with their training and experience, office managers run local operations. General responsibilities of the office manager are to represent office interests and perspectives on the Operating Committee, facilitate communication on office and company-wide issues, ensure that the office complies with company polices and procedures, facilitate recruiting efforts and business development, and authorize office purchases.
- Corporate Managers—Accounting/HR, Information Technology (IT) Department, and Publications/Marketing managers establish and implement processes and standards for Company operations and communications and provide technical staff with the support they need to focus on their technical work and their interactions with clients.

2.3.2 Project Roles and Responsibilities

Roles and responsibilities of corporate and other staff with respect to both corporate and project-specific aspects of quality assurance activities are described in the following sections.

2.3.2.1 Operating Committee

The Operating Committee is responsible for ensuring implementation of the QMP, including:

- Identifying the appropriate PIC for each project
- Complying with the overall requirements of the QMP
- Appointing the QAO and members of the QAC and overseeing the functioning of the QAC.

2.3.2.2 Principal-in-Charge

The PIC is responsible for project-specific implementation of and compliance with the QMP, including:

- Complying with project-specific requirements of the QMP
- Resolving disputes regarding quality management procedures in cooperation with the QAO and QAC.

The PIC has overall supervisory responsibility for the project, including meeting scope, schedule, and budget. Day-to-day activities are delegated to the project manager.

2.3.2.3 Quality Assurance Committee

The QAC is responsible for ensuring implementation of the quality function, including:

- Identifying activities and resources to accomplish project quality objectives (PQOs)
- Reviewing and approving revisions to the QMP
- Ensuring that quality management training is provided to staff
- Ensuring management reviews to assess the effectiveness of the quality management procedures.

2.3.2.4 Quality Assurance Officer

The QAO is responsible for implementation of this QMP, including:

- Developing and revising the QMP
- Providing assistance to Integral personnel on quality assurance procedures applicable to the implementation of the QMP for specific projects
- Reviewing and approving quality assurance components of planning documents, including QAPPs, sampling and analysis plans (SAPs), and SOPs
- Identifying training needs
- Conducting quality management assessments, identifying deficiencies, documenting findings, evaluating proposed corrective actions, and verifying the effectiveness of the corrective actions
- Conducting annual quality reviews with Integral management to present the status of quality management documents and procedures, to review the results of assessments and corrective actions, to assess the strengths and weaknesses in the QMP, and to identify opportunities for improvement.

The QAO has an independent role on the project team and is not directly involved in generating, compiling, or evaluating environmental data. For projects where the QAO has this project role, another QAO or designee conducts quality assurance tasks. The QAO routinely has access to corporate and regional management through telephone and electronic mail correspondence to conduct quality assurance oversight.

2.3.2.5 Project Manager

With regard to quality assurance activities, the project manager is responsible for:

- Specifying project-specific quality goals and procedures, in coordination with the PIC and QAO; these are documented either in a deliverable QAPP or in internal guidance provided to project staff
- Identifying resource needs to achieve project-specific quality goals
- Informing project personnel of the QMP and its requirements
- Selecting appropriate corporate sampling, analytical, and data handling SOPS, or, if necessary, developing project-specific sampling, analytical, and data handling practices in SOPs that are functional and accurate, and that are reviewed and approved by the QAO throughout the project for continued adequacy
- Managing application of quality assurance reviews on the specific project
- Arranging for project-specific staff review of project data quality objectives (DQOs), SAPs, and QAPPs, and other quality management documents
- Ensuring that the project-specific quality assurance reviews are performed as necessary, and that only data of adequate quality are used in environmental decision-making
- Identifying and implementing corrective actions.

2.3.2.6 Project Staff

Environmental data collection and analysis staff are responsible for:

- Reviewing the QMP and project-specific quality goals and procedures
- Maintaining data quality by conducting work following the project-specific quality assurance documents
- Adhering to project-specific sampling practices and procedures as prescribed in the project-specific quality specifications
- Adhering to good laboratory practices and methods as prescribed in project-specific quality specifications
- Documenting deviations from established methodologies, SOPs, and other quality protocols, and reporting the deviations to the project manager or PIC
- Identifying possible project-specific data quality problems and potential areas for quality improvements, and reporting these to the project manager or PIC
- Identifying to the project manager opportunities for SOP improvement and operations that are in need of SOPs
- Assuring the technical accuracy of project deliverables.

2.4 TECHNICAL ACTIVITIES AND PROGRAMS SUPPORTED BY THE QMP

This QMP applies to specific designated projects, which may include:

- Subsurface investigation
- Collection of environmental data in the field
- Collection of samples for laboratory analysis
- Design and implementation of treatability studies
- Design of remediation systems
- Installation and operation of remediation systems
- Preparation of project-specific reports.

2.5 DISPUTE RESOLUTION

Disputes that arise regarding the application of quality management procedures to a specific project should be resolved by the QAO. Should the dispute remain unresolved, the QAC resolves the dispute.

3 QUALITY SYSTEM COMPONENTS

The quality system components described herein provide the framework for planning, implementing, documenting and assessing activities relevant to environmental data operations and for carrying out required quality assurance/quality control (QA/QC) activities for the organization. Integral's quality management system comprises a number of functional components including the following:

- Documentation of project activities
- Annual reviews and planning
- Management assessments and reviews
- Training
- Systematic planning of projects
- Project-specific quality documentation
- Project and data assessments.

3.1 QUALITY MANAGEMENT PLAN

Integral's QMP is the umbrella document that describes the corporate quality management approach and its various components. The QAC and QAO are responsible for preparing, reviewing, and revising the QMP. Integral senior management and project managers are responsible for implementing the QMP and its various elements. The QMP and other documents pertaining to projects are to be accessible to all staff in all offices at all times. The QAO revises the QMP annually (or more frequently if necessary) for review and approval by the PIC.

3.2 QUALITY ASSURANCE PROJECT PLANS

QAPPs are formal documents that describe in comprehensive detail the required quality control, quality assurance, and related technical activates that are carried out for a specific project so that project deliverables are met and that the data results from the project are of sufficient quality to reliably meet the project objectives. Project-specific QAPPs are prepared in accordance with the EPA guidance documents identified in Section 1. The project manager is responsible for developing the QAPP, with review and approval by the QAO (review functions may be delegated to technically qualified individuals).

3.3 STANDARD OPERATING PROCEDURES

SOPs are written documents that describe the detailed procedures for a method of operations, activity, or analysis so that procedures can be consistently reproduced. SOPs are generally developed for activities that are conducted on a repetitive basis, often by multiple staff members performing the same task (Section 9.1). Areas appropriate for the development of SOPs include routine data collection activities, monitoring, and field measurement activities. SOPs are included as a part of or are referenced in the project-specific QAPP. SOPs can be developed internally for specialized tasks or can be adopted from approved procedures developed by state and federal agencies or standards development organizations. The sources for SOPs are clearly defined in the QAPP.

3.4 MANAGEMENT ASSESSMENTS

Management assessments are routine and ongoing processes of review by Integral project managers to monitor the effectiveness of quality assurance plans and reviews. This process begins at the time of project inception. The QAO and the project manager review the project plan to determine if adequate quality assurance protocols have been incorporated in the projects. They also have the responsibility for reviewing applicable regulatory quality guidelines pertaining to the project. The QAC provides additional expertise and authority for determining that appropriate quality assessments are carried out for each project. At the discretion of the Operating Committee, external assessment may be requested in the form of an outside reviewer or assessment team to assist in evaluating whether the projects are meeting their desired objectives.

3.5 SYSTEMATIC PLANNING PROCESS

Project planning requires a systematic process that is coordinated by the project manager. After the project objectives are identified, a scope of work (including project deliverables), budget, and time schedule are developed with proposed project team members who are involved in the planning process. Quality assurance protocols are included in the project planning process that specify the project quality assurance goals, the activities subject to technical review, the methods to be used, and the standards to be achieved. Financial and human resources necessary for implementation of the quality management program are included in the overall project budget. Project-specific DQOs are also identified during the planning process. DQOs include the desired bias and precision (uncertainty), completeness, and representativeness characteristics that are required to meet the project goals. The need for a separate QAPP is assessed during the planning process. If a stand-alone QAPP is not required, project plans include quality assurance protocols that are to be followed to meet the project objectives.

Environmental monitoring and measurement programs conducted by or for Integral projects are designed to produce technically and legally defensible data of a quality sufficient to support its intended use. Integral policy is to implement the DQO process, as appropriate, for projects involved in environmental data collection.

The DQO process is a systematic planning tool to facilitate the planning of environmental data collection activities. DQOs are qualitative and quantitative statements developed from the DQO process. The DQO process is a seven-step planning approach used to prepare for data collection activities. It provides a systematic approach for defining the criteria that a data collection design should satisfy, including when, where, and how to collect samples; tolerable decision error rates; and the number of samples to collect. The DQO process helps investigators ensure that the data collected are of the right type, quantity, and quality needed to support environmental decision-making.

The seven steps of the DQO process are:

- State the problem
- Identify the decision
- Identify inputs to the decision
- Define the study boundaries
- Develop a decision rule
- Specify limits on decision errors
- Optimize the design for obtaining data.

The DQO process defines qualitative and quantitative criteria for determining when, where, and how many samples (measurements) to collect for a desired level of confidence. This information is documented in the QAPP, along with sampling procedures, analytical procedures, and appropriate QA/QC procedures.

3.6 TECHNICAL REVIEWS

Technical reviews, conducted during the course of a project, are documented assessments of project work to evaluate documents, activities, materials, data, calculations, or other work products that require technical verification for bias, precision, completeness, or representativeness. Technical reviews are conducted by Integral personnel who may or may not be independent of the project team, but with equivalent experience and training in the project discipline. Reviews may also be conducted by external individuals. Technical reviews result in a written record of the review findings with a documented response from the project manager that addresses the reviewer's findings. The project manager is responsible for retaining records that document the review findings and responses.

3.7 DATA QUALITY ASSESSMENTS

Data quality assessments are scientific evaluations of results to determine their validity and appropriateness for their intended use. Routine data quality assessments are incorporated into the project design, with clear indication of the personnel responsible for conducting the assessments. The assessments are conducted on a regular basis and a written record is maintained to document the results of the data review. Deviations from the DQOs that are discovered during the assessments are reported to the project manager for corrective action. Some projects may require that data quality assessments be conducted by a qualified third party.

4 PERSONNEL QUALIFICATIONS AND TRAINING

4.1 QUALIFICATIONS

Integral personnel must meet at least the minimum academic and professional experience qualifications for their positions and work responsibilities. Performance dimensions for job classifications are specified in Integral's Employee Manual and address professional, business/client, and leadership/teamwork dimensions. Employees are measured against these criteria on an annual basis.

Integral project personnel who engage in field activities at hazardous waste sites are required by the Occupational Safety and Health Administration (OSHA) to have Hazardous Waste Operations and Emergency Response (HAZWOPER) 40-hour training together with an annual 8-hour HAZWOPER refresher and medical monitoring. Training may be conducted by internal or external staff. HAZWOPER training records are monitored and maintained by the corporate health and safety officer.

4.2 COMMITMENT TO TRAINING

Integral trains its staff to conduct project tasks consistent with technical standards of practice, SOPs, and project-required quality management specifications. Staff training is conducted at several levels:

- Technical disciplines—Technical staff are expected to maintain or increase their proficiency in scientific or engineering disciplines, and Integral provides training, or training opportunities, to support this continued growth in staff expertise.
- Project-specific procedures—Integral provides training to familiarize staff with project-specific SOPs and other specifications as needed.
- Corporate standards and requirements—All staff are provided with training or access to training materials that cover corporate policies and procedures, specifically including those associated with quality assurance planning and reviews.

Integral supports staff development and training through a variety of programs:

- Mentoring
- Educational reimbursement
- Platform/poster presentation and attendance at conferences
- Membership in professional societies
- Annual performance review, with associated performance dimensions and feedback

- Semi-annual review of progress toward achieving performance goals
- Advanced project manager training.

Integral also supports career growth and development through the following:

- Technical review process, where all written products are reviewed for accuracy and readability
- Technical seminar series
- Health and safety training, as noted above
- Technical group meetings, discussions and initiatives, including the following workgroups:
  - Geographic information system (GIS)
  - Soil and sediment
  - Health and safety
  - Ecology
  - Sustainability.

The information shared and lessons learned during debriefs conducted as part of the activities of the technical workgroups are key elements in helping Integral to maintain our science and engineering expertise and to help our clients make informed decisions, manage risk effectively, and develop optimal solutions to complex technical problems. The workgroups are a major means for promoting, coordinating, and disseminating technical standards throughout the firm.

The application of sound quality assurance policies and procedures requires that staff, including project managers, field personnel, analysts, and technical experts who generate or use environmental data are provided with the appropriate level of quality assurance training commensurate with their duties. Project managers and field supervisors are responsible for ensuring that each employee with a quality assurance-related assignment has the necessary qualifications and proficiency for the work assigned. It is the responsibility of PICs or their designees to discuss quality assurance training needs with personnel involved in environmentally-related data gathering activities and with their supervisors during the annual performance evaluation process.

A quality assurance training requirement should appear within the project-specific QAPP for project staff, as appropriate (including subcontractors). For example, project managers and field supervisors are responsible for ensuring that contract personnel involved with the gathering of environmental data have the necessary and appropriate quality assurance training for their tasks and functions. The QAO determines the need for retraining, based on the results of quality management assessments and changing circumstances.

The PIC is ultimately responsible for ensuring that project data are of known quality. Therefore, it is critical that project managers and field supervisors receive the necessary training to ensure their understanding of the importance of quality assurance, their responsibilities with regard to environmental data collection activities, and specific quality assurance policies and procedures. Therefore, retraining based on changing requirements occurs as needed.

The QAO is responsible for maintaining a library of pertinent quality assurance documentation to assist technical staff and communicating any necessary retraining. The PIC, project manager, and staff will participate in project quality assurance training as appropriate.

4.3 DOCUMENTATION OF STAFF TRAINING AND EDUCATION

Job opening announcements for new employees are based on the requirements of the position in terms of education and experience. Applicants must meet these minimum requirements to be hired. A permanent record of the successful applicant's resume, with education and work experience, is maintained in the HR Department. New staff is also required to provide written acknowledgements that appropriate policy and employee manuals have been provided and that the employee understands the provisions contained in the documentation. Existing employees are to provide the same documented acknowledgments for new or revised policies. This documentation is maintained in the HR Department.

As part of the annual personnel evaluation process, personnel provide updated information regarding formal education and any other subsequent training, certifications, or licenses that have been received. Principals and supervisors encourage professional development in the annual evaluation process and support personnel by identifying qualified training programs that are responsive to technical changes. The supervisor assesses effectiveness of the training in the annual evaluation process. Individual employees maintain their own training records on an updated resume. Records of required training will be maintained in the project file or in the permanent HR file, as appropriate.

5 PROCUREMENT OF ITEMS AND SERVICES

Applicable project-specific procurement contracts meet established administrative and quality assurance requirements. These procedures are re-evaluated on a periodic basis. In those procurements and contracts where higher level quality requirements apply, appropriate clauses can be included in the contract.

After contract award, when requesting services either through the issuance of a work assignment, task order, or delivery order, the quality requirements specified in the project-specific quality documents are followed.

5.1 PROCUREMENT SOURCE EVALUATION AND SELECTION

The project manager has the primary responsibility for determining that goods and services procured to meet project deliverables are of sufficient quality to provide reliable and consistent performance. Purchase requests for goods and services should include adequate detail to specify the quality and performance requirements of the acquired items. Project managers are responsible for ensuring that agreements describe the quality management elements for which the supplier is responsible. This is particularly important for goods and services that are subject to bid processes. Project managers are responsible for bid evaluations and take into account the suppliers' quality-related documentation and quality aspects of the offered goods and services based on the performance specifications that were indicated on the request for bid forms. The project manager reviews and approves applicable responses to bid solicitations to ensure that they satisfy technical and quality requirements.

Integral purchasing and contracting personnel are responsible for maintaining lists of approved vendors for a broad category of goods and services. They are also responsible for assisting the project manager in obtaining competitive pricing schedules. Any quality defects that affect the performance of goods and services obtained should be reported by the project manager to purchasing and contracting personnel.

Contractors retained to provide services are preapproved and have evidence of insurance, bonding, and appropriate documentation of licenses and certifications, depending on the vendor type. External providers of laboratory services provide adequate documentation to show compliance with accreditation requirements, including the availability of quality assurance plans, QMPs, and SOPs, where applicable.

5.2 EVALUATION OF QUALITY OF VENDOR-SUPPLIED COMMODITIES, SERVICES, AND EQUIPMENT

As applicable, the project manager is responsible for providing specifications on the purchase request to determine that procured goods and services are of acceptable quality to meet the project objectives. The project manager verifies vendors' conformance to Integral requirements. Certifications of performance, quality, and warranty information that accompany goods and services are maintained by the project manager in the appropriate project file. This includes Material Safety Data Sheets that accompany chemical purchases. External providers of laboratory services provide adequate quality control information to assess the bias and precision (uncertainty) of the reported results.

6 DOCUMENTS AND RECORDS

Maintenance of documents and records (both printed and electronic) associated with a specific project is the responsibility of the project manager for the project and the staff conducting the work. Integral has established procedures for identifying, controlling, filing, storing, protecting, and accessing documents and records. Documents include guidance documents, policy memoranda, written procedures, reports, and quality assurance management and project planning documents. Records provide objective evidence of an item or process and include laboratory reports, field notes, data recording media, photographs, and drawings.

The QAO is responsible for documents and records associated with the implementation of the quality management procedures.

6.1 PROCESS FOR IDENTIFYING PROJECT-SPECIFIC QUALITY-RELATED DOCUMENTS AND RECORDS REQUIRING CONTROL

The QAO identifies specific project documents and records that require control. The control of quality-related documentation and records is described in the following documents that are subject to the review of the QAO:

- QMP
- Project plans
- Project-specific QAPPs
- SOPs
- Training records
- Technical system audit reports
- Quality assurance review records
- Subcontractor-specific QAPPs
- Additional contract-specific documents, including contract agreements.

These documents also require that personnel involved in environmental data collection and environmental technology activities maintain quality assurance-related records (both written and electronic) including, but not limited to:

- Chain-of-custody records
- Field sampling notes
- Field and fixed analytical records for the transfer, preparation, and analysis of samples

- Data reports, including analytical results forms
- Communication records.

Project staff prepare quality-related documents and records, as appropriate. The PIC, project manager, QAO, or designee reviews and approves these documents. The project manager or designee assesses conformance to these requirements through quality management assessments and data validation programs.

6.2 PROCESS FOR ENSURING THAT DOCUMENTS AND RECORDS ACCURATELY REFLECT COMPLETED WORK

The PIC is responsible for establishing procedures for ensuring consistency and technical accuracy of documents and project records. It is the project manager's responsibility to implement these procedures and ensure that records and documents accurately reflect completed work. Project staff use a QA Review Form (Attachment A) for documenting the review of data manipulations, analyses, and documents. Engineering calculations and drawings are peer reviewed and checked; this process is documented on the cover page or title block of the document. Data tables and figures made using project data are also peer reviewed and checked for accuracy. Deliverables are checked by one or more technical reviewers as appropriate, and the PIC is responsible for ensuring that all reviews have been conducted as needed (i.e., as prescribed in the project plan) and carried out by appropriately qualified staff.

Data archives are accompanied by documentation that describes the hardware and software used to read and write the archives; the variables stored in the archives; the format and units of the variables; the conditions under which they were collected; and any other information that may inform the user about the nature of the data, its quality, or its use. Data will be archived in such a way that the quality of the records will not be compromised. Records will be stored in a secure location with controlled access and adequate temperature control to maintain their integrity.

Standards and procedures for maintaining quality-related documents and records, including transmittal, distribution, retention, access, preservation, traceability, retrieval, removal of obsolete documentation, and disposition should be specified in the project plan. Maintenance of a file system for each project is the responsibility of the project manager. In addition, for each project-specific QAPP, the project manager forwards the following to the QAO:

- Copy of completed title and approval page with approval signature
- Documentation of systematic planning process use (e.g., DQO/PQO summary form or other documentation).

6.3 PROCESS FOR ESTABLISHING AND IMPLEMENTING CHAIN OF CUSTODY AND CONFIDENTIALITY PROCEDURES

Integral has established a procedure for establishing chain of custody for evidentiary records. The Integral Employee Manual establishes confidentiality procedures for work. The PIC or designee ensures that required procedures are implemented.

7 COMPUTER HARDWARE AND SOFTWARE

Integral uses many different computer hardware and software systems in the course of project-specific work. Integral's IT Department is responsible for managing the selection of system components, general system operation and maintenance, system integrity and security, and system planning.

7.1 INFORMATION MANAGEMENT SYSTEMS

Integral's IT Department evaluates the quality of computer hardware and software, assesses its usability, and then integrates hardware and software into company use as needed or requested. The IT Department assesses and documents the impact of changes to user requirements and/or the hardware and software on performance, using the process described below.

Where available, the IT Department requests the product from manufacturers for the purpose of usability testing. If the product is commercially available and manufacturer approved, usability testing typically does not exceed 60 days.

New products are tested against existing computing systems to ensure compatibility, while assessing the risks associated with the use of the technology and ensuring that specific product process goals and objectives are met, as expected.

The IT Department prepares and presents an overview plan to the corporate Operating Committee as a recommendation for testing and implementation prior to integrating the product into the general production environment. When requested details and concerns are addressed and the plan has been approved, the IT Department will move forward with the testing phase. Depending on the complexity of the product, documentation and/or training may be used to introduce the product for use.

The IT Department provides training, which may include (upon request) self-help documentation, online materials including manufacturer-provided interactive training, and one-on-one sessions. As part of our continual IT support, any questions regarding the use of our software or systems can be answered by email or a phone call to any one of the department members.

The IT Department maintains relevant documentation and materials supporting the technology we use. Any sensitive procedures, checklists, documentation, and related resources are stored in a secure location (e.g., license keys). End user-related materials are made readily available through Integral's Microsoft Outlook public folder system and are updated by the IT Department or the appropriate department member when changes are made.

The IT Department Manager is responsible for the administration of IT Department operations and functioning support teams within the department. The IT Department Manager is also responsible for maintaining relationships with respective employees of the firm and will provide for additional technical support or make recommendations as needed.

7.2 HARDWARE AND SOFTWARE

Non-standard hardware and software purchases require preparation of business justification to be submitted for approval by the managing principal or designee. Business justifications for purchases that will be used at the corporate, department, or office location levels are initiated by the IT Department.

If approved, the purchase request will proceed following established company procurement policies. For higher risk or high cost initiatives, the IT Department verifies the need for the technology being considered. The process for evaluating hardware and software includes:

- Identifying goals and objectives of intended software/hardware
- Identifying business requirements and intended benefits of the software/hardware
- Identifying an existing solution or if a replacement/upgrade is in order
- Identifying a proposed new solution after evaluating different options
- Identifying risks which may be associated with the product
- Identifying the total cost of ownership including maintenance, recurring or additional costs, and any other budgetary considerations.

For special project needs, the evaluation process will be conducted in conjunction with the project manager, data management staff, and other project staff as appropriate. The IT Department obtains input and recommendations from approved vendors with a preference to stay with top-tier manufacturers to ensure stability in the marketplace, lower risks, and ensure better compatibility with existing systems. Consideration may be given to proprietary technology sources as driven by business-specific needs. Where available, the IT Department will request actual product reviews from manufacturers.

The final technology selection process is completed and the business justification formalized to include pilot feedback, a general scope of work, along with a basic delivery and implementation timeline. Upon approval, the IT Department proceeds by adhering to established company procurement policies.

7.3 DATA STANDARDS

In many cases, specific data standards may be mandated for data produced in response to federal and state regulations. It is Integral policy to identify such data needs, if required, and to comply with guidance concerning data standards. It is the responsibility of each project manager to be aware of the current standards and regulations and communicate those standards to the project data manager.

8 PLANNING

8.1 SYSTEMATIC PLANNING PROCESS

The project manager has the primary responsibility for implementing a project planning process that involves relevant stakeholders, which may include clients, appropriate project task managers, quality assurance representatives, project personnel, external consultants, and vendors. These participants are involved during the preliminary planning process in order to address relevant scientific and administrative issues early in the project.

The planning process includes the development of written project plans. It includes project goals, objectives, and technical and logistical questions that are addressed in the project. The written project plans, which ultimately are incorporated into the QAPP, are reviewed and approved by the PIC, project team members, regulatory agencies, and other key stakeholders. The number of personnel involved with the production and review of the project proposals is commensurate to the size and complexity of the project. See also Section 3.5.

8.2 IDENTIFICATION OF PROJECT SCHEDULE, BUDGET, STAFF RESOURCES, AND DELIVERABLES

It is the project manager's responsibility to develop project schedules and budget requirements, including the proposed allocation of personnel time necessary to meet the project goals. Project deliverables and deliverable dates are developed in conjunction with project team members. A summary of the project deliverables should be clearly stated in the written project plan.

8.3 IDENTIFICATION OF DATA COLLECTION NEEDS AND HOW DATA USE MEETS PROJECT GOALS

In determining data needs for a project, project objectives are specified, analytical and interpretive approaches are determined, along with their data needs, and existing data are evaluated to determine if they meet project needs. Secondary data may include data generated for or by external, independent parties, which are then transmitted to the current user. Secondary data may also include data collected in other investigations designed to answer similar or different questions than those posed in the current investigation. Using data and information that are not generated for the same quality objectives as the current investigation may result in erroneous decisions; therefore, it is essential to identify use limitations for secondary data. This identification process is performed and illustrated during the development of project-specific QAPPs.

As part of the planning process, the project manager and appropriate project team members identify what data will need to be collected and what methods will be used for data collection. The data collection methods and types of data collected depend on the project objectives. The methods for data collection and the types of data to be collected are clearly stated in the written project plan or the QAPP.

The project plan identifies the types of information that are needed to meet the project objectives (e.g., summary information, detailed trends, graphs, GIS). This information assists the project manager in determining the necessary data quality to meet customer satisfaction criteria.

8.4 IDENTIFICATION OF REQUIRED QA AND QC PROTOCOLS TO MEET DQOS

The project plan and QAPPs describe in detail the quality assurance protocols that are used to meet the specified DQOs (Section 3.5). DQOs for data collection tasks include bias and precision (uncertainty) characteristics for field and laboratory measurements, data completeness criteria, and a discussion of how data representativeness will be assessed. Specific quality control activities that are used to meet the DQOs are also described in the project plan or QAPP. Responsible parties for implementing the quality assurance program are included in the project plan or QAPP, as well as a schedule for internal and external technical and systems assessments.

8.5 PROTOCOLS FOR DEVELOPMENT, REVIEW, AND APPROVAL OF QAPPS

The primary responsibility for the development of a QAPP resides with the project manager. The development of QAPPs is described in Section 3.2. However, depending on the nature and size of the project, this function may be delegated to a project team member with qualifications and experience in developing quality assurance documents. The QAO serves as a technical resource for developing and reviewing QAPPs. After it is developed and reviewed, each QAPP may be submitted to the client and to regulatory agencies for approval. Approved QAPPs are reviewed, and revised if necessary, on an annual basis, or more frequently if changes in project scope, personnel responsibilities, or quality assurance goals occur.

9 IMPLEMENTATION OF WORK PROCESSES

The PIC is responsible for overall project supervision to determine that work is performed according to approved project plans, scopes of work, QAPPs, SOPs, and contractual requirements. The project manager is responsible for routine tracking of project scope, schedule, and budget. Project task managers may be identified at the discretion of the project manager, depending on the size and complexity of the project. The project manager or designee conducts periodic reviews or assessments to ensure that work is performed as planned.

9.1 DEVELOPMENT OF STANDARD OPERATING PROCEDURES

The project manager, in conjunction with the PIC and QAO, identifies the need for the development of SOPs for critical and routine technical and administrative tasks that are important in satisfying the project objectives. SOPs may be developed independently or may be adopted or modified from a previously approved SOP from an appropriate standards development organization such as EPA, U.S. Geological Survey, or American Society for Testing and Materials. The use of SOPs is recommended to minimize the variability in tasks that are critical to meeting project DQOs.

SOPs are prepared by project personnel, reviewed by senior project personnel, and approved by the project manager and QAO or delegate. SOPs may be revised by senior project personnel for approval by the project manager. As appropriate, SOPs are deemed obsolete and removed from the project plan by the project manager.

Quality management-related SOPs are prepared, reviewed, and approved by the QAO.

9.2 IMPLEMENTATION OF STANDARD OPERATING PROCEDURES

The project manager is responsible for ensuring that the processes described in project-specific SOPs are followed and implemented as written. The project manager ensures that project personnel using SOPs are appropriately trained. The project manager communicates changes to SOPs to project personnel and verifies that changes are implemented and obsolete SOPs are removed.

9.3 DOCUMENT CONTROL OF STANDARD OPERATING PROCEDURES

Planning documents, including SOPs, are subject to the document control procedures as described in Section 6 of this QMP. Electronic versions are controlled. Hard copies are considered uncontrolled. Project personnel verify the use of the most recent version of SOPs.

10 ASSESSMENT AND RESPONSE

10.1 QUALITY SYSTEM ASSESSMENT

Integral's quality assurance process, as documented in this QMP, is assessed on an annual basis to identify opportunities for improvement. The QAO will lead the assessment and will communicate the results to the QAC and Operating Committee. If changes to the QMP are necessary, the QMP and associated procedures will be revised accordingly. Individual project quality assurance will be conducted by the project manager or designee.

10.2 CONDUCTING ASSESSMENTS

Periodic project assessments are conducted by the project manager, using tools detailed in the project plan. The project manager has the responsibility to select those tools that best meet the DQOs of the project. Tools may include internal or external audits, data quality assessments, peer reviews, and technical systems reviews. In selecting assessment tools, the project manager complies with applicable statutory and regulatory requirements, as well as requirements stipulated by the client.

The QAO or similarly experienced designee conducts the annual corporate-wide quality management assessment. The assessor is trained in quality assessments. The assessor may not have project management responsibilities, or have direct technical involvement, for the work being assessed. As a higher level manager, the QAO has access to project personnel and documentation for conducting the assessment without disruption. The annual quality assessment tools include checklists for completion of project quality assurance tasks, such as project planning, QAPP and SAP implementation, data validation, and peer review of deliverables.

Assessment documentation identified in Section 10.4 is compiled as an assessment report. Recommendations may be provided for improvement of the quality management system. The report is signed by the QAO and the project manager, and is forwarded to the PIC and the project file. The objective of the report is to communicate assessment results to the responsible level of management for implementing timely, effective response actions, so that quality objectives can be met. The project manager and designees are responsible for ensuring that any deficiencies found during quality review assessments are appropriately addressed. Project managers are responsible for ensuring that findings from assessments of project activities are appropriately addressed.

10.3 CORRECTIVE ACTIONS

The project manager is responsible for identifying and implementing corrective actions in response to quality review assessments. For each non-conformance, the assessor prepares a corrective action report (CAR) identifying the non-conformance, including objective evidence. Root cause for the non-conformance should be identified by the project manager prior to proposing a corrective action. Corrective actions are implemented by the project manager in a timely fashion. The assessor verifies the corrective action. CARs are retained in the project file and by the QAO.

10.4 DOCUMENTATION AND TRACKING

The content requirements and format for documenting and tracking assessments are developed by the QAO in an SOP. Assessment documentation includes:

- Planning information, including the criteria for the assessment
- Checklists for collecting and recording objective evidence
- Assessment summary matrix
- CARs.

10.5 DISPUTE RESOLUTION

If disputes arise as a result of an assessment and related response, the dispute resolution process outlined in Section 2.5 of this QMP applies.

11 QUALITY SYSTEM REVIEW AND IMPROVEMENT

The Integral quality management system is a dynamic set of policies and procedures that is intended to encourage ongoing quality improvement throughout project activities. The assessment and corrective action processes corrects systematic problems, improves consistency, enhances individual system components, re-engineers ineffective work processes and procedures, and customizes quality tools. Through review of assessments and project closeout, management and staff are encouraged to establish communications among themselves and with clients and contractors to explore areas for improved service.

Personnel involvement is required to enhance the quality of the data, reports, and publications. It is the responsibility of each project team member to identify conditions that are adverse to quality and to suggest improvements to quality assurance procedures. This can be done through the corrective action process. When deficiencies or shortcomings in the quality management system are identified, project personnel should promptly inform the QAO so that the issue can be reviewed, verified, and addressed.

Annually, the QAO conducts a review of the QMP with the QAC and other members of management, as appropriate. The review serves to communicate major quality issues to Integral management and to identify opportunities for improvement. Based upon this review, the PIC recommends changes to the QAO and allocates resources to address quality assurance needs.

Attachment A: QA Review Form

Project #: _____ **Project Name:** _____

Project Manager: _____

Description or title of document: _____

Type of material

- ☐ Lab data package
- ☐ Data entry
- ☐ Calculations/analysis
- ☐ Internal documentation
- ☐ Draft deliverable
- ☐ Final deliverable

Type of review

- ☐ Technical review
- ☐ Editorial review
- ☐ PM and principal approval

Details of review to be conducted

Reviewers' comments:

Print Name	*Signature*	*Date*

Technical Reviewer(s)

Print Name	*Signature*	*Date*

Editorial Reviewer

Print Name	*Signature*	*Date*

Project Manager

Print Name	*Signature*	*Date*

Principal

Print Name	Signature	Date