

## **4.0 QUALITY CONTROL PLAN**

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### **4.1 INTRODUCTION**

#### **4.1.1 Policy Statement**

It is MARRS Services policy to perform all work in conformance with applicable standards of quality. The procedures specified in this Quality Control Plan (QCP) will be considered the minimum acceptable standards for MARRS Services. Additional requirements that exceed the stringency of this QCP may be specified by CESPL or regulatory agencies. Procedures less stringent than those specified herein shall not be adopted without prior written authorization from CESPL, the MARRS Project Manager and QC Manager.

This QCP will be reviewed, and formally approved by CESPL before any field operations commence. It is the responsibility of all personnel involved in site investigation activities to understand and maintain the QC issues applicable to their work.

This QCP has been developed to comply with appropriate industry and regulatory standards. It will be used to ensure project-related activities are conducted in a planned and controlled manner, the product of those activities conforms to contractual requirements, and appropriate documentation exists to support each activity for which MARRS is responsible.

#### **4.1.2 Scope**

This QCP consists of the plans, procedures, and organization necessary to produce an end-product that meets the requirements specified in Contract W912PL-05-C-0007, and the SOW addressing the Former Borrego Maneuver Area. This plan includes a designated QC organization with the authority to enforce all provisions. The plan governs all operations by MARRS and its subcontractors, both on and off site. It covers submittals, field activity control, field changes, equipment standardization and maintenance, audits, deficiencies and noncompliance, corrective actions, and associated documentation and record keeping. The QCP is designed to follow the sequence of field operations.

#### **4.1.3 Quality Assurance**

Quality assurance (QA) will be accomplished by and at the discretion of CESPL to evaluate the field investigation activities. The purpose of the evaluation will be to ensure the field investigation and data collection meets the specifications of the CESPL Statement of Work and approved work plan. QA audits and inspections will be performed in accordance with the CESPL guidelines.

### **4.2 SITE-SPECIFIC QUALITY CONTROL PLAN**

This QCP describes the quality management procedures to be followed during the geophysical and intrusive investigation data collection at Former Borrego Maneuver Area and documentation associated with the RI/FS evaluation and assessment. Site-specific information includes, but is not limited to, project personnel, definable features of work, required control operations, equipment tests, specific equipment calibration/response check procedures, audit procedures, and CESPL or regulatory agency requirements.

After acceptance of the site-specific QCP, MARRS will notify CESPL in writing, using the field change form in Appendix F, a minimum of 7 days prior to implementing proposed changes. Proposed changes will be subject to acceptance by CESPL and the MARRS QC Manager.

### 4.3 QUALITY CONTROL ORGANIZATION

MARRS has selected a project team to provide the specific technical and management capabilities and qualifications to perform the contract work. The project organization will ensure that all project objectives are met in a timely and cost-effective manner. Key MARRS and Earth Tech personnel contact information is provided in Table 4-1.

**Table 4-1. MARRS Services Quality Control Organization**

Title	MARRS Personnel	Services Telephone Number
Program Manager	Riaz Chaudhary	562-407-1094
Quality Control Manager <sup>(a)</sup>	Rod Reeve	760-578-6194
Project Manager	Charles Welk	619-318-5985
Site Manager	Armando Lucero	619-818-8455
Geophysical Manager <sup>(a)</sup>	Brian Hecker	707-888-6605
GIS/Database Manager <sup>(a)</sup>	Brent Rogan	949-351-6823
Site Safety Officer <sup>(a)</sup>	Raymond Fillion	520-909-3119
Senior UXO Supervisor	Kelly Hickman	909-714-8631
UXO QC <sup>(a)</sup>	Frank Cota	623-670-0473

<sup>(a)</sup> = Direct QC/QA Role

The key QC personnel will not be replaced without the approval of CESPL. The QC Manager will provide the names, qualifications, duties, and responsibilities of each proposed replacement to CESPL.

The BMA Organizational Chart showing the lines of authority for implementation of a multi-phase control system for monitoring QC activities is provided as Figure 2.1 in Chapter 2. The job requirements, responsibilities, duties, and authorities of key QC personnel are discussed below.

#### 4.3.1 Responsibilities and Authority

##### 4.3.1.1 Program Manager

The Program Manager is responsible for overall direction, coordination, technical consistency, and review of contract activities. Responsibilities and authorities include:

- Final approval and review of work plans, project deliverables, schedules, contract

changes, and labor allocations.

- Approval of budgets and schedules, and changes in budgets and schedules
- Ensuring availability of personnel assigned to the project for the duration of the contract
- Overseeing coordination between management, field teams, and support personnel to ensure consistency of performance.
- Communicating, as necessary, with CESPL to evaluate the progress of the program and to facilitate the avoidance of any potential problem.

#### **4.3.1.2 Quality Control Manager**

The MARRS QC Manager will perform his duties independent of cost, scheduling, and other performance constraints. The QC Manager will be responsible for reviewing and updating the QCP as needed, and for verifying compliance with the plan. Compliance will be verified through audits of project activities by the QC Manager, who has the authority to require corrective actions and stop work, as needed, to ensure compliance with the QCP. Work stoppage, if necessary, will be coordinated with CESPL. Responsibilities will include:

- Ensuring the site QCP is being properly implemented
- Ensuring corrective actions are documented and acknowledged by the PM and field personnel, as well as communicated to the customer, when adverse situations or defective work result from a project activity.
- Ensuring that all personnel are properly trained and adequately experienced for the duties assigned.
- Ensuring that project deliverables are defined prior to instigation or commencement of the fieldwork, and are submitted as required by the Work Plan and project schedule.
- Evaluating the implementation and effectiveness of the QCP on a regular basis
- Ensuring that ground-truthing and feedback processes are being accomplished
- Implementing field investigation QC activities, including field management of ground reconnaissance activities and environmental protection programs.
- Scheduling to ensure that the QC personnel are on site during all field activities

Delegation of QC duties to qualified staff members (QC staff will report to and be supervised by the QC Manager).

#### **4.3.1.3 Health and Safety Professional**

The MARRS Health and Safety Professional will be responsible for implementing the Corporate Health and Safety Program, reviewing and monitoring compliance with project-specific health

and safety plans, implementing corrective measures for health and safety deficiencies, and ensuring required training and medical monitoring of personnel. The Health and Safety Professional has the authority to require corrective measures related to health and safety issues and to stop work, if required, to ensure a safe working environment.

#### **4.3.1.4 Project Manager**

The PM has the responsibility and authority for day-to-day management of all operations and has the authority to stop any phase of work that the project manager deems necessary to the achievement of a safe work environment or good quality work, including:

- Review and approval of sampling, testing, and field investigation methods and QCP, including designs, schedules, and labor allocations.
- Preparation of progress reports with the assistance of key support personnel
- Management of funds for labor and materials procurement
- Technical review of all project deliverables
- Establishment and enforcement of work element milestones to ensure timely completion of project objectives.
- Implementing corrective action in response to Quality Deficiency Notices (QDNs)
- Responding to QDNs within 30 days, or as stipulated in the audit report
- Frequent communication with CESPL regarding day-to-day progress of the project

#### **4.3.1.5 Site Manager**

The Field Site Manager (SM) is responsible for the daily conduct of all operations at the project site, and has the authority to stop any phase of work that the SM deems necessary to the achievement of a safe work environment or good quality work. The duties of the SM will include:

- Daily work assignments
- Conduct of daily safety briefings
- Personnel and resource assignments
- Monitoring and tracking the progress of each operable phase of work
- Reviewing QC documentation
- Reporting daily progress to the PM
- Conduct weekly project meetings, interfacing and coordinating with project safety and

quality management personnel.

- Interfacing with the customer, site visitors, and off-site MARRS Services personnel

#### **4.3.1.6 Site Safety Officer**

The UXOSO is responsible for performing the routine duties for health and safety, with the assistance of the Health and Safety Professional and PSO. The UXOSO will administer the SSHP and addenda. Responsibilities include:

- Performing regular and frequent site inspections to find hazards and observe personnel at work.
- Stopping work when necessary to prevent injury or illness
- Ensuring personnel and environmental health and safety
- Investigating all injuries and illnesses
- Developing and implementing corrective action plans to eliminate or mitigate hazards

#### **4.3.1.7 Geophysical Manager**

Requirements for this position include proven technical competency in the areas of work for the assigned project, and a minimum of 5 years of geophysical investigation experience, including UXO detection and mapping investigations. The Geophysical Manager reports directly to the PM and is responsible for the following:

- Evaluating results of the geophysical equipment field test and technology evaluation
- Designing geophysical data collection and reduction processes
- Reviewing geophysical field data
- Verifying validity of measurement methods, data consistency, and reproducibility

#### **4.3.1.8 UXO Quality Control Specialist**

The UXOQC Specialist reports directly to the QC Manager in the performance of his duties. The UXOQC is the senior Quality Control Staff member on site, and is responsible for the implementation and enforcement of the QC Plan. Responsibilities include:

- Verifying site training and current Hazardous Waste Operations and Emergency Response (HAZWOPER)/medical monitoring documentation
- 
- Ensure all site surveillance activities and audits are conducted and documented in accordance with the QCP
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- Ensure all quality control reports are provided in the proper format, as required by the QCP.
- Authority to approve corrective actions as required to ensure all work complies with the QCP, and stipulated contractual requirements.
- Ensure MEC-related anomaly source materials have been completely removed from all intrusive excavations.
- Review/verify correct identification for all recovered MEC, MPPEH, and MD and MC
- Check for defective or damaged equipment
- Verify appropriate personnel are being used during all field operations
- Perform and document daily audits/surveillances of job activities
- Perform follow-up checks and correction of all deficiencies prior to the start of additional features of work.
- Verify all required equipment calibration has been performed and that inspection and standardization results comply with contract requirements and the Work Plan.
- Maintain all audit and surveillance documentation

#### **4.3.1.9 Quality Control Staff**

Requirements for this position include proven technical competency in the areas of work for the assigned project, and a minimum of 3 years of field investigation experience on projects similar to those required by the contract. The QC Staff report directly to the MARRS QC Manager and are responsible for execution of quality management activities at the site, and:

Quality control staff will be composed of technical personnel with direct technical expertise in their field (e.g., MEC, geochemistry, geophysics, and/or survey mapping) and will have been specifically trained to conduct surveillances and inspections in accordance with an audit plan. These individuals will observe and monitor site activities and inspect the accomplished work with the intention of:

- Ensuring that the daily tailgate safety and work briefing provide clear direction (daily instruction) to all field teams regarding work to be accomplished.
- Ensuring that data collection is repeated over all areas containing suspect data
- Ensuring that the project database captured the results and particular data for each investigated anomaly, including re-work accomplished during re-visits.
- Ensuring that field investigations comply with contract requirements

- Coordinating with MARRS field teams to verify that the appropriate personnel are being utilized during all field investigation activities, all work phases, and work shifts.
- Implementation and documentation of QC activities. This work will be completed daily by the QC staff at the job site.
- Review of data and documentation to ensure that they are complete and correct
- Conferring with the MARRS Project Geophysicist, UXOSO, Site Manager, and SUXOS to stay informed on project performance.

#### **4.3.1.10 GIS/Database Manager**

Duties and responsibilities will include:

- Ensuring that the database is designed and established prior to commencement of field investigations.
- Ensuring data for each activity is properly incorporated into the project GIS
- Ensuring metadata is accurately maintained in accordance with the work plan.

#### **4.3.1.11 Senior UXO Supervisor**

Duties and responsibilities will include:

- Conduct and supervision of equipment maintenance/function checks
- Supervision of field investigations
- Job safety during all field operations
- Assuring that all personnel are properly trained
- Ensuring that all MEC operations field logs are updated daily
- Ensuring safe, compliant transportation of explosives on site
- Ensuring explosives management activities are conducted in accordance with the work plan
- Ensuring that site preparation activities are completed in accordance with the project work plan
- Ensuring MEC operations are conducted in strict conformance with the project work plan.

#### **4.3.1.12 Site Geophysicist**

Duties and responsibilities will include (these bullets include initial daily, and any other periodic QC checks with associated data archiving and delivery to CESPL):

- Ensuring proper function and response of geophysical instrumentation
- Assuring that all requisite equipment and personnel are on site for the phase of geophysical work being accomplished, and are operational.
- Ensuring that daily logs are completed by the geophysical field teams, processors, and geophysicist, including records of QC activities.
- Ensuring that site preparation activities are completed in accordance with the project work plan
- Monitoring equipment quality control activities
- Supervision and direction of field mapping activities
- Supervision of data processing activities
- Performance of data validation in accordance with the work plan
- Ensuring that all personnel engaged in the collection, reduction, and interpretation of geophysical data are properly qualified and trained for the specific activities/duties to which they are assigned.
- Ensuring that the progress of the geophysical investigation(s) are tracked and reported in accordance with the work plan.
- Ensuring that all technical data are reviewed and acceptable before that data is submitted to the customer.
- Ensuring QC documentation is tracked and submitted in accordance with the work plan

#### **4.3.1.13 Field Team Leaders**

Team Leaders are responsible for the conduct of the fieldwork assigned and direct supervision of team members. Duties will include:

- Performance of QC checks
- Documentation of field activities in daily logs
- Supervision of field operations
- Participation in project meetings

- Adherence to all safety and quality requirements in accordance with this Work Plan

### **4.3.2 QC Personnel Qualifications and Training**

MARRS will ensure all project personnel meet the standards required by USACE. Resumes of BMA key personnel are included in Appendix H. MARRS maintains personnel files for each employee. These records include copies of licenses, training records, and certificates of qualifications that support employees' placement and position. Prior to an employee's initial assignment or any change in duties/assignments, the PM reviews the employee's licenses, training records, and certificates to ensure that the employee is qualified.

Training and health records for field personnel will be maintained on site, including 40-hour OSHA health and safety training certificates, 8-hour supervisor training records, 8-hour annual refresher course, certificate of medical clearance/annual physical exam, current certificate for CPR training and first aid, and other applicable certifications.

Specific training for field equipment, including GPS, metal detectors, radios and geophysical operations and procedures to be implemented, will be provided to all personnel during the initial safety briefing and site-specific training.

## **4.4 QUALITY MANAGEMENT SYSTEM**

### **4.4.1 Field Activities**

MARRS will perform inspection and surveillance of all work areas to maintain control over field activities identified in the work plan.

The controls will ensure that qualified personnel and approved procedures and equipment are used, and that specified process parameters and environmental conditions are maintained. Also, the controls will ensure that all requirements of the contract are met.

#### **4.4.1.1 Project Inspections**

##### **4.4.1.1.1 Pre-Mobilization**

- Preliminary Readiness Review
- Final Readiness Review

##### **4.4.1.1.2 Initial/Interim Field Inspections**

The QC Manager will perform periodic inspections of job site activities. Appropriate technical assistance will be provided to perform the inspections, as necessary, for the specific field investigation activities being performed. The inspections will include, but not be limited to, the following:

- Examination of the quality of workmanship
- Compliance with contract requirements

- Compliance with approved, required submittals
- Verification that all required equipment calibration/response checks have been performed and results comply with contract requirements and the work plan.
- Check for defective or damaged equipment
- Verification, inspection, and documentation of delivery and storage of material and equipment to the site
- Performance of follow-up checks and correction of all deficiencies prior to the start of additional features of work that may be affected by the deficient work; MARRS will not conduct field operations using nonconforming investigative work methods.

#### **4.4.1.1.3 Final Inspection**

At the completion of all fieldwork or any defined increment of the fieldwork, the QC Manager will conduct a completion inspection of the work and develop an inventory/checklist of any items that do not conform to the contract requirements. Such a list will be included in the QC documentation and will include the estimated date by which the deficiencies will be corrected. The PM and QC Manager will make a second completion inspection to ascertain that all deficiencies have been corrected. The completion inspection and any required deficiency corrections will be accomplished within the time specified for completion of the work in the contract.

#### **4.4.1.1.4 Documentation**

Inspection documentation that will be maintained in the project files include:

- Quality Management System (QMS) Checklist and QC reports (blanks in Appendix F)
- Equipment calibration/response equipment maintenance results
- QC-related meeting minutes
- Nonconformance and corrective action documents as well as audit documentation

These documents will include the following information:

- All personnel and their area of responsibility, qualifications, and project-specific training
- Weather conditions
- Operating equipment with hours worked, idle, or down for repair
- Work performed each day, including location, description, and worker(s)
- Test and/or control activities performed with results and references to contract requirements; deficiencies should be noted along with corrective action.
- Quantity of materials received at the site with statement as to acceptability, storage, and reference to contract requirements.
- Submittals reviewed with contract reference, by whom, and action taken

- Job safety evaluations stating what was checked, results, and instructions or corrective actions.
- Instructions given/received and conflicts (if any) with contract requirements

The QC Report, which is to be kept on site, will be the primary document, with all other applicable reports and forms attached to it. Copies of the reports will be available to CESPL upon request. Reports will be signed and dated by the QC Manager. The report from the QC Manager will also include copies of any reports prepared by subordinate QC personnel.

#### **4.4.1.1.5 Surveillance Monitoring**

Surveillances will be performed for the definable features of work. These will help ensure quality controls have been properly implemented in accordance with the Work Plan. Elements to be monitored are presented on the Quality Management System Checklist, which is provided in Appendix F. The areas that will be monitored include:

- Site Management
- Survey and Location Mapping
- Geophysical Detection and Mapping
- MEC Operations
- MEC Disposal
- Documentation

Quality control validation of the data will be performed before delivery of submittals to CESPL, and will include checks and reviews of the digital data deliverables. Specific checks will include data completeness, quality, and format checks, which will be entered in the database QC log. QC checks will be applied to each step of data processing, from data entry forward.

Overall, these QC checks will help to ensure that the results of all work are properly recorded, headers are attached to data files, and that scanned field forms are included with their corresponding data files. If at any point during this process the data are found to be deficient, MARRS will take corrective action regarding the data in question. Automated checking procedures measures may be developed and used throughout the course of this program.

### **4.4.2 Data Validation**

#### **4.4.2.1 Quality Control Inert Munitions Blind Seeding**

Inert munitions or simulated munitions seed items will be placed along the planned transects immediately prior to geophysical mapping. The Geophysical QC and UXOQC will be responsible for seeding activities and verifying seed detection and removal. The Geophysical QC and UXOQC will emplace and survey the location of the seed item with the same type of positional equipment being used by the geophysical data acquisition team. Seed items may be left in place after geophysical data acquisition to check the effectiveness of field crews during reacquisition and intrusive investigation.

This seeding program will provide data to evaluate:

- Geophysical detection performance
- Positional accuracy
- Target reacquisition performance

Seed locations will be determined in the field immediately prior to geophysical data acquisition activities. In the case of single path transect DGM, mapping personnel will be directed to acquire geophysical data along a specified portion of the transect where the blind seed item was placed. In remote areas and areas with public access the seed will be removed immediately after geophysical data acquisition. In areas with easy access, limited public access, and with anticipated rapid turn-around times from geophysical mapping to intrusive investigation, seeds may be left in place after the geophysical mapping team for later reacquisition and removal. All seed locations will be marked in the field logs along with current seed status (removed or in place).

Reacquisition/dig teams will record the position and identification data of any seed items recovered and record in the field log. Geophysical QC will compare the offset between the geophysically-identified seed location and the GPS location established by the reacquisition team. Any offsets larger than 1.0 meter will be investigated to determine the source of the offset.

Typically one to two seeds may be planted and removed for each geophysical mapping team during the course of daily field activities; this may be increased at the discretion of the QC and project management personnel.

#### **4.4.2.2 Geophysical Data Evaluation**

MARRS personnel not assigned to the field project will perform a separate validation of 10% of the geophysical data. This validation will be accomplished using Geosoft Oasis Montaj software to replicate data analysis and results. Parallel processing should result in selection of similar targets. Data will be audited by processing data from randomly selected transects using the Geosoft Mapping and Processing System and UX-Detect Target Analysis. QC processing of digital data will include production of representative profiles. These images will be used as a QMS tool to compare visually discriminated locations with those anomaly locations identified by the target-picking routines used to generate the anomaly “dig” lists for the RI. Geophysical team(s) will not be demobilized from the site until data review has been completed and QC data have been submitted to CESPL.

#### **4.4.2.3 Performance Criteria**

The performance criteria for the geophysical data will include an evaluation of the complete data submittal package. Field logs will be reviewed each day to verify that data were collected following a continuous progression along the transects and to ensure instrument performance meets the standardization criterion.

The field data will be reviewed to ensure that the transect investigation was complete by

verifying that the spatial data density (measurements per unit distance) is representative of the mapping effort described in the daily log. Survey data will be captured such that 95 percent of the measurements are recorded at increments sufficient to image the smallest ASR-defined munitions along each transect. Field notes will be compared to the downloaded digital file data to assure correspondence between transects searched and transects recorded.

In addition to the evaluation of the static noise evaluation, a mean deviation from the standard response will be calculated for each instrument used. Variations less than or equal to 20 percent of an expected or "Standard Response" yield the expectation that the geophysical equipment was responding consistently and within acceptance parameters. Any discrepancies in positional accuracy of the data noted during the field review will be described, including steps taken to correct or resolve any such QC issues.

The field data will also be evaluated against the established data quality standards. Data will be analyzed to ensure that the signal-to-noise levels in the data are sufficient to allow adequate detection of the established response from the smallest munition of concern for each MRA. This evaluation will be based on static and dynamic noise tests conducted during the equipment field tests. Spot checks of anomalies not selected for excavation will be conducted at the direction of CESPL or QC personnel.

#### **4.4.2.4 Data Resolution**

Data resolution needs to be sufficient to detect the smallest individual MEC of concern. At a minimum, pass/fail performance criteria for the geophysical methodologies should be as follows: (1) all MEC targets (real or simulated) buried at the calculated performance depth must be detected, and (2) required anomaly coordinate locations must be within 1 m (3.28 ft) of the actual location.

The percentage of coverage for each investigated segment, block, or parcel (contiguous lanes for grid or aerial coverage, individual transects for non-contiguous traverses) will be determined. Field logs should have recorded survey progress and noted geophysically important features. Significant lack of coverage (> 5 percent missed) will be flagged and annotated with the steps to be taken to resolve the missed coverage. Unavoidable obstacles will have been mapped using mapping or survey grade GPS systems and should result in direct correspondence with missing data. Data drop-outs or inexplicable data shortages, if not detected during the field review, will be discussed with personnel on site to identify the root problem and steps needed for resolution.

#### **4.4.3 Quality Reporting**

The QA/QC results of the geophysical survey will be tracked on a master spreadsheet that will tabulate survey area identification, coordinates, and date surveyed. A table will be developed and progressively updated that presents pertinent anomaly data (e.g., anomaly identity, amplitude, width, apparent source, depth-to-target). A weekly Quality Report will be prepared and submitted to the Project Manager that presents a summary of quality management activities, findings, recommendations, and/or corrective action notices. A QC summary will be prepared and submitted to the CESPL Project Manager at the completion of the field effort.

##### **4.4.3.1 Integrity/Data Storage**

Copies of all digital and hardcopy data will be made on site. These data will include the raw

field data in its native format, ASCII files containing X, Y, and sensor readings of the raw field data, processed data in ASCII or Geosoft data base format, digital images of all daily field logs and digital images of daily processing logs, These data will be stored in an onsite computer for data processing and archived in an on-site external hard drive, as well as on the server in the MARRS Escondido, California office. Access to these data will be via additional copy only – no manipulation of these data will be allowed (other than copying).

## **4.5 EQUIPMENT MAINTENANCE AND RESPONSE CHECK**

### **4.5.1 Maintenance**

All tools, instruments, and equipment deployed to the project site will be properly maintained and calibrated (as necessary) in accordance with the instrument manufacturer specifications or standard industry practice. This applies to equipment used in the field for UXO safety support and related activities affecting quality, including geophysical instruments, communications equipment, vehicles/machinery, environmental monitoring equipment, and personal protective equipment. Rulers, tape measures, levels, and other such devices need not be standardized if normal commercial equipment provides adequate accuracy, but will be maintained in good working condition.

Equipment will be protected from dust and contamination and visually checked for damage prior to use. Preventative maintenance on the metal detectors and GPS units will be performed on a regular basis according to the manufacturers' operating instructions or recommendations. Critical spare parts will be kept on hand to minimize downtime. All maintenance will be recorded in the Equipment Maintenance/Calibration Log.

### **4.5.2 Response Check Log**

All metal detectors and GPS units will be checked daily for operational function against a known (standard) source to ensure quality standards are maintained. A weekly response log (Appendix F) will be used to document these checks. The records will indicate the time and date of the last check, the item name, and serial number or identification number. Each completed weekly log will be dated and signed.

#### **4.5.2.1 Metal Detector and GPS Hand-held Unit Checks**

All metal detectors will be checked daily against a known metallic anomaly source, typically an item in the site-specific test strip. Prior to UXO escort activities, a magnetometer check bed will be established by burying 3 to 4 inert munitions or simulants approximating the size and nominal equivalence of a 40mm HE projectile to a depth of 30 cm (12 in) bgs. The detectors are checked against these sources to ensure they are operational and capable of detecting metal objects as specified in the SOW (Appendix A). To assure a margin of safety for the UXO teams, the instruments used to assess the proximity of subsurface metallic anomaly sources must be capable of "outreaching" the penetration of the digging implements. To ensure that instruments remain operational during field operation, the UXOQC will periodically check all instruments against a surface anomaly (i.e., keys, watch) and document response in daily log.

Detectors that fail to detect inert munitions or simulants in the field will be considered to have failed QC and will be removed from service until repaired/recharged.

Hand-held GPS receivers used for navigation purposes and recording surface visual features will be checked daily over a known (UTM coordinates established) location to ensure it is operating within Manufacturer's specifications. Handheld GPS units must be WASS-capable and provide  $\pm 3\text{m}$  (10 ft) accuracy (WASS capable). Each unit will be checked daily and monitored for adequate battery voltage, correct configuration and receipt of sufficient data to update the project GIS. Handheld GPS that do not meet this standard will be considered to have failed and will be removed from service until they can meet standard.

### **4.5.3 Shipping Equipment**

Equipment sensitive to temperature changes will be properly insulated. Equipment will be adequately packaged to prevent damage from jarring, shock, or vibration.

#### **4.5.3.1 Records**

Records pertaining to maintenance/calibration/response checks include:

- Daily Field Activity Report entries
- QC Report
- Equipment Maintenance/Calibration check log entries
- UXO Supervisor logbook

### **4.5.4 Corrective Measures**

Corrective measures will be tailored to the defect and applied, as necessary.

### **4.5.5 Records Management**

All daily notes will be recorded in bound field notebooks, digitally-captured data will be copied to archive disks, and all data files will be accompanied by Microsoft Word documents detailing file content, file naming, and data processing performed on the field data.

## **4.6 FIELD CHANGE CONTROL**

### **4.6.1 Responsibilities**

Any individual, including the PM, assigned to perform or supervise a task who recognizes the necessity for a field change is responsible for instigating appropriate field changes and completing and submitting the field change request for review and approval.

#### **4.6.1.1 Project Manager**

The PM is responsible for:

- Evaluating validity and acceptability of the field change request with respect to contract requirements.
- Evaluating and documenting the effect of the field change on project costs
- Accepting, qualifying, or rejecting the field change

- Soliciting and obtaining approval (from CESPL) of any changes to the contract or costs prior to performance of any work affected by the changes.

#### **4.6.1.2 Quality Control Manager**

The QC Manager is responsible for evaluating and approving the changes to ensure that all QC requirements are met and that all changes to the contract are properly reviewed and approved by the responsible personnel (MARRS and CESPL). The QC Manager will assist the PM in negotiation of changes to the contract scope with respect to QC.

#### **4.6.2 Procedure**

##### **4.6.2.1 Recognition of Necessity for Field Changes**

During the course of field investigation activities, approved work plans, technical procedures, and design documents will be followed unless some unforeseen contingency occurs. In this instance, the performer of the task is required to determine the best approach toward satisfactory completion of the task through the following actions:

- If warranted, stop affected activities until the PM and/or acting QC Manager evaluates the situation.
- Instigate field changes for approval

##### **4.6.2.2 Definition of Minor and Major Changes and Major Project Impact**

Field changes and major project impacts are defined in the following paragraphs.

A Minor Change is defined as a field change that would not adversely affect the quality of the data or product in the field, the rationale for the field procedures, or costs. Minor changes may be implemented prior to approval by the PM and the QC Manager. Examples of minor changes are as follows:

- Changing the sequence of the field activities
- Changing any of the administrative requirements relative to a remedial effort with the exception of those requirements mandated by federal or state regulations (e.g., chain-of-custody procedures).

A Major Change is defined as a field change that will adversely affect the quality of field activities, will cause a significant change in the cost or the scope of the activity, or will cause significant delays in the schedule. Major changes will require the approval of the CESPL Contracting Officer and MARRS QC Manager. Examples of major changes are as follows:

- Significantly changing the area of sampling to be investigated
- Repairs or relocation of utilities not anticipated
- Significantly relocating a plant or animal species not defined in the contract

A change with Major Project Impact is defined as a change that has a major impact on project cost, schedule, and/or technical performance. Some changes defined as major changes may have major project impact.

Field changes will be documented by completing the Field Change Request Form, Appendix F, and describing the reasons for the change, the recommended disposition, cost impact, impact on previous work, and type of change (Minor, Major, Major Project Impact). The signed and dated form will be immediately provided to the PM and QC Manager for review.

#### **4.6.2.3 Final Disposition**

After completion of the review and approval process, the Field Change Request Form will be forwarded by the PM to personnel responsible for conducting the work and the QC Manager, with the following action requested:

- If approved, the personnel responsible for the work will implement the change
- The QC Manager will note final disposition of field change request (e.g., change incorporated and work completed, change rejected and work performed per original requirements) on the Field Change Request Form.
- The QC Manager will verify that all changes to the SOW are marked on all copies in use in the field and on file.
- The completed Field Change Request Form will be submitted to the project file
- The PM will incorporate any approved cost adjustments into the budget and WBS

If an implemented Minor Field Change is not approved by one of the reviewers, it will be deemed a nonconforming condition and, as such, will be treated as directed by the procedures for Nonconformance/Corrective Action.

#### **4.6.3 Records**

Records pertaining to Field Change Control will include:

- Field Change Request Form (Appendix F)
- Field Change Request Log

### **4.7 AUDITS**

An audit is an examination and evaluation performed to determine whether applicable elements of the site-specific QCP and work plan have been performed, documented, and effectively implemented in accordance with specified requirements. A UXOQC will be on site full time to conduct daily audits of UXO activities and documentation. The QC Manager will conduct at least two on-site QC audits during the RI field activities as an independent MARRS review and validation of the data collection and site management processes.

### **4.7.1 Objectives**

Audit objectives include:

- To verify by evaluating objective evidence that the QCP and work plan are being implemented.
- To assess the adequacy, effectiveness, and thoroughness of the QCP and work plan
- To verify conformance with approved procedures, work plans, drawings, specifications, and procurement documents.
- To identify quality deficiencies
- To verify correction of previously identified quality deficiencies

### **4.7.2 Responsibilities**

The Program Manager will be responsible for reviewing audit results. The QC Manager is responsible for:

- Implementing and conducting an audit program of MARRS activities per the requirements of this procedure.
- Reporting quality deficiencies to management
- Reviewing and evaluating audit reports to determine if quality deficiency trends are developing.

The QC Manager (or UXOQC) is responsible for:

- Auditing site work on a periodic basis and submitting QDNs for non-compliance
- Reporting non-compliance to the PM and QC Manager

### **4.7.3 Audit Procedure**

#### **4.7.3.1 Scheduled Audits**

The QC Manager will audit project-related activities at least semiannually. Field activities will require audit at least once for each complete or partial quarter of field activity. Re-auditing to verify implementation and satisfactory completion of recommended corrective actions will be performed as deemed necessary.

#### **4.7.3.2 Unscheduled Audits**

Unscheduled audits may be performed if the following occurs:

- Significant changes are made in functional areas of the QCP, such as significant reorganization or procedure revisions.
- There is evidence of a serious breakdown in the implementation of the QCP
- A systematic, independent assessment of program effectiveness is necessary

- It is necessary to verify implementation of recommended corrective actions

#### **4.7.3.3 Audit Report**

An audit report will be prepared and signed by the QC Manager and will include the following:

- Audit scope
- Audit date
- Auditor identification
- Controlling documents
- Personnel contacted
- Audit result summary, including an evaluation statement of elements audited
- Identification of any QDNs

The report, with attached QDNs, will be distributed to responsible management. The audit report will be issued within 30 days of the audit.

#### **4.7.3.4 Follow-Up**

The Project Manager will review the audit report and any QDNs. If a QDN has been issued, the PM will determine and schedule appropriate corrective action to prevent recurrence. The PM will describe the corrective action taken on the QDN and submit the notice to the QC Manager within the designated time frame, which should not be more than 30 days after audit report issuance.

The QC Manager will:

- Verify that the PM completes the appropriate sections of the QDN and submits the form within the designated time.
- Review the response and determine whether it is satisfactory
- Evaluate evidence of completion of corrective action to determine whether the action taken is satisfactory.
- Request an additional response if the response and/or corrective action is unsatisfactory
- Close the QDN, if the response and/or corrective action is satisfactory
- Complete the Audit Closure blocks

#### **4.7.4 Records**

QC Audit Report (Appendix F)

## **4.8 NONCONFORMANCE/CORRECTIVE ACTION**

### **4.8.1 Purpose**

The purpose of this section is to:

- Verify that conditions adverse to quality (non-conformances) are identified and reported to appropriate management levels.
- Verify that nonconforming items (e.g., test data, analyses) are appropriately marked and/or segregated and not used until corrective action has been completed.
- Verify that appropriate corrective actions or dispositions (i.e., accept, reject, repair, rework) have been recommended, approved, and implemented.
- Provide a system for the review and analysis of conditions adverse to quality (nonconformance) to determine their causes and trends, and to verify that corrective actions will preclude recurrence of adverse conditions.

### **4.8.2 Responsibility**

All MARRS project team personnel will be responsible for identifying and reporting nonconformance. The supervisor of the activity is responsible for:

- Evaluating non-conformances to determine if the work should be stopped
- Proposing corrective action
- Implementing corrective action
- Evaluating nonconformance impact on prior work or on previously obtained data (if any), and notifying all individuals and organizations that may be affected by the nonconformance and resulting data.

The PM and QC Manager are responsible for:

- Evaluating non-conformances to determine if the work should be stopped, and/or if the nonconformance should be reported to CESPL.
- Approving the proposed corrective action or disposition
- Verifying that the corrective action or disposition has been satisfactorily implemented
- Providing (if necessary) CESPL with a written report of any nonconformance

The QC Manager is responsible for reviewing non-conformances to determine if trends adverse to quality are developing, and proposing and implementing long-term corrective action to prevent recurrence of any identified nonconformance trends.

### **4.8.3 Nonconformance Procedures**

#### **4.8.3.1 Identification and Reporting of Nonconformance**

A nonconformance exists if there is a deviation from or noncompliance with the contract SOW and contract requirements, the QCP, approved procedures, work plans, or other project requirements. Non-conformances also include major errors in documented analysis, data, or results, and deficiencies in documentation or any other aspect of the project that affects quality. Personnel who identify a nonconformance will report the condition by:

- Completing Part A of the Nonconformance Report (NCR) (Appendix F)
- Requesting an NCR number from the QC Manager, who will enter the NCR on the log
- Distributing the NCR to the PM and QC Manager

#### **4.8.3.2 Evaluation of Nonconformance Report**

The QC Manager and PM will review the NCR to determine if:

- Ongoing work should be stopped
- The nonconformance constitutes a significant condition adverse to quality, and in such a case, will determine the cause of the condition. Examples of significant conditions adverse to quality are failures to implement the QCP, major errors in data or analyses that had previously been approved, major deviation from the contract or CESPL-approved work plans, major deviations from the SOW, and conditions that may affect the cost or schedule of the work. Non-conformances that constitute significant conditions adverse to quality will be reported to CESPL.
- The nonconformance has any impact on previously obtained data or reports submitted to CESPL or other organizations. If affected, the PM will note the impact in the remarks section of the NCR and notify in writing all individuals and organizations that may be affected by the nonconformance and resulting data.

The evaluation will be documented through completion of Part B of the NCR.

#### **4.8.3.3 Recommendation of Corrective Action or Disposition**

Persons determining corrective action or disposition will have demonstrated competence, an adequate understanding of the requirement, and have access to pertinent background information (e.g., the engineer responsible for the work plan). The QC Manager will recommend corrective action or disposition to resolve the nonconformance by completing Part C of the NCR. In the case of a nonconformance, the corrective action will be such as to preclude recurrence of the nonconformance. The recommended corrective action or disposition will be reviewed and approved by the PM and QC Manager.

#### **4.8.3.4 Corrective Action Implementation and Verification of Implementation**

The approved corrective action or disposition will be implemented by appropriate personnel.

When completed, Part D of the NCR will be signed and dated by personnel performing the corrective action. Corrective action or disposition implementation and NCR closeout will be reviewed and approved by the PM and QC Manager. The identification, cause, and corrective action for a nonconformance that is adverse to quality will be reported to the QC Manager. The completed NCR will be given to the QC Manager for logging into the NCR Log and filing in the QC records.

#### **4.8.3.5 Work Stoppage**

Work stoppage authority, for other than safety, resides with the QC Manager, PM, Site Manager, UXOQC, and CESPL. If it is determined that work will be stopped, it will be noted in Part B of the NCR; the conditions necessary for work to resume will be noted in the Remarks section of Part B of the NCR, and coordinated with CESPL. The supervisor will direct project personnel to stop all affected work. Work will not be restarted until the conditions required to restart work have been satisfied and written approval has been received from the QC Manager. All work stoppages will be reported to CESPL.

#### **4.8.3.6 USACE Notification**

If USACE notification is required, the PM will submit a written report of the nonconformance with the proposed corrective action or disposition, and will obtain concurrence from CESPL.

#### **4.8.3.7 Tracking of Nonconformance Reports**

The QC Manager will monitor nonconformance reports to determine if trends adverse to quality are developing. If such trends are developing (e.g., repetitive NCR related to a particular activity, organization), the QC Manager will issue a written report identifying the problem to the Program Manager. The Program Manager will evaluate the identified problem and propose and implement a written corrective action program to prevent recurrence of the nonconformance.

### **4.8.4 Records**

Records pertaining to Nonconformance/Corrective Action will include:

- NCR
- NCR Log
- Documentation of Notification of Nonconformance to CESPL
- Evaluation of NCR trends
- Corrective Action Report for NCR trends

### **4.9 Lessons Learned**

During the course of field activities, data or information may be discovered that could eliminate or reduce challenges and/or offer opportunities for quality and productivity improvements through value engineering. Lessons learned are annotated and archived as soon as possible to allow access by project personnel. These lessons learned are considered as valuable tools in

updating plans and procedures for subsequent field activities to include further geophysical/intrusive investigations.

To provide a method of capturing and documenting lessons learned, weekly quality management meetings will be held and attended by the PM (in person or by telecomm), the QC Manager, Site Manager, SUXOS, UXOQC, team leaders, and QC personnel. Topics of discussion for these debriefs will address:

- Problems
- Solutions
- Alternatives
- Trends
- Quality/Productivity Improvements

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