

DATA ITEM DESCRIPTION

Title: Geophysics

Number: HNC-003.01

Approval Date: 20150313

AMSC Number:

Limitation:

DTIC Applicable: No

GIDEP Applicable: No

Office of Primary Responsibility: CEHNC-EDC-G

Applicable Forms: Attachment A – Field Data Sheet, Attachment B –Access Database Required Tables, Attachment C - Geophysical Submittals & Due Dates

Use/Relationship: This Data Item Description contains instructions for preparing UFP-QAPP Worksheets and data requirements when addressing geophysical investigations for Munitions Response or other munitions related projects. This DID specifies naming and formatting conventions for data deliverables associated with geophysical activities. This DID shall be used in association with EM 200-1-15 Chapters 6, 8, 9, 11 & 13. Additional references include the Ordnance and Explosives Digital Geophysical Mapping Guidance- Operational Procedures and Quality Control Manual (USAESCH, 2003).

Requirements:

1. **Geophysical Investigation Plan.** The Contractor shall incorporate all aspects of the Geophysical Investigation Plan (GIP) into the UFP-QAPP for MEC and related SOPs. The plan shall provide details of the approach, methods, and operational procedures to be employed to perform geophysical investigations at Munitions Response or other munitions related projects. The GIP shall describe how the geophysical investigation and related activities will meet the project's Data Quality Objectives (DQOs). The DQOs shall include statements identifying the specific MEC target objectives, their anticipated or expected burial depths, and the detection and removal objectives for the project. Geophysical data needs and operating procedure requirements shall be identified and specified to support all project DQOs. Digital Geophysical Mapping (DGM) shall preferentially be incorporated into the GIP where appropriate. Exceptions to using DGM shall have PDT concurrence. Additionally, the following topics shall be addressed in the GIP:

- a. Specific Area(s) to be investigated, including a Survey Mission Plan Map.
- b. Account for and address all known project specific constraints, adverse conditions or features potentially affecting geophysical investigations (i.e. vegetation, geology, soil type, background geophysical noise, man-made features, site accessibility, etc.)
- c. Geophysical Survey type(s), equipment and field procedures (required for both analog and digital detectors)
- d. Required field documentation (see Attachment A for a sample Field Data Sheet template)
- e. Data processing, corrections and advanced analysis (see EM 200-1-15 section 6.6)
- f. Anomaly identification and ranking/prioritization criteria, and dig selection criteria (see EM 200-1-15 section 6.6.2)
- g. Anomaly reacquisition and resolution procedures (see EM 200-1-15 section 6.6.9)
- h. Descriptions of final data formats and final map formats.

2. **Instrument Verification Strip (IVS) Plan & Letter Report.** The Contractor shall prepare an IVS Plan to address those elements described in EM 200-1-15 section 6.7 and the Final Report Geophysical System Verification (GSV): A Physics-Based Alternative to Geophysical Prove-Outs for Munitions Response (Final GSV Report, ESTCP, 2009). A Geophysical Prove-Out should be considered when a DGM sensor is not well characterized and sensor response curves can't be generated. If determined necessary by the PDT, the GPO Plan detailing the size and scope necessary to meet the project needs shall be submitted as described in EM 200-1-15 section 6.7.3. After the IVS or GPO field effort, the Contractor shall prepare an IVS or GPO Letter Report to contain all information required by the PDT to support their selection decisions as described in EM 200-1-15 section 13.6.

A letter report shall be delivered along with the following files:

- a. The IVS or GPO Letter Report (Microsoft Word format);
- b. All raw and processed geophysical data;

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- c. Geophysical maps in their native format (Surfer®, Geosoft Oasis Montaj™, Intergraph, or ESRI ArcView format) and as raster bit-map images such as BMP, JPEG, TIFF or GIF;
- d. Seed item location table (Microsoft Excel or Access format);
- e. Microsoft Access Tables in accordance with Attachment B.
- f. Table (Microsoft Access format) of all control points, survey points and benchmarks established or used during the Location Surveying task.

The IVS or GPO Letter Report shall be included in future work plans and reports associated with the survey area. If the contractor proceeds with production geophysical mapping prior to the Government's acceptance of their IVS or GPO letter report, they will proceed at their own risk. If the Government rejects any portion of the Contractor's IVS or GPO letter report pertaining to geophysical mapping procedures, quality control or detection capabilities, all data collected by the Contractor at their own risk will be rejected and the Contractor shall re-collect the data at zero cost to the Government.

3. Quality Control (QC) Plan. The geophysics sections (digital and analog) of the QC plan shall be developed in accordance with EM 200-1-15 Chapter 11 (see Tables 11-1 to 11-6) and incorporated into the UFP-QAPP for MEC and related SOPs. The quality control plan shall identify meaningful and reasonable QC checking and testing procedures to define and document the quality achieved by the work processes performed and in the data generated. The QC plan shall include procedures for performing root-cause analyses when failures occur. Results of QC tests, numerical and pass/fail, shall be reported in an Access database using the naming and formatting conventions found in the database template provided by USAESCH and as described in Attachment B. Contact the USAESCH Geosciences Branch for the current database template. This database provides the format for reporting common QC tasks, it does not specify QC requirements. The tables are not all-inclusive and additions may be made to support project specific needs. Project specific QC metrics and QC requirements shall be defined and the QC Plan shall specify how they will be calculated and the frequency they will be calculated.

4. Data Format Requirements. The formats specified in this paragraph are REQUIRED to be exactly followed, although the Contractor may choose to submit the data in additional formats as well. All geophysical data shall be accompanied by metadata in the form of a read-me file or a database or spreadsheet table documenting the field activities associated with the data, the processing performed, and correlation of data file names to grid names used by other project personnel. Metadata shall be generated for each logical grouping of data (e.g., names and contents of all files generated to map a grid, or names and contents of all files generated from a towed platform during a mapping session.) Metadata shall fully describe all measurements recorded in each data file, and shall include all information necessary to successfully associate all geophysical system measurements to their correct geographical location. At the discretion of the PDT, the metadata can be limited to provide references to where this information is located. Appendix B identifies naming and reporting conventions that shall be used to deliver information associated with geophysical activities, such as function test results, QC assessment information and results, anomaly characteristics, dig lists, reacquisition information and intrusive investigation results. Separate reporting formats and conventions are provided for analog and digital geophysical activities.

a. Raw Geophysical Field Data Format and Storage. Raw field data will be stored in a logical file directory (folder) structure to facilitate its management and dissemination to PDT members. Raw field data is defined as all digital data generated from the geophysical system, and includes geophysical, positioning, heading, tilt, and any other peripheral or instrument measurements collected or recorded during data acquisition. All raw field data shall have a time stamp associated with each measurement event. At the discretion of the PDT, raw field data may include geophysical system data that has been checked, corrected and processed into ASCII files, either individually by instrument or merged with positioning data. Metadata for raw geophysical data shall include instructions for generating ASCII formatted data from all raw data for use in computer processing systems.

b. Final Processed and Advanced Processed Data Format and Storage. Final and Advanced (as required) processed data shall be produced and presented in ASCII formatted files and native geophysical processing software formats (e.g. Geosoft GDB). Final processed data is defined as data that represents, to the best of the Contractor's ability, the true potential field that exists at each actual location measured by the geophysical system. Final processed data shall have all corrections applied needed to correct for positioning offsets, instrument bias (including instrument latency), instrument drift, roll-pitch-yaw-angle offsets, and diurnal magnetic variations. Advanced processed data is defined as Final Processed data that has been subjected to additional advanced processing (e.g.

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filtering) techniques and was used in the anomaly selection process. Final processed data shall conform to field names in the DGM Access Database as applicable (e.g. CH1_final, CH2_final). All corrections and processing steps will be documented. Metadata for final processed and advanced processed data shall include UTM zone and coordinate units (the PDT or PWS may require additional coordinate units and projections be included), and descriptions and units of all “z” values, which are the data associated with each measurement event. All measurement events shall have a time stamp. Unprocessed, interim-processed, final processed, and advanced processed (if used) “z” values shall be included in a single file. Each data file will be logically and sequentially named so that the file name can be easily correlated with the project-specific naming conventions used by the PDT. Naming conventions of files and data fields shall be included with metadata.

c. Anomaly Table, Dig Selection Table, Reacquisition Table & Intrusive Results Table formats. The Anomaly, Reacquisition & Intrusive Results Tables shall be submitted digitally in a Microsoft Access Database in accordance with Attachment B. The Anomaly Table shall include all anomalies above background or above a basic selection threshold, and shall include entries for all optional columns used in making dig decisions (e.g. Size, SNR, Fit_MagneticMoment, etc). All anomalies that have been selected for intrusive investigation will be marked as such in the Anomaly Table. The Reacquisition and Intrusive Results Tables shall include all information tabulated for each target during those phases. Post-dig verification responses shall be recorded in the Intrusive Results Table to meet the Anomaly Resolution requirement as appropriate. The tables shall be logical and descriptions of intrusive results shall be consistent.

d. Additional QC Table formats. Attachment B lists the tables that are required with each data submittal. The most recent Access Database format provided by USAESCH shall be followed with modifications as agreed to by the PDT.

e. Map Format. For submittals, the contractor shall provide maps in editable form if available (e.g. Geosoft .map) and map images in a common image format (e.g. JPEG) for viewing without the software used to produce the maps. Additional geospatial files supporting the project and data map creation (e.g. grid/transect locations, obstacle locations) shall be provided in formats that can be imported into Geosoft and/or ESRI software. Maps will include all the following basic map features in addition to any other necessary site information.

- (1) General: All selected anomalies and known features shall be marked with symbols on the map. Map scales should be even multiples of the base units presented in the map. Map sizes should be designed to fit standard printer or plotter sizes. Grid ticks or grid lines should be visible and labeled.
- (2) Title block: Include Figure number, the map Title and sub-title (e.g. instrument and type/component) and the location of the information being presented (e.g. site/area name and property/grid ID).
- (3) Legend: All objects/symbols shown on the map should be identified in the legend. Map Scale bar, coordinate system and North arrow shall be included. Color scale bars should use a color scheme that clearly differentiates between anomalies and background readings. Background values should be plotted in white or gray, so as not to distract the viewer. A classic “cold to hot” color scale should be used with negative values plotted in blue and high positive values plotted in red/pink. The range of values should be “fixed” so that the same color scale is utilized across the site. The region of major interest is almost always near the detection/background limit, not the maximum or minimum values of the data set.
- (4) Additional Project Information: minimum requirements are to have boxes for the following information: Client, Project, Contractor, Map creator, Map approver, Date created.

5. Data Submittals

The Contractor shall furnish all geophysical data, geophysical maps and dig sheets to USAESCH, via internet using USAESCH-approved FTP, E-mail attachment for small files under 5 Mb, CD/DVD or other approved method, for inspection. Data submittals shall be delivered in a single package (i.e. zip file) and be self-extracting into a consistent file structure as appropriate. All geophysical data shall be accompanied by metadata as described in Section 4. The delivery schedule shall be in accordance with Attachment C, unless otherwise established by the PDT. Analog QC data shall be submitted on a recurring basis during field work, as established by the PDT. The

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Contractor shall also provide a digital planimetric map in ESRI ArcView, Geosoft, or other approved format, and coincident with the location of the geophysical survey, so that each day's geophysical data set can be registered within the original mission plan survey map. Each data submittal shall include the Attachment B tables to identify the quality of the data and whether it is meeting project objectives. Any QC failures shall be identified and the corrective action that is being taken shall be described. The final report deliverable shall include two copies on CD/DVD of all project data.

6.0 Contractor Minimum Performance And QC Requirements

The Contractor shall include in their QC plan specific tests as described in Section 3 above and listed references. The values listed in the various requirements (see EM 200-1-15 Tables 11-1 to 11-6) may be adjusted upon request, provided the Contractor supplies supporting documentation and rationales for Government concurrence. Acceptance sampling parameters for anomaly resolution are provided in EM 200-1-15 Table 6-6. All reported QC results from these tests will be reviewed as part of government QA. In the event a requirement is not met and the contractor submits the data to the Government, the contractor shall provide rationales for accepting them. All such rationales will be reviewed as part of government QA. If the rationales are either insufficient or technically unfeasible, or are attempts to justify non-conformances that should be corrected to meet project needs, the Government will issue a Corrective Action Request to the contractor and the submittal(s) will be rejected. Some performance standards are default values and may be changed by the PDT to suit project needs, potentially as a result of TPP decisions. The database template shall be used; however, the required fields will change based on the final QCP as approved by the PDT.

7.0 Advanced Classification Data

The Contractor shall use advanced classification sensors in both dynamic and cued mode where appropriate as approved by the PDT, utilizing personnel with previous advanced classification experience. Currently, advanced classification sensors include TEMTADS, MetalMapper, and MPV, all of which are multi-axis, multi-coil electromagnetic induction (EMI) sensors. New sensors may be developed, but must share several characteristics with these advanced EMI sensors, including a detailed, written description of the sensing modality and analysis approach, ability to predict in advance the signals and characteristics expected from the expected munitions items, and demonstrated performance on a test site or previous project. The Geophysical Classification for Munitions Response Quality Assurance Project Plan (GCMR-QAPP) template produced by the Intergovernmental Data Quality Task Force (IDQTF), current version, shall be utilized for project planning and documentation. Any changes to the black text of the GCMR-QAPP template must be explained and justified.

8.0 End of DID HNC-003.01.

Attachment A

Field Data Sheet

Project Name: _____

Project Location: _____

Geophysical Contractor: _____

Field Team: _____

Coordinate System (w/ units): _____

Survey Type: _____

Survey Area ID: _____

Date: _____

Raw Data File Name: _____

Repeat Data File Name: _____

Geophysical Instrumentation: _____

Serial Number: _____

Navigation Method: _____

Serial Number: _____

Additional Comments: _____

Sketch of Survey Area- include North arrow, Approximate scale, brief description of terrain, site conditions, and any surface features potentially affecting the data quality or coverage.

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Attachment B

DID_Tables Access Database

This Appendix identifies reporting conventions that shall be used to deliver information associated with geophysical activities. Tables for reporting information are separated by common functions or activities and include reporting specification for function test results, QC assessment information and results, anomaly characteristics, dig lists, reacquisition information and intrusive investigation information. Separate reporting formats and conventions are provided for digital and analog geophysical activities in Figures B1 and B2, respectively. Not all information in the template Access Databases is required; however all information that is necessary to document QC requirements success or failure are mandatory. All DGM required information shall be kept in the DGM Access Database (Fig. B1) and all analog required information shall be kept in the Analog Access Database (Fig. B2).

Where appropriate, a “QCStatus” field is included in a table to indicate whether all associated QC assessments and tests have been performed and accepted or rejected by QC personnel. Site specific QC metrics and requirements shall be developed by the PDT. Those metrics and requirements can be appended to these tables to simplify reporting and checking activities, and their format and use should be defined collaboratively by the PDT.

Contact USAESCH for the latest version of the DGM and analog databases.

Figure B1: DGM Access Database Tables

DGM Template Access Database

Project Start-up Tables

- * **Project** (*project location, contractor, coordinate system, etc.*)
- Performance_Requirements_Defaults** (*project specific quality objectives*)
- IVS_StandardValues** (*initial IVS values for daily test comparison*)
- StaticTest_StandardValues** (*initial static test values for daily comparison*)
- Control_Point** (*base station, grid corners, etc...*)
- Seed&Test_Item** (*description/location of seeds*)

Daily/Dataset Quality Results Tables

- * **Along_Line_Spacing** (*dataset/grid values*)
- * **Background_Noise** (*dataset/grid values*)
- * **Coverage** (*dataset/grid values*)
- Dynamic_Repeatability** (*dataset, not required if doing an IVS*)
- Dynamic_Repeatability_Transects** (*dataset, not required if doing an IVS*)
- * **IVS_daily_results** (*AM/PM*)
- * **Repeat_Lines** (*dataset/grid results, not required if doing an IVS*)
- * **Speed** (*dataset/grid results, not required if doing an IVS*)
- * **StaticTest_Repeatability_Test** (*daily*)
- Geodetic_Accuracy_Repeatability** (*occasional re-checks of base station/control points*)
- Geodetic_Functionality** (*daily GPS test*)
- Geodetic_Internal_Consistency** (*per grid for fiducial positioning*)

Dataset Tracking Tables

- * **Dataset** (*filename, location, terrain, etc...*)
- * **Data_Processing** (*optional processing metadata*)

Anomaly / Dig Results Tables

- * **Anomaly** (*export from target gdb*)
- Reacquisition** (*offset, direction, etc...*)
- Intrusive_Results** (*dig sheet*)
- Acceptance_Sampling** (*Look-up table, not required*)
- Acceptance_Sampling** (*QC re-check of dig locations*)

* Exported from Geosoft UX-Process

Figure B2: Analog Access Database Tables

Analog Template Access Database

Project Tables

Project (*project location, contractor, coordinate system, etc.*)

Team (*field team compositions per day*)

Control Point (*GPS control points used during the project*)

Daily/Dataset Quality Results Tables

Geodetic Functionality (*daily GPS check*)

Function Test (*daily analog instrument test, repeatability*)

Grid Mapping (*grid data collection and intrusive summary*)

Transect Mapping (*transect data collection and intrusive summary*)

Grid QC (*seeds recovered, percentage re-checks*)

Transect QC (*seeds recovered, dynamic repeatability*)

Seeding (*coverage, detection & recovery seeds*)

Dig Results Tables

Intrusive Results (*intrusive results per anomaly*)

MEC MD Characteristics (*MEC/MD descriptions*)

Anomaly Resolution (*QC re-checks of dig locations*)

Grid Mapping (*grid data collection and intrusive summary*)

Transect Mapping (*transect data collection and intrusive summary*)

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Attachment C

Geophysical Submittals & Due Dates

	With Each Submittal	24 hours after collection	24 hours after request by government representative	By the Following Friday	7 days after completed excavations of each grid/transect	CD/DVD With Final Report
ReadMe File	X					
Index Map	X					
Updated DID_Tables Access Database	X					
QC logs, checklists and associated documentation	X		X			
First Week's mapping and QC data		X				
Special Request Draft Data			X			
DGM Data Package for each week's data collection (raw and final mapping & QC data, Maps, Field Data Sheets, & updated associated database tables)				X		
Intrusive Results Tables					X	
All Raw & Final Digital Data, Maps, Final Access Database, Final QC documentation						X