

GENERAL SPECIFICATION

Geophysics

GS EP GPY 304

Land Magnetotelluric acquisition

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1. Scope

This document specifies the minimum technical requirements for land magnetotelluric acquisition. It replaces Exhibit D.

In Call For Tenders / Contracts, it is associated with:

- Exhibit A: Health, Safety, Societal, Security and Environment (HSE)
- Exhibit B: Scope of Services
- Exhibit C: Equipment and personnel
- Exhibit E: Remuneration

2. Reference documents

The reference documents listed below form an integral part of this General Specification.

External Documents

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and addendums, is the latest revision published at the effective date of this document.

Reference	Title
Not applicable	

Total General Specifications

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and addendums, is the latest revision published.

Reference	Title
GS EP POS 003	Land surveying and positioning works

3. Glossary

Definitions of terms used in this General Specification are:

AC	Alternating Current
AD	Analog to Digital
CRS	Coordinates reference system
DC	Direct Current
DTM	Digital Terrain Model
EM	Electromagnetic
EX	X-component of the Electric field
EX ^R	X-component of the Electric field rotated

EY	Y-component of the Electric field
GIS	Geographical Information System
GNSS	Global Navigation Satellite System
HSE	Health Safety, Societal, Security Environment
HX	X-component of the magnetic field
HY	Y-component of the magnetic field
HZ	Z-component of the magnetic field
ITRF	International Terrestrial Reference System
MT	Magnetotelluric
QC	Quality Control
WGS84	World Geodetic System 1984

4. Quality assurance

4.1 Introduction

Contractor is required to acquire the land magnetotelluric data in accordance with the scope of work and the technical and HSE standards.

4.2 Quality management

4.2.1 System

Contractor is to be managed by an effective quality management system that ensures conformance to agreed requirements and provides adequate confidence that the product or service fulfils requirements for quality.

The requirements of "ISO 9001" have to be met although registration is not essential.

The quality management system will include:

1. The quality manual
2. The management procedures
3. The work instructions
4. The records, reference and support documentation
5. The project quality plan

These have to be in the english language and available for inspection by Company.

4.2.2 Quality audits

Company has to reserve the right to assess the technical capacity of Contractor and review the effectiveness of the quality management systems implemented by Contractor and its subcontractors. This may be carried out by means of surveillance, review and audit methods at the discretion of Company.

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Contractor has to maintain similar methods to assess and review its subcontractors. The records will be made available to Company.

4.2.3 Quality plan

The Contractor is required to propose a comprehensive Quality Plan covering all aspects of the services and which satisfactorily relates the Quality System to Company requirements in scope of service of the contract.

The quality plan will contain at minimum:

1. A description of the Contractor's organisation which specifies those individuals responsible for achieving compliance with the technical and quality requirements of the work;
2. The work instructions used for each survey activity;
3. A list of the objective documentation to be produced as proof of achievement of the requirements;
4. The criteria used to measure the acceptance of acquired data including algorithms where applicable;
5. Precision of the services to be carried out by subcontractors and the methods used by Contractor to assess and control these services;
6. The project quality plan.

4.2.4 Definition of project quality plan

A project quality plan will set out the specific quality practices, resources and sequence of activities relevant to the work.

All aspects of Contractor services during the work have to be covered by the project quality plan, which is required to relate the quality management system to the specific requirements of the contract.

The project quality plan describes Contractor's methods by which it ensures conformance to Company's requirements in terms of data quality. With close reference to the Contractor's general management procedures and general work instructions, the project quality plan is to detail Contractor's equipment, methods, techniques and general configuration by which these objectives will be met.

{Rule 1:

Contractor shall ensure the presence of a full time Quality Control (QC) senior geophysicist to monitor and assess operations and data quality in accordance with the Contractor's QC procedures that will be provided to Company in project quality plan. He will be the person appointed by Contractor to act on his behalf for all QC related aspects of the survey.}

4.2.5 Project quality plan contents

As a general rule, this document contains:

1. Modus operandi for operations: geodesy, pre-scouting, fly camps, normal operations, operations adapted to particularities of the field conditions.

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2. Comprehensive descriptions of all equipment and processing systems. The version numbers of all software and hardware systems has to be supplied.
3. List of all periodic tests for all equipment involved in data quality, according to Contractor standards, manufacturer recommendations, and per contract technical specifications.
4. Contingency for the replacement or repair of defective material.
5. Quality Control flow chart.
6. Modus operandi for minimizing the environmental impact.
7. Modus operandi for the restoration of work sites.
8. Key personnel information.
9. Planning of internal quality audit.
10. Mobilisation Chart, defined at § 4.2.6.

Company reserves the right to request changes and/or to add further specified procedures if considered necessary.

4.2.6 Mobilisation chart

The Mobilisation Chart details all mobilisation related activities and time frame. This chart has to include at a minimum:

1. Contract finalisation
2. Meetings between Company and Contractor representatives
3. Advanced Party activities
4. Surveying and topography activities
5. Line clearing activities
6. Base camp installation
7. Personnel and equipment mobilisation
8. Project Quality Plan finalisation
9. Equipment testing
10. Technical Audit date estimation
11. Mobilisation Date estimation
12. A start up meeting

4.2.7 Project quality plan update

The quality plan can be updated during the project with Company's approval.

During the project, the following items will be added to the project quality plan:

1. Procedures and notes issued by Company, concerning QC or operations.
2. Procedures and notes issued by Contractor and approved by Company concerning QC or operations.

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4.3 Independent Quality Control

In addition to Contractor's quality management system implementation, Company reserves the right to perform an independent QC of the acquired data by a Company supervisor.

The presence of the Company supervisor and QC systems will however in no way relieve Contractor of any responsibility for magnetotelluric acquisition and positioning.

Company's QC systems are to not be considered as a part of the Contractor's QC structure. Contractor is to afford all reasonable assistance to Company supervisor in the execution of their task.

All raw data, production logs and QC reports has to be made available to Company supervisor as detailed in this document through the camp computer network or by media previously agreed.

4.4 Reference documentation

The following documentation is required to be available on site to both Company and Contractor personnel at any time during the survey. All key personnel will be conversant with and fully aware of the contents of the documents appropriated to their activity. This documentation is to be available for consultation by Company supervisor.

1. Copy of quality management system documentation.
2. Copy of this document (general technical specifications for land magnetotelluric acquisition) and scope of services of the contract.
3. Technical manufacturer manuals of recording unit, and all system implemented for recording system.
4. Technical manuals and diagrams pertaining to all geophysical and positioning equipment and software used.
5. A copy of all standard recording format used on the survey, including: the SEG (Society of Exploration Geophysicists) "Electrical Data Interchange (EDI) file".

5. Company technical audit(s) and acceptance certificate

5.1 Technical audits

Company will carry out an internal or external technical audit during which Contractor will demonstrate that:

1. The field unit is conforming to the contractual requirements.
2. Contractor's and Company's health, safety and environmental management systems are implemented.
3. The mobilisation report has been provided by Contractor and accepted by Company's representative.

5.1.1 Mobilisation report

The Mobilisation report has to contain at a minimum the following documents:

1. Contractor's quality management system implementation.

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2. Technical characteristics of each magnetotelluric equipment units.
3. Results of each magnetotelluric equipment calibration and adjustments.
4. Pre-survey equipment tests for magnetotelluric receiver (magnetic and electric sensors plus the recording unit).
5. Maps of magnetotelluric station planned positions.
6. List and equipment of subcontractors.
7. Operational procedures.
8. Operational line management.
9. Information flow diagram.
10. Camp drawing including electrical network.
11. Camp computer network.
12. Company supervisor's technical facilities.

Company will inspect, examine and copy records for verification of any document related to equipment, personnel and procedures.

5.2 Acceptance certificate

Contractor will be officially notified of acceptance of the field unit by the Company.

6. Personnel requirement

6.1 General requirements

{Rule 2:

The party chief shall have at least three years of experience in the same position.

All key personnel shall have at least one year of experience in the same position and five years of experience in land magnetotelluric operations.

Key personnel cannot be replaced without the consent of Company representative, on curriculum vitae approval.}

It is required that all senior staff will be fully conversant in spoken and written English

Contractor has to pay for and provide all transportation for the personnel between their points of origin, the operation area and return,

Rotation schedules for all personnel will be agreed by Company representative and will be compatible with applicable laws or/and Company regulations.

No personnel (Contractor and subcontractor) may work for a period exceeding sixty (60) days without an adequate period of break. In exceptional circumstances and with the written approval of the Company, this restriction may be relaxed.

Continuity will be maintained by partial replacement of crews at specified intervals and by briefing/debriefing with comprehensive hand-over reports. This hand-over will not be less than 24 hours for key personnel.

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6.2 Contractor experts

{Rule 3:

A specialist in MT equipment and data processing from Contractor shall attend the audits. He/She will be required to report and comment the selected equipment, parameters and method of work.}

Written recommendations will be issued before their departure from the survey area.

6.3 Key personnel information to be provided

This information is part of the project quality plan:

1. Areas of competencies of each key personnel.
2. Responsibilities covered by each key personnel, regarding production and QC.
3. Curriculum vitae of key personnel.
4. Name of personnel appointed to be responsible of the overall QC, from station planning to data shipment, with instrument and data QC.
5. Clear definition of senior geophysicist competence and responsibilities.
6. Procedure of personnel turnover management (continuity of information).

7. Camp facilities

Refer to the HSE exhibit (A) of the contract for camp and fly-camp installations.

7.1 Camp communications

It is required that computers of relevant departments (Contractor's party chief, Survey, Q.C., HSE, clinic and administration, Company supervisor(s) be networked using shared folders for all data related to the contract execution and follow-up. It is also recommended that local e-mail system be available between these computers.

All documents, listing, tables, maps, graphs, reports, figures, etc related to the magnetotelluric acquisition will be saved in shared directories accessible at all time to Company supervisor(s).

7.2 Satellite communications

Contractor will provide satellite communications for voice and data between the survey unit and Company's offices. Communication has to be sufficient to allow contact between offices and survey units in all location of the survey area at all time.

Communication has to be sufficient to allow proper internet access in Contractor and Company's offices.

7.3 Facilities for Company supervisors

Contractor has to provide at his own cost:

1. Accommodation and food. The accommodation facilities will be completely separated from working area (office), will consist of single rooms, and be supplied with brand new air heating/conditioning, cupboard and refrigerator.

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2. Private showers and toilets will be appreciated. Office and accommodation have to be wind and sand proof.
3. One office equipped with a brand new air heating/conditioning system, and fitted with:
 - One up to date personal computer (with a 19 inches colour screen, DVD reader, CD-ROM writer), one colour printer, and a stable power supply.
 - One X-Terminal connected on the crew's network providing access to the Contractor's QC software.
 - Telephone and Internet communication with dedicated bandwidth channel, with access to e-mail with dedicated address.
 - Radio communication or internal phone to communicate with all other base camp departments.
 - One VHF radio powerful enough to monitor all the field operations.
 - Consumables (A4 format paper for printer, printer cartridges, CDs, etc...).
 - Whiteboard(s)
4. Two (2) brand new 4x4 Vehicles (Land Cruiser or equivalent) with air-conditioning, safety equipment, VHF and SSB radio, and driver available all time unless otherwise specified in the scope of service of the contract.

7.4 Complete meteorological station

7.4.1 Requirements

It is required that a complete meteorological station is settled on the base camp. Values of temperature, pressure, hygrometry and wind speed have to be monitored continuously.

The meteorological station is to include:

1. Thermometer
2. Barometer
3. Hygrometer
4. Rain gauge
5. Anemometer

7.4.2 Procedures

Temperature, pressure, hygrometry and wind speed will be continuously recorded and logged in a database.

The rainfall will be cumulated over one day duration, from 8 am to 8 am.

8. Permitting

8.1 Requirements

Contractor is to ensure that its crews take the greatest care to limit as much as possible the damages when progressing through land properties.

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Line clearance has to be carried out in compliance with the applicable laws, local environmental standards and restrictions detailed in the scope of services of the contract.

8.2 Procedures

A permit-man from Contractor crew, unless otherwise detailed in the scope of services of the contract, will go with the scouting crews.

Contractor will outline the limits of the properties and record all the relevant information for each property in files before the entering of the line cutting crews. The property limits could be computed from cadastral maps if available, or be surveyed with GNSS if necessary.

All the properties owners have to be met and briefed about the survey before the entering of any crew in their properties. The owners have to give their written authorization for the passing of the crews, being fully aware of the conditions and rates of the compensations.

The following information has to be supplied and mapped using a GIS (Geographic Information Software) system.

Information 1

1. Index number of the property
2. Owner name, address, phone if available
3. Type of cultivation, number of cattle...
4. Water wells

Information 2

The damages will be inventoried after the passing of the surveying/opening crews

If the Contractor is in charge of the permitting, this information will be recorded in a tabulated text file as follows:

Station number s	area	owner	For 3D property index	date of assess ment	type of cultivation	cost per station	total cost
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Information 3

After the recording is complete and the cleaning has been done (which is basically an adjustment of information 2).

Station number s	area	owner	For 3D property index	date of final assess ment	type of cultivation	cost per station	total cost
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Information 4

The amount of compensation to be given to the land owners will be computed from the last damages inventory, once all the crews have definitively left a property.

The following information will be attached to each owner's assessment form:

1. Owner's name
2. Station numbers
3. Area of the stations