Geothermie Braunau

Vibro Tender

Client: Geo5 GmbH, Roseggerstrasse 17, 8700 Leoben, Austria

Projekt: Geothermie Braunau, Vibro

Lokation: Braunau am Inn, Austria

Date of Project: Acquisition: 03/2024

Date of Tender: November, 20th 2023

Questions till: December, 4th 2023

Submission deadline: December, 12th 2023

Bidder meetings: December 18th 2023 – January 12th 2024

Date of Award: January, 16th, 2024

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1 Project description

1.1 General information

CLIENT regarding to the planning, supporting and acquisition of the pre-investigations is Geo5 GmbH.

Geothermie-Fördergesellschaft Simbach-Braunau GmbH (GSB) plans to expand district heating in the area "Braunau-Ost" due to increased heating demand. For this purpose a second geothermal doublet with a preferential location in Braunau am Inn should be constructed. The location for the wells as well as the target of the doublet is to be located in the east of Braunau in the area of the so-called "Mattig Fault". Suitable areas for the drilling of wells to reach the target are located in the vicinity of the transformer station Braunau - St. Peter.

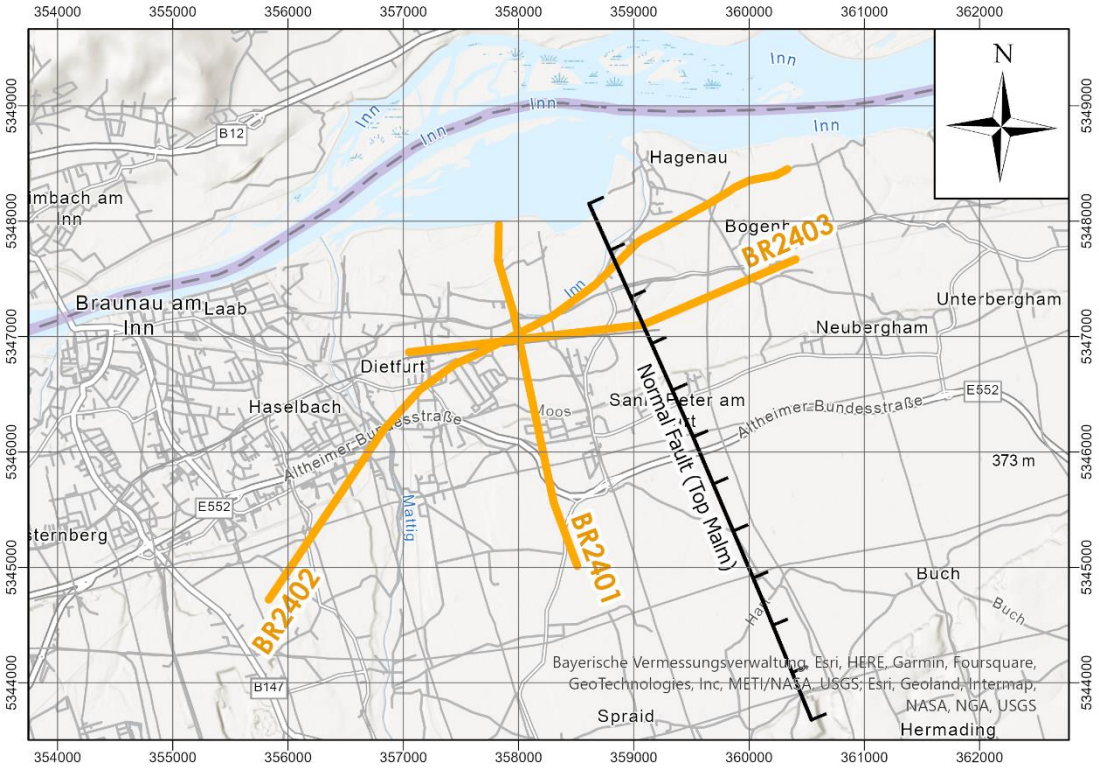

Figure 1: Location of planned three seismic profiles (yellow: receiver lines) east of Braunau am Inn, in Upper Austria. Source points will be near receiver lines on public and private roads.

For the geological pre-planning of the doublet geological and geophysical investigations are necessary. All existing and all newly acquired data are the basis for the creation of a thermal-hydraulic model.

In addition to already existing seismic data it is also planned to acquire new seismic reflection data on at least three profiles. The acquisition of these seismic data will be performed in February or March 2024 by Geo5 GmbH. As seismic acquisition system STRYDE-Nodes will be used.

Due to the geological conditions of the subsoil near the surface, we decided to use Vibrators instead of dynamite as seismic source. These layers are predominately coarse gravel which are partially saturated with water. The water level is more or less in depths of about 15 m below ground level. Due to this it will be more efficient to use Vibrators as seismic source so that the necessary energy can reach the target depth of approx. 2.500 meters.

The subject of the invitation to tender in this context are only the provision of the Vibrator services to perform these seismic surveys.

In this tender, parameters for measurements with vibrators are specified.

In addition, however, the CONTRACTOR is specifically expected to make recommendations on vibrator specifications (type and number of vibrators, weight, etc.) based on its experience with such projects. The CONTRACTOR is also expected to provide recommendations on typical vibrator parameters (sweep frequency, length a number of vertical stacks for each Vibrator-point) for such geologic conditions. The planned vibrator parameters are described in topic 2.11.

Before the start of the acquisition at least on one day these parameters should be tested. At the end of these tests the data will be harvested and visualized to review the data quality. Then the final vibrator-parameters for the seismic acquisition will be defined.

1.2 Geological conditions

The project area is located in the southern German/Upper Austrian Molasse Basin, which is part of the northern foreland of the Alps. It belonged over long periods to the Tertiary Paratethys, an intermittently separated Tethys, which extended from Lake Geneva in the west across southern Germany, Lower Austria and along the Carpathian Mountains into the area of the Caspian Sea and the Aral Sea. The underlying stratum of the Molasse Basin comprises the crystalline rocks of the Bohemian Massiv.

The filling up of the northern foreland depth was caused by the dynamics of alpine mountain building and influenced by eustatic sea level. The typical molasse sedimentation is characterized by sediment supply from the Alps and by strong subsidence of the sedimentary

depositional space. It began in the Eocene/Oligocene boundary area and lasted about 25 million years until the Upper Miocene. During this period, the Molasse Basin progressed several tens of kilometers northward due to the alpine orogeny to the north. Sediments were transported both radially and basin-axially. Various fills from the north are largely confined to the northern margin of the Molasse Basin. At the alpine margin, the entire molasse succession reaches up to 5000 m thickness, towards the north it decreases significantly down to the tens of meters range (see Figure 2).

Within the project area the lithology is to be expected as follows:

- some 10th meters of gravel (Quaternary);
- around 2200 meters of several succesions of sand-, clay and marly limestone (Neogen-Cenoman);
- some 100s meters of limestone (Malm).

The limestone of Malm represents the target rock in this project in about 2000m TVD.

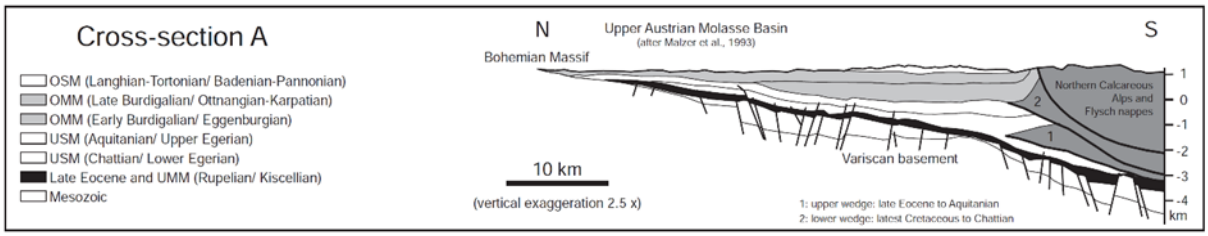

Figure 2: Generalized cross section of the Northern Alpine Foredeep Basin. [after Malzer et al., 1993]

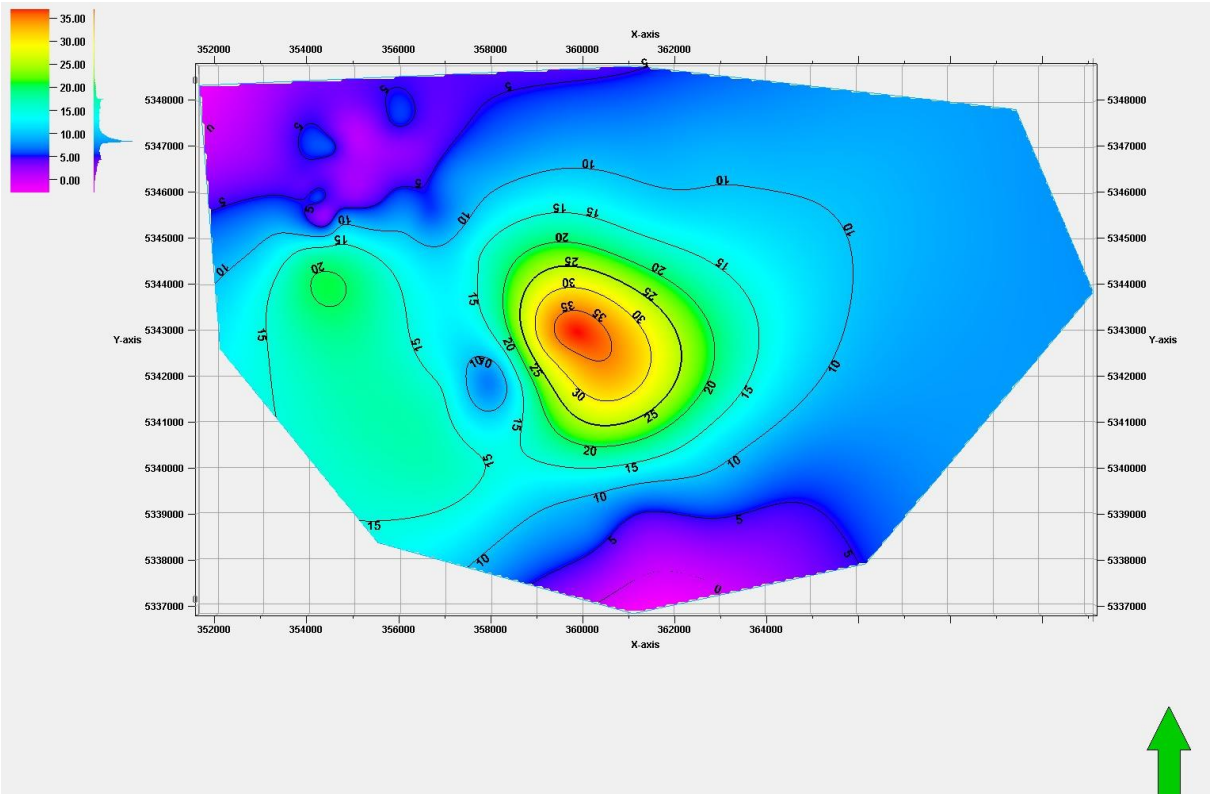

Figure 3: Thickness of the unsaturated zone in the project-area directly beneath surface. The thickness of the unsaturated zone is indicated in the colour scale, numbers are thickness in meter.

The quarternary gravel in the uppermost meters is considered to suppress the seismic signal significantly, especially in the unsaturated zone. See Fig. YX for the estimated thickness of the unsaturated zone in the project area.

2 Conditions

The following conditions, procedures and technical specifications must be complied.

The CONTRACTOR is responsible for the procedures and compliance with the technical specifications, as well as their documentation and verifiability. In case of any deviations or errors the CLIENT must be informed immediately.

2.1 Permitting

Pre-permitting and permitting will be managed and performed by Geo5 GmbH.

All installation investigations will be completed and permissions for the use of public roads will be available at that time, too. The permitting of the source positions on public and private roads will be managed by Geo5.

2.2 Source

The energy source has to be provided by vibrators.

Vibrators must be equipped with modern source control system such as Inova VibProHD, Seismic Source Force2 or Force3, Sercel VE464.

Each vibrator must have GNSS positioning system installed and centrel of pad positions should be accurate to <1m accuracy using differential, RTK or SBAS GPS positioning system.

Vibrators should record all sweep start times (T0) to microsecond accuracy.

According to the target depth, two vibrators (plus 1 spare) will be used. The recording parameters will be done after an approx. one-day parameter test together with the client.

The contractor should deliver a data sheet of the used vibrators.

The CONTRACTOR may, in certain cases such as

- in the case of vibration-sensitive buildings,
- if there is a risk of exceeding the vibration limits according to a local standard,
- in the case of spatial limitations (roads that are too narrow or similar),
- in case of a technical defect of a vibrator (max. 3 vibrator points),

use less than the specified number of vibrators for a short period of time. In these exceptional cases, the number of sweeps shall be increased according to the following table without additional costs for the client. Furthermore, the client has to be informed immediately.

The number of sweeps with a reduced number of vibrators as provisionally determined in the table below (Table 1) shall be finally determined during the parameter test. More detailed information can be found under chapter 3.2.

Number of vibrators	1	2
Number of sweeps	6	4
	8	6
	10	8

Table 1: Table for the different numbers of sweeps in case of variation of vibrators.

2.3 Operating of the Vibrators

The vibrators have to be in perfect technical condition and that the driver and the vibrators are fit to drive and approved in accordance with the regarding laws, in particular the Road Traffic Act.

Throughout the survey CONTRACTOR shall operate a Quality System that conforms to the requirements of ISO-9000 or similar and shall use the system to ensure that quality standards are maintained throughout the WORK.

Noise-insulating measures have to be taken for the operation of the vibrators (e.g. encapsulation of the motors). Oil leaks have to be avoided and repaired immediately. The CONTRACTOR shall obtain approval from the competent Austrian authority to operate the vibrators.

2.3.1 Personnel

CONTRACTOR personnel shall comprise of at least the following:

- One senior observer (= Vibro operator);
- Sufficient personnel to execute the WORK in a timely fashion (driver);
- One senior vibroseis mechanic;
- Personnel for traffic control;
- Personnel for vibration measurement (peak particle velocity (PPV) measurements).

2.4 Necessary language competence

Project, field and group leaders as well as at least one person in all working groups of the field crew must speak English or German fluently. The working language of the key personnel within the field crew must be German or English.

2.5 Similarity Tests

2.5.1 Wireline Similarity Tests

Wireline similarity tests (such as Verif-I Sandwich Box) have to be performed before starting and ending the seismic measurements. Furthermore, these tests have to be performed after any replacement or repair of larger vibrator components (e.g. control system, base plate, reaction mass, etc.) as well as after software updates of the control system.

The test results have to be recorded and evaluated. These digital files have to be handed out immediately to a representative of the client.

2.5.2 Radio Similarity Test

Radio Similarity Tests have to be performed at least 2 times a day:

- Daily before starting the measurements.

In addition, these tests have to be also performed after a vibrator has been replaced by another or the electronic system of a vibrator have been replaced.

The test results must be recorded digitally, evaluated and handed out to a representative of the client immediately.

2.6 Post Sweep Services (PSS)

Regarding to Post Sweep Services, relevant parameters for each sweep have to be digitally recorded, displayed and immediately handed out to a representative of the client for daily inspection. The following thresholds per sweep must be observed:

- Minimum peak force > 75 % at 80 % force;
- Minimum average force > 65 % at 80 % force;
- Peak values of the phase error < 15;
- Average phase error < 5;
- Peak values of distortion < 35%;
- Average distortion < 25%.

Sweep start times (T0) must be recorded with microsecond accuracy for every sweep.

Vibrator GPS coordinates must be recorded for every sweep.

Individual exceedances of limit values of a sweep can be neglected. If all sweeps of a vibrator exceed the limit values evenly and permanently, suitable measures, e.g. a reduction of the force, have to be taken.

If a vibrator exceeds these thresholds at nine consecutive sweeps or at one source point while the other vibrator of the group complies with the limits, this vibrator has to be replaced and investigated regarding to the possible causes.

2.7 Receivers

The receiver lines of the three profiles (approx. 12.5 km in sum) will follow the planned profiles. As receiver, STRYDE-Nodes with a spacing of ten meters will be deployed in the ground by Geo5 GmbH. The receivers are not part of the tender.

2.8 Contaminated sites (UXO)

The CLIENT is responsible for identifying any suspected points contaminated with explosives (unexploded bombs) along the seismic profiles. The CONTRACTOR shall be informed of any suspicious points identified prior to the start of the measurement.

The corresponding procedure at these suspicious points shall be agreed between the CONTRACTOR and the CLIENT. Vibrator points in the immediate vicinity (approx. 10 m in radius) of these suspicious points are not expected to be performed or these suspicious points will be examined in detail and, if necessary, cleared by the CLIENT.

2.9 Property damage

Damage caused by the seismic acquisition must be generally avoided.

Vibrators may only travel on roads and paths in accordance with the routes planned in or routes determined in the previous visit. Crossroad travel must be agreed with the client.

Damage in case of proper execution

Damage resulting from the proper execution of the seismic acquisition shall be reported to the client. Furthermore, these damages have to be documented photographically and with position sketches and transmitted digitally. The assessment as well as the procedure for the repair or financial compensation of the damage shall be carried out by the permitting staff or the client.

If damage is unavoidable and foreseeable in advance, the client and the permitting personnel shall be informed in advance and the further procedure shall be agreed with them.

Damage caused by improper execution

Damage caused by improper execution of the work cannot be charged to the CLIENT.

Damage caused by negligence on the part of the CONTRACTOR, such as non-compliance with safety distances (e.g. underground pipes) or disregard of instructions or rules (e.g. building vibration standard), etc. shall not be reimbursed by the CLIENT.

All damage caused by improper execution must be documented and reported to the CLIENT and the CONTRACTOR must initiate the repair of the damage.

Damage that can be repaired directly by the CONTRACTOR must be documented and reported the CLIENT.

2.10 Field reports

The following reports have to be submitted to the CLIENT representative:

- Daily reports
  - Number of surveyed vibrator points
  - Number of acquired vibrator points
  - Number of acquired vibrator points with reduced number of vibrators
- Final report
  - Location and timestamp of each vibrator points
  - Overview of daily working hours
  - Measuring conditions (weather)
  - Other comments

In addition, the following have to be handed out to the CLIENT:

- Observer log as ASCII file;
- Radio Similarity Tests in digital form and as PDF file;
- PSS data in digital form (original Inova, Seismic Source, Sercel files; *.CFG, *.VS, *.FMR, VAPS etc.), incl. information how many data exceed the respective limits;
- Post production source file with T0 time, line and point, GNSS position and sweep attributes should be made daily (text or CSV format);
- Statistical analysis of sweep performance per vibrator.

The CONTRACTOR shall name a responsible person who can be reached by telephone at any time to get this information. The responsible person should speak English or German fluently.

2.10.1 Report

The report from the seismic acquisition (incl. surveying) shall be submitted to the client in English or German language within 2 weeks after finishing the field work in printed form (3 copies) and in digital form.

The report has to be summarized according to the daily reports and must contain all data acquisition.

2.10.1.1 Daily Reporting

A Daily Report shall be provided to CLIENT by email.

CONTRACTOR shall provide comprehensive, industry standard, statistical daily reports to CLIENT Representative every morning with details of the previous 24 hours operations to include as follows:

- Date;
- Prospect;
- Diary of events;
- Significant events;
- Timing breakdown;
- Cumulative totals for the above;
- Weather conditions;
- Safety incidents including corrective action, close out and management of change;
- HSE statistics including exposure hours and comments;
- Compensation claims with breakdown;
- Projected activity for following 24 hours.

Any disputed times and/or kilometres shall be clearly stated on the daily production report.

2.10.1.2 Line Completion Reports

CONTRACTOR shall deliver to the CLIENT recording information as follows:

- First-last source position;
- Number of records;
- USB Sticks with line number and shot points;
- Shot point maps.

2.10.2 Other reports

The following reports shall also be submitted to the CLIENT:

- the results of the Wireline Similarity Tests are to be handed over to the representative of the client online without delay;
- Short report from the parameter tests as part of the field report;
- HSE report as part of the field report.

2.11 Scope of services

Summary description of the scope of services according to Chapter 2 and Chapter 3:

- Mobilisation and Demobilisation
- Execution of tests
    - Similarity tests
        - Wireline Similarity Tests
        - Radio Similarity Tests
        - Post Sweep Services (PSS)
    - Parameter-test
        - The day prior to acquisition
- Stimulation of at least three 2D seismic profile with Vibrators
    - Profile length: between 4 - 6 km per profile
    - Vibrator-point distance: 20 m nominal
- Execution of vibration measurements
    - Measurements according to Austrian standard
- Data transfer
    - Field reports
    - Other reports

3 Technical scope of services

3.1 Preparation work

3.1.1 Site setup and mob- & demobilization

This position includes all costs as a lump sum for the transport to and from the site and the provision of all devices, equipment and personnel for fulfilling the order as well as the provision for the entire duration of the measurements. Included are the proper disposal of all waste, the clearing of the required areas after completion of the work as well as the arrival and departure of the team including personnel, transport and additional costs. Furthermore, cleaning, wear and tear and possible loss of materials are to be included in the respective prices. Transport costs are also to be included.

The areas required for the storage of materials, offices, etc. will be provided by the CLIENT. If requirements are imposed by an authority, these must be complied with. Any delay times caused by this shall not be remunerated separately. The CONTRACTOR is responsible for securing all equipment and facilities and for ensuring that they function without complaint.

CONTRACTOR'S equipment and personnel depart the SITE on completion of the survey, all camp sites (if applicable) have been restored to their original state, any environmental damage rectified, any and all outstanding damage claims satisfactorily settled and any final equipment calibration tests have been conducted. The demobilisation fee will include all costs associated with the removal of equipment and personnel from the SITE.

3.1.2 Preliminary site inspection and coordination

A lump sum price for the preliminary inspection and coordination with the CLIENT for the final determination of the seismic profiles has to be stated in this position.

In addition, the costs for coordination with the client regard to any official requirements as well as neuralgic sections (problematic installations, listed buildings, etc.) and joint determination of accompanying measures for protection of these sections have to be indicated in this position.

3.2 Setup and execution of 2D seismic acquisition

3.2.1 Parameter tests

Together with the CLIENT, the final recording parameters including filter settings are determined within the framework of parameter tests (Start-up test).

These parameter tests have to be performed before starting the production on an additional working day (approx. 10 h incl. initial evaluation) with an active node configuration - equal the starting spread for production - of a seismic profile and one day stand by for harvesting and analyzing the data. The relevant seismic profile is specified by the CLIENT and is the one that is recorded first.

The recording parameters for p-wave excitation are:

- number and applied force of vibrators per vibrator point;
- the sweep length;
- the number of vertical stacks (also with reduced number of vibrators);
- frequency range (most likely 12 – 96 Hz).

The lump-sum price for the performance of the parameter tests (One day for testing the parameters and one day as Standy by during harvesting and analyzing the data) has to be specified in this position.

3.2.2 Acquisition of the seismic profiles

The prices for the field work according to the conditions of execution (Stimulation), described in chapter two, for the following parameters and for performing with two vibrators and the different vertical stacking per vibrator have to be specified. The different variants of acquisition parameters for the pricing are shown in Table 2.

Variant	Number of vibrators	Vertical Stacking	Frequenz	Vibrator points
Variant 1	2	4	12-96 Hz	600-800
Variant 2	2	6	12-96 Hz	600-800
Variant 3	2	8	12-96 Hz	600-800

Table 2: Table with the most likely different variations of acquisition parameter for pricing.

The final parameters shall be determined during the parameter test. The total number of vibrator points to be invoiced is expected to be approx. 250, respectively per profile. Billing will be based per unit of one vibrator point.

Key data for three seismic profiles:

- Profile length: 3 x about 4 to 6 km;
- Receiver distance: 10 m;
- Source-point distance for two vibrators: 20 m nominal, move-up 2 m
    - 3 x about 200-250 Vibrator points;
- Active Spread: full profile length, shooting through line.

Source:

The first preliminary specified measurement parameters for the tender are as follows:

- 2 Vibrators, medium size (approx. 50000 lbs, approx. 20 tons with a max. of 12 tons for each axle), 1 spare;
- sweep frequency (most likely): 12 – 96 Hz;
- 12 s sweep length;
- 4 vertical stacks, with the option of a fifth (which should be prized separately);
- 6 vertical stacks;
- 8 vertical stacks.

The final parameters shall be determined during the parameter test.

Recording (not part of the tender, for information only)

- Wireless recording system with STRYDE-Nodes by Geo5 GmbH
- 10 s listening time
    - Calculated measure time per Vibration-point 88 s nominally

The values given are nominal values which may still be changed after the parameter tests (according to 3.2.1 Parameter test). If the assumed total measuring time ([sweep length + listening time] multiplied with stacks per vibrator point) changes less than plus/minus 5% of the calculated value, the quoted price is fixed. Each variation of +/- 5 % has to be given for pricing.

3.3 Vibration measurements

The Vibrator points are located close to the receiver lines according to the given infrastructural conditions, preferably on roads and field paths. In the vicinity of vibration-sensitive structures (listed buildings, bridges, etc.), as well as in populated areas, accompanying vibration measurements must be carried out by the CONTRACTOR in accordance to ÖNORM S 9020.

The recording and evaluation of the vibrations generated by the vibrators is a condition. The careful documentation regarding address, location sketch, location description, photo, vibrator point number, measured value, date, time and evaluation is a decisive component for the recognition of the measurement.

Vibration measurements and evaluations have to be performed for vibrator points with buildings within a 50 m radius from the nearest vibrator. The vibrator excitation is to be changed or stopped when the threshold value is reached. If the threshold values are still exceeded, the excitation point shall be omitted.

An appropriate number of calibrated measuring instruments shall be provided for vibration measurement during the project.

The unit price (assuming, for example, 100 units) for the accompanying vibration measurements shall be included in this position. The number of measurements likely to be required can be estimated during the site inspection for bidding purposes. The unit price is independent of the actual number of units provided. This position will be invoiced according to the actual number of pieces.

3.4 Delay times

3.4.1 Directional works

If work is necessary that is not covered by the positions in the scope of services, the hours incurred will be charged on a time and material basis according to the hourly rates listed in the scope of services.

3.4.2 Stand-by times

Waiting times are interruptions of work due to unforeseen events over which the CONTRACTOR has no influence and/or which the Client expressly requests.

These unforeseen events include:

- Force majeure;
- Sabotage;
- blockades by the public;
- weather conditions;
- Loss of or instability in positioning systems unless such loss or instability is due to failure or malfunction of equipment under control of CONTRACTOR;

- Instructions or actions of Governmental or Local Authorities or Military Agencies or other Administrations e.g. Customs always provided CONTRACTOR has not incurred such restrictions or delays due to CONTRACTOR'S own default.

These have an unacceptable influence on the data quality or endanger the safety of the personnel and the measuring equipment. Waiting times caused by technical defects, e.g. of a vibrator, cannot be charged to the client. Waiting times are to be reported to the client immediately. The operation is to be resumed immediately after the interruption.

Waiting times will be charged on an hourly basis with a maximum of 8 hours per day. Partial hours shall be remunerated on a pro rata basis.

For any waiting times (times due to the above definitions or events), an hourly rate for leading individuals (project, field and squad leaders) or for the entire measuring squad (including leading personnel, measuring squad personnel as well as measuring equipment) shall be specified in the bill of quantities.

Long-term interruptions (more than 2 days) due to unforeseen events must be negotiated separately with the CLIENT. The CONTRACTOR must notify the CLIENT immediately of any major interruptions.

3.5 Dates

Subject to official approval procedures, the following time periods are defined for the data acquisition of the three 2D seismic profiles:

- The field measurements (incl. dismantling sensors) are not to start before 07:00 local time.
- In settlement areas, measurements can be carried out subject to official requirements and other restrictions, measurements can probably be carried out from Monday to Saturday (except public holidays in Austria) 7:00 a.m. to 8:00 p.m. may be carried out.
- In sparsely populated areas, data acquisition can be carried out from Monday to Saturday from 7:00 a.m. to 8:00 p.m. after consultation with the CLIENT data acquisition can be carried out from Monday to Saturday from 6:00 a.m. to 10:00 p.m. (except public holidays in Austria).

3.6 Performance Monitoring

CONTRACTOR shall report to the CLIENT in writing any significant findings or problems immediately as and when they occur. During acquisition of all data, CONTRACTOR shall report in writing on progress made and estimated completion dates.

3.7 Health, Safety and environmental Guidelines

CONTRACTOR PERSONNEL involved, shall be in good general health before assignment and shall have been medically examined and declared in good health in the twelve-month period prior to the start of the Contract. CONTRACTOR PERSONNEL involved, shall be issued with appropriate personal protective equipment (PPE), and attend a site specific safety induction before the start of activities. The induction shall include job descriptions, proposed applicable emergency response plan activities, and the timing of meetings, audits, and emergency drills.

CONTRACTOR shall be exclusively responsible for the safety, security and health of CONTRACTOR PERSONNEL; shall arrange for adequate personal accident, medical and sickness insurance; and shall be responsible for payment of any compensation to CONTRACTOR PERSONNEL at all times in respect of any accident or injury during the measurements.

CONTRACTOR shall pay particular attention to the hazards associated with road operations and shall provide detailed HSE procedures detailing how as a minimum, the following major hazards shall be managed:

- Vehicle Accident;
- Fire;
- Vibroseis operations on public roads (to include traffic control);
- Crossing of public roads by vibrators, vehicles, staff.

Reporting of incidents or accidents that fall into the minor category shall be verbally reported within 6 (six) hours to the CLIENT. Major or serious incident and/or accidents shall be verbally reported within 1 (one) hour. Fatalities shall be reported as soon as humanly possible. An initial written report shall be produced within twelve (12) hours, and updated in a timely manner as possible with the final investigation report after all and any witnesses have been interviewed and the investigations competed. Incidents and/or accidents are classified as fatality, injury to persons, damage to equipment, serious near misses, environmental damage or pollution, and media attention.

The natural environment shall be respected and it shall be the objective of the CONTRACTOR to pay appropriate regard to and comply with the national and local legislation and regulations relating to the conservation of the environment and to ensure that the working sites are restored to original conditions after the survey is completed.

No waste, either camp or operations generated, shall be left in the project area. All waste shall be removed or disposed of according to national and local legislation upon completion of the measurements. All temporary waste dumps shall be fenced to prevent access by wildlife. National and local government off-road driving rules shall be strictly followed.

CONTRACTOR shall repair promptly any property damage for which the CONTRACTOR is or may be responsible, within the limits of the means of Contractor's personnel and equipment. CONTRACTOR shall report all damage and particularly all non-crop related damage, immediately to the CLIENT regardless of any repairs which are carried out.

CONTRACTOR shall ensure that the most of the site clean-up shall have been completed during the WORK. However, before leaving the site, CONTRACTOR shall execute clean-up checks to ensure any waste created during the measurements and any damage repair work has been completed or shall be completed within the time frame approved by the CLIENT.

3.8 RADIO AND CELL PHONE COMMUNICATIONS

CONTRACTOR shall ensure that radio or cell phone communications facilities are installed in all field vehicles. Communication is required between the recording truck, each working unit, all vehicles and Crew Camp.

3.9 Operational conditions

If the interruption or re-acquisition is for reasons whereby CONTRACTOR is found to be accountable, then the re-acquisition, including any required overlap, shall be for the account of CONTRACTOR.

Misfires shall not be acceptable unless mutually agreed by CLIENT. For this reason, the Observer Log shall clearly identify the problem records and describe the error fully.

Prior to project start the mobilisation of the equipment will be discussed due weather conditions.

3.9.1 DEFINITION OF MISFIRE

The following are examples that constitute a misfire:

- Loss of magnetic recording;
- Loss of time break;
- For vibrator acquisition loss of recording of vibrator positioning data;
- Data recorded with incorrect instrument settings, source geometry or source parameters;
- Data is unidentifiable;
- Loss of synchronisation;
- For vibrator acquisition there is no initiation of sweep on less than all of the vibrator units;
- Auxiliary channels are out of specification or unreliable;
- Data is recorded without the performance it the required instrument tests;
- VP affected by earthquakes, thunder, lighting, etc.

For the project there shall be no misfires allowed. All lost vibrator points that are misfires shall be re-acquired.

3.10 Safe operating distances

Safety distances may be defined by national and/or local government legislation and regulations, the relevant OGP and IAGC safety standards, and CLIENT.

Minimum distance for any source position to pipelines, water or oil wells, permanent buildings, underground cisterns and surface cisterns with dam shall be determined. CONTRACTOR PARTY MANAGER shall communicate these minimum safe distances to all CONTRACTOR DEPARTMENTS operating in the Work area.

CONTRACTOR is authorised to offset any of the energy source on line locations assigned by the CLIENT where energy locations would be nearer to objects that are shorter than the accepted minimum safe distance.

Where requested and near to buildings and residential areas (villages, settlement, houses, etc.) the peak particle velocity (PPV) measurements shall be used during recording to check the soil particle motion against the critical limits. CONTRACTOR shall supply sufficient instruments, personnel and equipment to allow such recording to take place as required. CLIENT may request additional PPV measurements. Records of all records taken, including location, timings and peak PPV recorded are to be maintained and submitted with the final report.

3.11 Vibrator Spacing and Drive Level

Vibrator spacing and move-up shall be specified by CLIENT in each area. In case of obstacles the vibrator array may be shortened and/or rotated with the approval of the CLIENT.

Vibrator drive levels are to be maintained at agreed levels, without exceeding the quality control limits. These quality control limits may be modified by CLIENT which shall be confirmed in writing. Standard applied force level shall be 70 to 80% of peak force, and the low force shall be 50% of peak force.

3.12 Vibrator Monitoring System

Vibrator performance shall be monitored continuously by an automatic system. The printout and electronic files of automatic system shall be part of the seismic data. Permanent fundamental force control (phase and amplitude) feedback is considered as a minimum requirement for vibrator operations.

Histograms and/or graphs of the vibrator status information shall be produced daily to provide a good overview of the individual vibrator performance. These are to include information on the value for phase (average and peak); ground force (average and peak); and distortion (average and peak). Copies of this information shall be submitted daily to the CLIENT.

CONTRACTOR shall propose system(s) which provide real-time positioning for each vibrator on the Survey Datum. CONTRACTOR shall obtain appropriate permit(s), security clearance(s), and equipment if real-time GNSS or RTK positioning for each vibrator is to be used. CONTRACTOR shall advise the CLIENT of any complication(s) in achieving this requirement as part of the tender.

3.13 Vibrator QC Limits

The phase difference between a pilot sweep generated at the recorder and a vibrator control sweep shall not exceed plus or minus ten (± 10) degrees at any time during the sweep, and the average difference shall not exceed two (2) degrees.

Start time delays shall be less than plus or minus one hundred (± 100) microseconds of the reference. The peak force measured shall be within 10% of the nominal value set for the vibrators. The force envelope shall be such that there is less than 3 dB of variation over the sweep (ignoring the start and end tapers)

For any vibrator the ratio of the peak to side lobes on the auto-correlation of the data should not exceed 45 dB down. Or expressed in another way, a vibrator should not show correlation wavelet ghost harmonics greater than 45 dB down from the peak wavelet amplitude.

Maximum peak distortion of each sweep shall be less than 50%, and average distortion less than 25%.

The vibrators shall conform to the SEG convention of polarity which states the weighted sum of the base plate and mass accelerometer signals shall be in phase with pilot sweep recorded on tape.

3.14 Traffic Control

CONTRACTOR shall make sure that vibrator vehicles are able to run and operate in Austrian territory.

CONTRACTOR shall provide a system of full traffic control for operations on roads, lanes and tracks. Such a system shall be subject to and in compliance with national legislation and the requirements of local authorities, but shall as a minimum include as follows:

- Road signs warning of road restrictions ahead
- A "stop/go" system of traffic control to restrict traffic past the vibrators when on the road, lane or track. One person to be positioned at each end of the line of vibrators. Both persons to be in radio contact with the vibrators and each other.
- All personnel working on or within 10 metres of all roads, lanes and tracks shall wear appropriate personal protective equipment (PPE) which shall as a minimum consist of a clean, reflective body vest and steel toe capped work boots at all times.

The CLIENT will prepare all necessary traffic control arrangements in advance and assist with official matters relating to traffic control. The governmentally notification for the traffic control shall be issued to the CONTRACTOR.

Geothermie Braunau

Tender: Compensation Table

Client: Geo5 GmbH, Roseggerstrasse 17, 8700 Leoben, Austria

Projekt: Geothermie Braunau, Vibro

Location: Braunau am Inn, Austria

Date of Project: Acquisition: 03/2024

Date of Tender: November, 20th 2023

Questions till: December, 4th 2023

Submission deadline: December, 12th 2023

Bidder meetings: December 18th 2023 – January 12th 2024

Date of Award: January, 16th, 2024

Compensation for Geothermie Braunau, Braunau am Inn, Austria

Company details:

Name of Company:

Adress:

Company register number:

Project Manager:

The offer must be delivered per Email not later than December, 4th, 11:59 a. m. to office@geo-5.at as PDF. In addition, it is possible to send a written offer by mail to: Geo5 GmbH, Roseggerstraße 17, 8700 Leoben, Austria.

The undersigned hereby confirms that all conditions for the execution of the project as stated in the tender of Geo5 GmbH are met. It is confirmed that all legal regulations in Austria (social security and tax) for the execution of the necessary work are complied with. There is a work permit for Austria for all employees in this project.

The offer is valid until 16 February 2024.

Authorized to sign: Name and Function; Date

It is possible that questions about the execution of this project to prepare the offer in writing to office@geo-5.at until November 27, 11:59 a.m..

It is planned that an award meeting (also possible online) will be held no later than 15 January, 2024.

Service for 2 vibrators	Variant 1 4 x Vertical stacks	Variant 2 6 x Vertical stacks	Variante 3 8 x Vertical stacks	Alternativ Variant	Descripiton
Mobilisation/ Demobilisation					Lump-Sum €
Parameter tests					Lump-Sum €
Vibration measurements					Price for 1 unit (Vibratorpoint) (€); [expected 600 to 800 units]
STAND-BY					
Total Crew					Rate (€) per Hour (max. 8 hours per day)

Authorized to sign: Name and Function; Date

Terms of payment: The work performed can be invoiced after the data and the final report have been handed over.

Payment is due 30 days after receipt of an auditable invoice. The invoice is to be sent to Geo5 GmbH via email office@geo-5.at.

The following documents must be supplied:

- This document, signed twice;
- Description of the alternative offer, if applicable;
- Description and data sheets of the offered vibrators and control unit(s);
- Reference list of at least 3 similar projects with the offered equipment within the last 6 years.