

## Geophysical Service Providers in Support of Law Enforcement

This questionnaire seeks to gather information from geophysics professionals on law enforcement use of near surface geophysical methods (such as ground penetrating radar, electrical resistivity, magnetometry) to detect concealed targets as part of a criminal investigation (for example: homicide graves, drugs, or weapons). This questionnaire will ask about: your engagement with law enforcement, geophysical methods employed, suspected targets, environments of the geophysical surveys along with the summaries of 1 to 3 geophysical surveys you have conducted for law enforcement. The results of this questionnaire may be used to understand how geophysical methods are applied to law enforcement investigations. *If you have not applied geophysical methods to aid law enforcement missions, there is no need to complete this questionnaire.* **The survey should take about 10-15 min to complete.**

If results from this questionnaire are published in scientific research and/or law enforcement publications, identities, organization(s), and contact information will be **anonymized**. In addition, U.S. domestic participants may voluntarily provide contact information for potential inclusion on a preliminary list of regional geophysical providers for law enforcement. Providing contact information is **optional**.

Within this questionnaire, geophysical methods are grouped into the specific categories, in bold below, that would be more familiar for law enforcement personnel. For example, ground penetrating radar (GPR) is a recognizable geophysical method for law enforcement applications and has theories and principles in electromagnetics but will not be classified under electromagnetics method. Any electrical resistivity, spontaneous (self) potential and induced polarization methods will be classified under electrical methods category.

Below are a few examples of geophysical methods **but are not limited to** the following:

- **Ground Penetrating Radar (GPR)**
  - Low-to-High frequency (10 MHz to (+) 2000 MHz) GPR antenna systems, Multichannel GPR
- **Electrical Methods**
  - Electrical Resistivity (ER), Electrical Resistivity Tomography (ERT), Capacitively-Coupled Resistivity (CCR)
  - Including Induced Polarization (IP) & Spontaneous (Self) Potential (SP) Methods
- **Electromagnetics**
  - Electromagnetic (EM) Induction (e.g., EM38, metal detectors), Ground Conductivity Meter
- **Magnetometry**
  - Proton procession magnetometers, fluxgate magnetic gradiometers
- **Gravimetry (Gravity)**
  - Including Microgravity
  - Gravimeter and/or gravity gradiometer
- **Near Surface Seismic**
  - Seismic refraction and reflection surveys, surface waves (M.A.S.W.)
  - Surface and subsurface (borehole) seismometers

### **Consent**

- (i) By completing this questionnaire, you agree to allow FBI Laboratory Division to collect and use your responses. **\*Required\***  **I consent & continue**
- (ii) May we contact you for follow-up questions about this questionnaire and/or your geophysical survey(s)? **(Optional)**  **Yes**  **No**

(If yes)

**Name:** \_\_\_\_\_

**Preferred title:** \_\_\_\_\_

**Organization/Company/Affiliation:** \_\_\_\_\_

**Phone number:** \_\_\_\_\_

**Email address:** \_\_\_\_\_

Do you wish to receive a notification of the results of this questionnaire after publication, check this box and provide the information above.

Geophysical Service Providers in Support of Law Enforcement

**Demographics**

- (1) What is your professional and/or academic title? (For example, Professional Geophysicist, State Soil Scientist, Associate Professor of Geophysics, .... etc.): \_\_\_\_\_
- 2) What is the highest academic degree you have obtained?
- High school diploma/ General Educational Development Certification (GED)
  - Trade school
  - Associates degree
  - Bachelor's degree
  - Master's degree
  - Doctorate (Ph.D.)
  - Other: \_\_\_\_\_
- 3) List the subjects/concentrations of all of your degrees (i.e., geology, geophysics, archaeology)? : \_\_\_\_\_
- 4) What best describes your professional organization/affiliation? (Check all that apply)
- University/College research position/professor/faculty
  - State Government
  - Federal Government
  - Private Company
  - FFRDC/National Laboratory
  - Independent contractor
  - Geophysical Instrument Manufacturer
  - Other: \_\_\_\_\_
- 5) What best describes your academic or professional field? **\*Required** (Check all that apply)
- |  |   |
|--|---|
| <input type="checkbox"/> Geology               | <input type="checkbox"/> Forensic Science               |
| <input type="checkbox"/> Geophysics            | <input type="checkbox"/> Civil Engineering              |
| <input type="checkbox"/> Archaeology           | <input type="checkbox"/> Electrical Engineering         |
| <input type="checkbox"/> Anthropology          | <input type="checkbox"/> Utility detection/Construction |
| <input type="checkbox"/> Environmental Science | <input type="checkbox"/> Other: _____                   |
| <input type="checkbox"/> Soil Science          |   |
- 6) How many times have you conducted geophysical surveys with the following geophysical methods **regardless of if it was for law enforcement investigations**? Provide an estimated number. Leave blank if not applicable:
- Ground Penetrating Radar: \_\_\_\_\_
  - Electrical Methods: \_\_\_\_\_
  - Electromagnetics: \_\_\_\_\_
  - Magnetometry: \_\_\_\_\_
  - Gravimetry: \_\_\_\_\_
  - Near Surface (NS) Seismic: \_\_\_\_\_
  - Other: \_\_\_\_\_ Number of times applied: \_\_\_\_\_

Geophysical Service Providers in Support of Law Enforcement

**Law Enforcement Engagement Questions**

7) Briefly describe how were you contacted to apply your geophysical services for law enforcement investigations?  
*For example, established collaboration with law enforcement over the past decades, law enforcement reached out by cold calling our group or university, we created an advertisement offering services directly for law enforcement... etc.*

8) Which law enforcement organizations did you conduct a geophysical survey for? Select all that apply.

- Federal Law enforcement
- State Law enforcement
- Tribal Law Enforcement
- County Law enforcement
- Municipal
- Foreign (outside of the USA)
- Other

9) Provide the name(s) of the law enforcement agency and points of contact below: **\*Optional\***

POINT OF CONTACT-NAME	LAW ENFORCEMENT AGENCY	PHONE NUMBER(S)	EMAIL ADDRESS(ES)

10) What percent of geophysical surveys in support of law enforcement were paid for in part (or full) by law enforcement (including implementation, acquisition, analysis, and/or interpretation)? \_\_\_\_\_

11) What percent of geophysical surveys conducted in support of law enforcement required you to sign a Non-Disclosure Agreement (NDA)? \_\_\_\_\_

**Geophysical Survey(s) conducted in support of Law Enforcement**

12) Briefly provide information on the geophysical methods conducted for law enforcement, include how many times you have applied each method, the suspected targets for law enforcement and other supplemental information if known. Leave blank, write 0 if not applicable. **\*Required**

*Example: As a geophysical service provider, I deployed a ground penetrating radar (**method**) three times (**times deployed**) at different locations within a forest, a building, a lake (**environment**) in attempts to locate clandestine grave, hidden weapons (**targets**) concealed by forest soil, concrete, water (**concealment material**).*

*Additional information can include: deployment method (ground based, marine based, airborne), details on specific geophysical equipment, .... Etc.*

**Ground Penetrating Radar:** Total number of times applied\*: \_\_\_\_\_

Instrument Manufacturers/models: \_\_\_\_\_

Processing/Modeling Software: \_\_\_\_\_

Suspected targets: \_\_\_\_\_

Survey Environments: \_\_\_\_\_

Concealment Material: \_\_\_\_\_

Additional information: \_\_\_\_\_

**Electrical Methods:** Total number of times applied\* \_\_\_\_\_

Geophysical Service Providers in Support of Law Enforcement

Instrument Manufacturers/models: \_\_\_\_\_

Processing/Modeling Software: \_\_\_\_\_

Suspected targets: \_\_\_\_\_

Survey Environments: \_\_\_\_\_

Concealment Material: \_\_\_\_\_

Additional information: \_\_\_\_\_

**Electromagnetics:** Total number of times applied\* \_\_\_\_\_

Instrument Manufacturers/models: \_\_\_\_\_

Processing/Modeling Software: \_\_\_\_\_

Suspected targets: \_\_\_\_\_

Survey Environments: \_\_\_\_\_

Concealment Material: \_\_\_\_\_

Additional information: \_\_\_\_\_

**Magnetometry:** Total number of times applied\* \_\_\_\_\_

Instrument Manufacturers/models: \_\_\_\_\_

Processing/Modeling Software: \_\_\_\_\_

Suspected targets: \_\_\_\_\_

Survey Environments: \_\_\_\_\_

Concealment Material: \_\_\_\_\_

Additional information: \_\_\_\_\_

**Gravimetry:** Total number of times applied\* \_\_\_\_\_

Instrument Manufacturers/models: \_\_\_\_\_

Processing/Modeling Software: \_\_\_\_\_

Suspected targets: \_\_\_\_\_

Survey Environments: \_\_\_\_\_

Concealment Materials: \_\_\_\_\_

Additional information: \_\_\_\_\_

**Near Surface (NS) Seismic:** Total number of times applied\* \_\_\_\_\_

Instrument Manufacturers/models: \_\_\_\_\_

Processing/Modeling Software: \_\_\_\_\_

Suspected targets: \_\_\_\_\_

Survey Environments: \_\_\_\_\_

Concealment Materials: \_\_\_\_\_

Additional information: \_\_\_\_\_

**Other:** \_\_\_\_\_ Total number of times applied\* \_\_\_\_\_

Instrument Manufacturers/models: \_\_\_\_\_

Processing/Modeling Software: \_\_\_\_\_

Suspected targets: \_\_\_\_\_

Survey Environments: \_\_\_\_\_

Concealment Materials: \_\_\_\_\_

Additional information: \_\_\_\_\_

- 13) If you have employed more than one geophysical method at the same law enforcement search, please list the one geophysical method that were used in conjunction? [For example: a 250 MHz & 500MHz frequency antenna GPR and Electrical Resistivity Tomography (ERT), Magnetometer and ERT]: \_\_\_\_\_

**Post Geophysical Survey**

14) After a geophysical method was conducted to find a suspected target for law enforcement, how many times did the following outcomes occur at a geophysical survey area? Leave blank if not applicable.

**After excavation**, targets were successfully **found** within areas of interest detected by the geophysical methods: \_\_\_\_\_

**After excavation**, targets were **not found** even if geophysical methods were effectively conducted, and areas of interest identified: \_\_\_\_\_

**After excavation**, targets were **not found** even if geophysical methods were effectively conducted, and **did not** identify areas of interest: \_\_\_\_\_

**After excavation**, targets were **found** even if geophysical methods were effectively conducted and **did not** identify areas of interest: \_\_\_\_\_

**No excavation** conducted due to geophysical methods results: \_\_\_\_\_

**No law enforcement follow-up or unknown results:** \_\_\_\_\_

**Other:** \_\_\_\_\_

15) When law enforcement geophysical surveys failed to detect a target, select the presumed reasons why the suspected target was not detected? Select all that apply.

- Target was not there
- Insufficient resolution for target detection
- Insufficient penetration for target detection
- Target composition similar to concealment material composition (ex. Soil type)
- Inadequate acquisition geometry (line and/or array spacing, line orientation)
- Incorrect instrument settings (frequency, step size, etc.)
- Inappropriate geophysical equipment deployed for concealment composition (ex. Soil type, salt water)
- Surface interference (debris or surface vegetation)
- Subsurface interference (roots, rebar, pipes, debris)
- Weather conditions (prior to survey)
- Weather conditions (during survey)
- User failure or error
- Equipment failure
- Other

16) Provide detail summary on 1 to 3 geophysical surveys conducted for law enforcement organizations. **At least one (1) summary of a geophysical survey is required for submission.** Several examples on how to answer specific questions seen below:

- i. **Suspected Targets:** Clandestine graves/human remains, firearms, vehicles, building structures (ex. foundations) ....
- ii. **Survey Site Environment:** Forests, rocky mountainous terrains, desert, lake, residential backyard, commercial building basement..
- iii. **Material in which the suspected target was presumed to be concealed:** Concrete, dry wall, topsoil-organic rich soil, tall grass, snow, fresh/salt water, volcanic soil..
- iv. **Rationale for ineffectiveness of geophysical method(s):** Target was not there, insufficient resolution for target detection, insufficient penetration for target detection, surface/subsurface interference...

If you wish to provide information on more than 3 geophysical surveys, contact [geophysics@fbi.gov](mailto:geophysics@fbi.gov).

Geophysical Service Providers in Support of Law Enforcement

(1) Geophysical Survey 1: \*Required\*

**Prior to Geophysical Survey:**

1. Did warrants limit the time allowed for a geophysical survey?  Yes  No If yes, what was the allotted time: \_\_\_\_\_
2. Did warrants limit the area or perimeter of search for the geophysical survey?  Yes  No
3. Were you attempting to locate a suspected target or searching to *exclude* a suspected target from a survey area?  Locate  Exclude
  1. Suspected Target(s): \_\_\_\_\_
4. At the time of the geophysical survey, how long was the suspected target estimated to be concealed? (Ex. homicide weapon buried in residential backyard approximately 5 years prior to survey): \_\_\_\_\_

**During the Geophysical Survey:**

5. What year was this geophysical survey completed? \_\_\_\_\_
6. Environment of Survey Site:
  1. Best describe the search environments where the geophysical method was deployed: \_\_\_\_\_
  2. Material(s) in which the target was presumed to be concealed: \_\_\_\_\_
7. How long was the geophysical survey conducted? Include units \_\_\_\_\_
  1. Method (1): \_\_\_\_\_ deployed  on the ground,  from the air,  in/on water
  2. Did you deploy more than one geophysical method? If so, list the method (2): \_\_\_\_\_ deployed  on the ground,  from the air,  in/on water
  3. Additional information on geophysical equipment(s): \_\_\_\_\_

**Interpretation of Geophysical Survey**

8. Were there areas identified by the geophysical survey of interest to law enforcement?  Yes  No (if no, precede the excavation.)
  1. If yes, and if multiple geophysical methods were used, which geophysical method identified areas of interest within the survey area?  method 1  method 2 ...

**Excavation**

9. If the geophysical survey area was excavated, was the excavation conducted with the guidance from the geophysical survey results?  Yes  No  Area was not excavated  Unknown
10. Was the target found with assistance of the geophysical method(s)?  Yes  No
  1. Briefly describe the conditions of the discovered target(s). Include the depth (or thickness of material concealing target), concealment material composition, target's condition (well preserved, highly deteriorated) ... etc. : \_\_\_\_\_

**Results**

11. Did you provide a formal, written report of the survey results?  Yes  No
  1. And was the report later submitted into to the courts?  Yes  No
12. Overall effectiveness
  1. Was geophysical method 1 effective in attempting to detect the suspected target(s)?  Yes  No
  2. Was geophysical method 2 effective in attempting to detect the suspected target(s)?  Yes  No
13. Rationale for why each method was not effective in detecting target(s): \_\_\_\_\_

For additional information:

Geophysical Service Providers in Support of Law Enforcement

(2) Geophysical Survey 2:

**Prior to Geophysical Survey:**

1. Did warrants limit the time allowed for a geophysical survey?  Yes  No If yes, what was the allotted time: \_\_\_\_\_
2. Did warrants limit the area or perimeter of search for the geophysical survey?  Yes  No
3. Were you attempting to locate a suspected target or searching to *exclude* a suspected target from a survey area?  Locate  Exclude
  1. Suspected Target(s): \_\_\_\_\_
4. At the time of the geophysical survey, how long was the suspected target estimated to be concealed? (Ex. homicide weapon buried in residential backyard approximately 5 years prior to survey): \_\_\_\_\_

**During the Geophysical Survey:**

5. What year was this geophysical survey completed? \_\_\_\_\_
6. Environment of Survey Site:
  1. Best describe the search environments where the geophysical method was deployed: \_\_\_\_\_
  2. Material(s) in which the target was presumed to be concealed: \_\_\_\_\_
7. How long was the geophysical survey conducted? Include units \_\_\_\_\_
  1. Method (1): \_\_\_\_\_ deployed  on the ground,  from the air,  in/on water
  2. Did you deploy more than one geophysical method? If so, list the method (2): \_\_\_\_\_ deployed  on the ground,  from the air,  in/on water
  3. Additional information on geophysical equipment(s): \_\_\_\_\_

**Interpretation of Geophysical Survey**

8. Were there areas identified by the geophysical survey of interest to law enforcement?  Yes  No (if no, precede the excavation.)
  1. If yes, and if multiple geophysical methods were used, which geophysical method identified areas of interest within the survey area?  method 1  method 2 ....

**Excavation**

9. If the geophysical survey area was excavated, was the excavation conducted with the guidance from the geophysical survey results?  Yes  No  Area was not excavated  Unknown
10. Was the target found with assistance of the geophysical method(s)?  Yes  No
  1. Briefly describe the conditions of the discovered target(s). Include the depth (or thickness of material concealing target), concealment material composition, target's condition (well preserved, highly deteriorated) ... etc. : \_\_\_\_\_

**Results**

11. Did you provide a formal, written report of the survey results?  Yes  No
  1. And was the report later submitted into to the courts?  Yes  No
12. Overall effectiveness
  1. Was geophysical method 1 effective in attempting to detect the suspected target(s)?  Yes  No
  2. Was geophysical method 2 effective in attempting to detect the suspected target(s)?  Yes  No
13. Rationale for why each method was not effective in detecting target(s): \_\_\_\_\_

For additional information:

Geophysical Service Providers in Support of Law Enforcement

(3) Geophysical Survey 3:

**Prior to Geophysical Survey:**

1. Did warrants limit the time allowed for a geophysical survey?  Yes  No If yes, what was the allotted time: \_\_\_\_\_
2. Did warrants limit the area or perimeter of search for the geophysical survey?  Yes  No
3. Were you attempting to locate a suspected target or searching to *exclude* a suspected target from a survey area?  Locate  Exclude
  1. Suspected Target(s): \_\_\_\_\_
4. At the time of the geophysical survey, how long was the suspected target estimated to be concealed? (Ex. homicide weapon buried in residential backyard approximately 5 years prior to survey): \_\_\_\_\_

**During the Geophysical Survey:**

5. What year was this geophysical survey completed? \_\_\_\_\_
6. Environment of Survey Site:
  1. Best describe the search environments where the geophysical method was deployed: \_\_\_\_\_
  2. Material(s) in which the target was presumed to be concealed: \_\_\_\_\_
7. How long was the geophysical survey conducted? Include units \_\_\_\_\_
  1. Method (1): \_\_\_\_\_ deployed  on the ground,  from the air,  in/on water
  2. Did you deploy more than one geophysical method? If so, list the method (2): \_\_\_\_\_ deployed  on the ground,  from the air,  in/on water
  3. Additional information on geophysical equipment(s): \_\_\_\_\_

**Interpretation of Geophysical Survey**

8. Were there areas identified by the geophysical survey of interest to law enforcement?  Yes  No (if no, precede the excavation.)
  1. If yes, and if multiple geophysical methods were used, which geophysical method identified areas of interest within the survey area?  method 1  method 2 ....

**Excavation**

9. If the geophysical survey area was excavated, was the excavation conducted with the guidance from the geophysical survey results?  Yes  No  Area was not excavated  Unknown
10. Was the target found with assistance of the geophysical method(s)?  Yes  No
  1. Briefly describe the conditions of the discovered target(s). Include the depth (or thickness of material concealing target), concealment material composition, target's condition (well preserved, highly deteriorated) ... etc. : \_\_\_\_\_

**Results**

11. Did you provide a formal, written report of the survey results?  Yes  No
  1. And was the report later submitted into to the courts?  Yes  No
12. Overall effectiveness
  1. Was geophysical method 1 effective in attempting to detect the suspected target(s)?  Yes  No
  2. Was geophysical method 2 effective in attempting to detect the suspected target(s)?  Yes  No
13. Rationale for why each method was not effective in detecting target(s): \_\_\_\_\_

For additional information:



Geophysical Service Providers in Support of Law Enforcement

**Overview-Exit review:**

17) [Optional] (**For U.S. based persons only**) If there is sufficient response to this questionnaire, the questionnaire authors will compile a contact list of self-identified geophysical service providers capable of aiding law enforcement efforts within the United States. By providing this personal information, you will be giving consent to the FBI Laboratory to collect participants' contact information and affiliations.

*For your awareness, your contact information and affiliation will not be released to the public. This information will be held by FBI Laboratory Division personnel and potentially released to law enforcement agencies upon request for geophysical services. Being included in this list of geophysical service providers will **NOT** be an indication of FBI endorsement of you or your methodologies.*

Otherwise, please provide the following information below:

- A. Name: \_\_\_\_\_
- B. Preferred title: \_\_\_\_\_
- C. Organization/Company/Affiliation: \_\_\_\_\_
  - a. Academic qualifications \_\_\_\_\_
  - b. Professional qualifications \_\_\_\_\_
  - c. Professional affiliations \_\_\_\_\_
  - d. Years or experience in forensic geophysics \_\_\_\_\_
- D. Phone number: \_\_\_\_\_
- E. Email address: \_\_\_\_\_
- F. State: \_\_\_\_\_
- G. County: \_\_\_\_\_
- H. City: \_\_\_\_\_
- I. Travel range: \_\_\_\_\_
- J. Specific geophysical methods/specialties able to provide: \_\_\_\_\_
- K. Geophysical equipment readily available to deploy: \_\_\_\_\_
- L. Additional comments: \_\_\_\_\_

18) \*Optional\* Any additional comments or questions which you wish to expand upon in the questionnaire prior to submission?

If you have any questions regarding the questionnaire, please contact [geophysics@fbi.gov].