

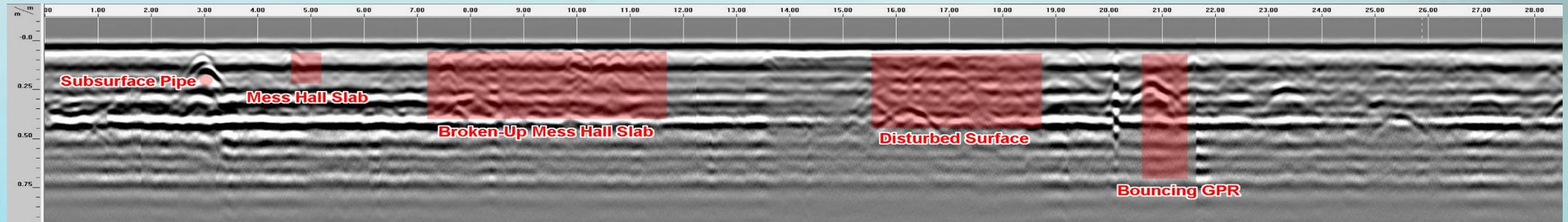
PUBLIC NOTICE: This is an archaeological investigation, known as GPR and Ground Truthing, being conducted at the request of the City of Bastrop to find the locations of unmarked burials. This work will be as non-invasive as possible using ground penetrating radar followed by shallow scraping to expose the tops of burial shafts only. No actual burials are intended to be exposed or damaged.

If you have any questions, please visit
www.cityofbastrop.org/page/city.cemetery
or call (512)332-8820 for additional information.



What is GPR?

GPR is Ground Penetrating Radar. AmaTerra will deploy an antenna connected to a data collector and survey cart. AmaTerra will collect GPR profiles and compile the profiles into time slices/plan views using RADAN GPR data processing software. Soils in the study area are prevalently sandy loams over clay loam; and GPR signatures of subsurface features such as unmarked interments are expected to show strongly in the soil column. The ability to conduct trial passes over known graves of similar antiquity within the cemetery may also substantially improve the resulting data. During the course of the study, if the GPR operator identifies subsurface profiles that are consistent with those of an unmarked grave, they will be identified with a pin flag(s). AmaTerra assumes that the GPR survey will require approximately two to three days to complete.



(Above is a profile from work at Mother Neff State Park near Waco. This shows what the GPR profile looks like on the screen and after it's outputted onto a computer.)

The GPR equipment, shown at right, consists of two main parts: the orange box is the antenna. At one end of the box is the radar emitter and at the other end is the receiver. The antenna sends radar pulses into the ground that bounce off whatever is below and those pulses come back to the receiver. The time it takes a pulse to come back and the strength of that returning pulse are interpreted with the data collector (the gray tablet-looking thing with the blue sun shade). The data collector is a mini-computer that sets up the various equipment settings, controls the antenna, and collects the data. There's a display on the screen that shows the soil profile in real time as you push the cart along.

The cart is pretty common to use, although not required, and AmaTerra does plan to utilize it for our project. A GPS antenna on the equipment can obtain super-accurate location readings as well but was not used in the survey shown.



What is Ground Truthing?

Ground truthing is a process. In the field, AmaTerra will deploy a backhoe or Gradall with a minimum 3-foot wide, flat-bladed bucket to conduct a series of scrapes to identify evidence of unmarked burials.

All scraped areas will be mapped using a hand-held GPS device with sub-meter accuracy. The field team will further document each trench on a standardized form and through photographs, recording the location and depth of any features within. In the event that any scraped area extends deeper than 3 feet, it will be staked off and marked with yellow caution tape.

All scraped areas and trenches will be backfilled at the end of the project. As with the remote sensing survey, the location recorded soil stains or materials indicating graves will be marked with pin flags and ultimately mapped with a sub-meter accuracy GPS. Any human remains inadvertently exposed will be carefully documented and mapped but will not be excavated. Investigators will notify the City of Bastrop and the other consulting parties, and then completely re-cover remains.

A Gradall is shown to the right but it is more likely that a smooth-bucket, standard backhoe would be used. Whatever equipment is utilized, scraping will be done – not digging.



What are the Advantages & Disadvantages of Ground-Truthing & GPR?

GROUND-TRUTHING: SCRAPING/FORMAL EXCAVATION

- Advantages: Almost fool-proof and, if properly done, will provide a definitive answer. Can be performed in any soil type, rocks are not a problem. If other methods will require ground-truthing, scraping first will be a cost savings.
- Disadvantages: Invasive, so families may object. Expensive; it requires an archeologist and machinery. There is always a chance that a very ephemeral burial will be missed and destroyed by machinery, although this is highly unlikely.

GROUND-PENETRATING RADAR (GPR)

- Advantages: GPR is non-invasive, so families typically do not object. Under ideal conditions, it can provide a highly-detailed image of the subsurface. GPR is probably the best form of remote sensing if the clay content of the soil is low and the surface conditions are favorable.
- Disadvantages: GPR's effectiveness depends greatly on soil conditions; it does not work well in clay-rich, rocky, or saturated soils. Success also depends on surface conditions and vegetation. GPR often requires some form of ground-truthing.

Selected contractor AmaTerra is listed on the Council of Texas Archaeologists Contractors List at <http://counciloftexasarcheologists.org/wordpress/wp-content/uploads/Contractors-List-October-2017.pdf>. AmaTerra is a small, minority-owned, and Historically Underutilized Business (HUB) and Disadvantaged Business Enterprise (DBE).

What Were the Alternate Methods Not Chosen?

There are advantages and disadvantages to each method. It is important to remember that no method is foolproof in finding unmarked graves. Some of the other methods are:

- **Rod Probing**
 - Disadvantages: Invasive and some families may object. Not typically useful for burials in wooden coffins that have likely deteriorated over the years. Rocks and other solid objects can give false readings.
- **Soil Coring**
 - Disadvantages: Invasive and some families may object. Requires an archaeologist or soils scientist. Difficult or impossible in rocky soil. Soil differences can be so subtle so that it cannot be determined if a grave exists. May require ground-truthing or scraping.
- **Resistivity**
 - Based on principles of soil moisture retention and electricity conduction. Ineffective if upper level of soil is disturbed and very wet/dry conditions. Can be expensive. Difficult in rocky soil. May require ground-truthing or scraping.
- **Conductivity**
 - Ineffective if the upper level of soil is disturbed over a large area. It is ineffective in the presence of ferrous metal, so the survey area has to be very clean and checked with metal detectors. It can be less effective if the soil is saturated, very dry, or rocky. It is affected by nearby power lines. May require ground-truthing.
- **Magnetometry**
 - Ineffective if the upper level of soil is disturbed over a large area. Soils need to have significant iron oxide content. Ineffective in the presence of ferrous metal (iron, steel, etc.), so the survey area has to be very clean and checked with metal detectors. Magnetometry can be expensive. May require ground-truthing.
- **Dowsing/Witching**
 - Most agree that dowsing is no better at finding graves than common-sense intuition. Dowsing could put the organization at legal and financial risk and could lead to public embarrassment.

What is the Project Area?

The current project area is approximately +/-1 acre in size, bounded by:

- Cedar Street (north)
- Bluebonnet Lane (south)
- Larkspur/Sage (east)
- Highway 95 (west).

