

## NJCU Field Geophysics GPR Exercise – Find the buried swimming pool *Fall 2008*

### Expected Student Outcomes:

- Learn how to lay out a survey grid with tapes and stakes
- Use GPS to locate survey points at line intersections (optional)
- Become familiar with ground penetrating radar (GPR) data collection techniques
- Interpret GPR data and locate a buried object (swimming pool)

### Scenario

One of your classmates (Nicole) lives out in the suburbs. Neighbors report that there used to be an in-ground swimming pool in the back yard, but all you see now is a lush green lawn, with no hint of any pool or pool equipment anywhere on the surface. Nicole might be interested in digging out the pool for use by her children as they become older. Even though you suspect Nicole has a screw loose, you decide to humor her. Therefore, you have brought your Field Geophysics class and your GSSI SIR-20 radar unit out to her home to survey her back yard.

### Procedure:

**Step 1:** Set up an evenly-spaced survey grid with marker tapes. If you have a GPS unit, you can GPS in each of the crossing points and name each point; this will enable you ultimately to make a map in “real space”. Grid size will probably be dictated by the size of the survey area. Here, we used a grid of marker tapes that crossed each other every 3 meters (10 feet):

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You will want to decide how best to name your line grid, but make sure that you name each line and that several students record your naming convention. To minimize potential confusion, *one or more students should draw a sketch map of the grid in their field notes and clearly indicate both grid line and radar line names and positions.* We named the E-W grid lines with alpha characters (Lines A,B,C,D,E), and the N-S lines with numeric characters (001,002,003,etc) as well as the radar line names that were assigned automatically by the GPR unit. The line names match the automatic GPR-designated names for the N-S lines, but then diverge. For example, Line A, the southern-most E-W line, was automatically named “line 008” by the radar unit, because we recorded it immediately after Line 007.

GPS points were taken at line intersections. These points were named with the combination of E-W and N-S line names. For example, the SW-most GPS point was labeled A1, representing the intersection of the southern-most X-coordinate axis (Line A ) and the western-most Y-coordinate axis (Line 001).

**Step 2:** Drag the radar transceiver as near to your marked lines as practicable. Place a “mark” on the radar line at every crossing line intersection, both to locate the line in space, and to properly position any anomalies observed on the line. Recording strategies differ from unit to unit, so the actual recording of the data will have to be tailored to your particular unit. (**NOTE:** *We use a GSSI SIR-20, for which we have straightforward operating instructions that can be made available.*)

**Step 3:** Once your data have been recorded, you will process it. As with data collection, data processing is very specific to the equipment you use. For the lines we collected and attached to this exercise, we used GSSI’s RADAN software. There are 7 E-W lines (001-007) and 5 N-S lines (A-E, named by the radar unit as 008-012). The white marks on each line represent the locations of crossing lines (radar and/or gridlines) every 10 feet (+/-). For example, Line E has a series of vertical white lines that represent the places at which other radar lines (Lines 1 through 7) cross it.

**Step 4:** Map the outline of the pool on the grid by determining its edges on each radar line relative to the white marks and transferring this information to the grid. Depth estimates in feet are on the vertical axis on the left side of each line. **NOTE:** Radar lines, like seismic lines, are subject to “sideswipe” because the radar signal is a spherical wavefront that captures information that is laterally adjacent to the line upon which it is portrayed. This can result in incorrect mapping, because an anomaly may appear - erroneously - to be directly below a surface line.

**Step 5:** Prepare a writeup of this exercise, including your objectives (find and map the location of a buried swimming), your procedure (especially if you do this in the field), and your findings to include with your grid map showing the outline of the buried object. In particular, comment upon possible sources of error (this may be difficult to do for those who don’t actually collect the field data).