

## **Introduction**

The use of Ground Penetrating Radar (GPR) has created many inroads into fields where non-invasive investigation of subsurface features and deposits is the goal. This is of particular importance to the fields of archaeology and cultural resource management, where traditional subsurface research (i.e., excavation) always results in the destruction of the archaeological deposit. While the application of GPR might not be a replacement for traditional excavation, at minimum it can focus the attention of excavators to limited locales within the overall dimension of the site, thereby keeping site disturbance to a minimum.

While the value of GPR in archaeological investigation could be substantial, its actual application may perhaps be more problematic. Special skills are required in both the operation and interpretation of results from any GPR study. In addition, a certain amount of ambiguity accompanies most GPR results due to the almost infinite range of sedimentary and archaeological deposits. The creation of the HAMMER GPR test-bed was targeted at both of these problem areas by first, providing training in the operation of GPR field equipment/procedures; second, to provide training in the interpretation of the results; and third, to provide a setting to facilitate research and development of hardware and software for GPR and other non-invasive subsurface technologies.

## **Methods**

In order to simulate authentic pre-historic and historic archaeological deposits, a bed 100' (north-south) by 30' (east-west) was excavated using a John Deere 644E bucket-loader. The bed was divided into ten units measuring 20' (north-south) by 15' (east-west), labeled A-J. The four northern units (A-D) were excavated to a depth of 12" below surface, the middle two units (E-F) to 24" below surface, and the four southern units (G-J) to 36" below surface. The excavated surfaces of these units were treated as the original paleo-surfaces, on which artifacts were deposited and caches/burials dug. Filling of the test bed itself would simulate the passage of time and the subsequent burial of the archaeological features.

## **Features/Items**

Features were recreated based on previous archaeological excavation, historical documentation, and passed down tribal knowledge. In addition to the features several items were placed within the test bed to widen the target field. Table 1 lists the location of both features and items by their unit location, size, and their approximate placement within the test bed using distances from the test bed walls. Figure A shows the placement of the features and items within the test bed.

# HAMMER GPR Test Bed

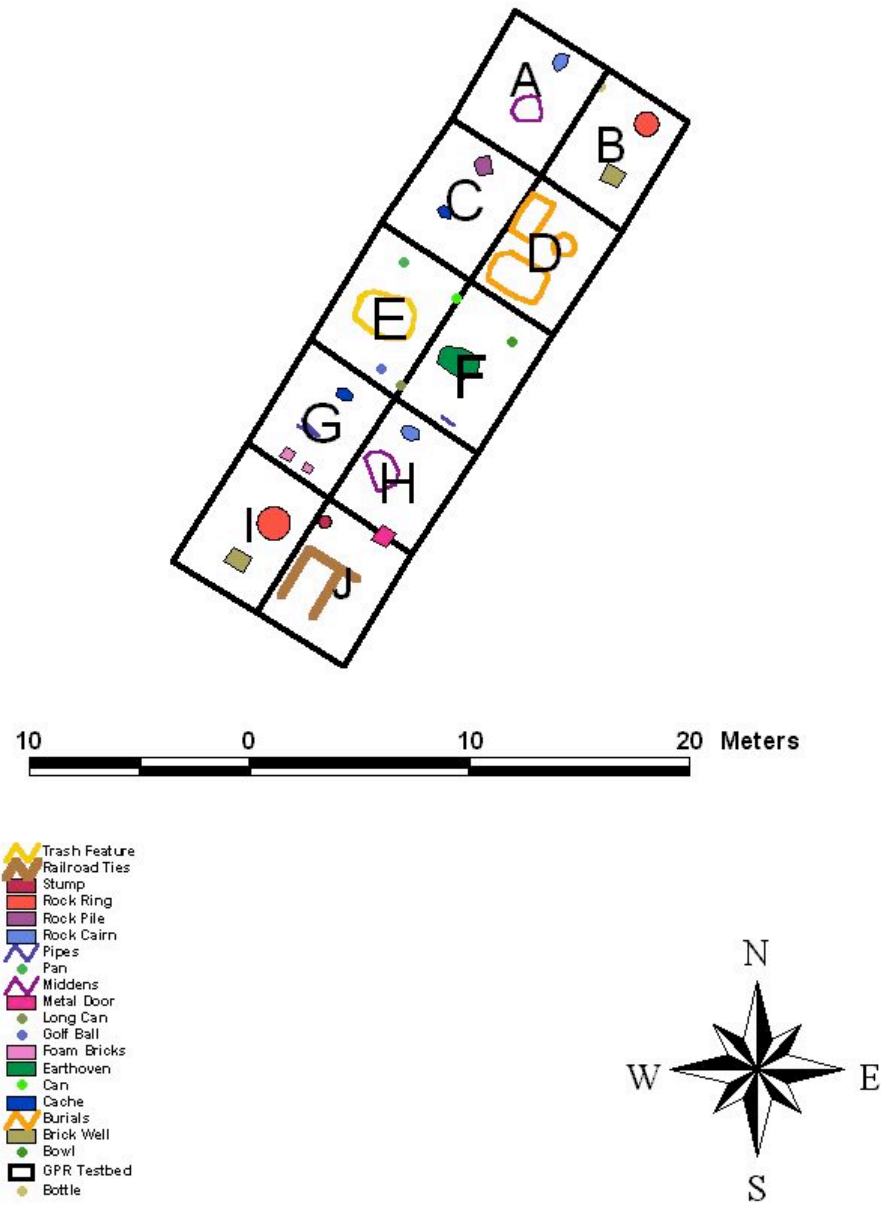


Figure A. HAMMER GPR Test Bed.

|               | <b>Features</b>   | <b>Items</b>  |
|---------------|---|---|
| <b>Unit A</b> | <p><b>Rock Cairn</b>-30" diameter x 5-7" thick. Located 2'6" from north wall, 4'6" from west wall.</p> <p><b>Midden</b>-4'0" diameter x 3" thick. Located 9'6" from north wall, 4'0" from west wall.</p> <p>Rock Cairn</p>  | <p><b>Bottle</b>-Located 13'10" from north wall, 13'0" from west wall.</p> <p><b>Small Rubber Ball</b>- Located 8'0" from north wall, 13'3" from west wall.</p>   |
| <b>Unit B</b> | <p><b>Rock Ring</b>-3'2" diameter x 3-5" thick. Located 2'2" from north wall, 2'10" from east wall.</p> <p><b>Brick Well</b>-2'5" square x 8" thick. Located 12'6" from north wall, 2'4" from east wall.</p>  |   |
| <b>Unit C</b> | <p><b>Rock Pile</b>-3'0" diameter x 5" thick. Located 21'0" from north wall, 3'0" from west wall.</p> <p><b>Biface Cache</b>-2'6" diameter x 9" deep (12" diameter at the bottom). Located 30'3" from north wall.</p>   |   |
| <b>Unit D</b> | <p><b>Three Burials</b></p> <p><b>#1</b>-Located 22'0" from north wall, 8'0" from east wall.</p> <p><b>#2</b>-Located 24'6" from north wall, 2'2" from east wall.</p> <p><b>#3</b>-8'0" (east-west) x 5'0" (north-south) x 2'0" deep. Located 32'0" from north wall, 3'4" from east wall.</p> |   |
| <b>Unit E</b> | <p><b>Historic Dump</b>-6'0" diameter x 18" thick (in center). Located 46'0" from north wall, 2'6" from west wall.</p>  | <p><b>Pan</b>-Located 42'0" from north wall, 2'0" from west wall.</p> <p><b>Horseshoe</b>-Located 58'6" from north wall, 3'0" from west wall.</p> <p><b>Golf Ball</b>-Located 57'6" from north wall, 6'10" from west wall.</p>  |
| <b>Unit F</b> | <p><b>Earth Oven</b>-4'2" (east-west) x 3'0" (north-south). Located 48'0" from north wall, 6'0" from east wall.</p>   | <p><b>Bowl</b>-Located 43'8" from north wall, 2'0" from west wall.</p> <p><b>Can</b>-Located 42'0" from north wall, 11'0" from west wall.</p> <p><b>Long Can</b>-Located 11'6" from west wall, 57'0" from north wall.</p> <p><b>Pipe</b>-Black PVC pipe filled with straw. 2'6" long x 4" diameter. Located 57'6" from north wall, 1'8" from east wall.</p> |
| <b>Unit G</b> | <p><b>Lithic Cache</b>-24" diameter x 7"</p>  | <p><b>Foam Bricks</b>-#1--8" x 3" x 4". Located</p>   |

|               |   |   |
|---------------|---|---|
|               | thick. Located 62'0" from north wall, 5'0" from the west wall.  | 75'3" from north wall, 8'0" from west wall. #2--8" cube. Located 75'4" from north wall, 4' from west wall.<br><b>Pipes</b> -35" length x 2" diameter. Located 70'6" from north wall, 4'0" from west wall. |
| <b>Unit H</b> | <b>Rock Cairn</b> -33" diameter x 5-8" thick. Located 61'6" from north wall, 5'2" from east wall.<br><b>Midden</b> -4'6" (east-west) x 4'0" (north-south), 3" thick. Located 67' from north wall.   |   |
| <b>Unit I</b> | <b>Well Casing</b> -4" diameter. Located 75'4" from north wall, 10'0" from west wall.<br><b>Rock Ring</b> -40" diameter, 5" thick. Located 83'0" from north wall, 5'0" from west wall.<br><b>Brick Well</b> -29" square, 8" thick. Located 91'0" from the north wall, 5'3" from the west wall.  |   |
| <b>Unit J</b> | <b>Railroad Ties</b> -Three wooden ties, each measuring 96" in length x 9" wide x 6" deep. See Figure A for layout. Located 85'6" from north wall, 2'6" from east wall.<br><b>Tree Stump</b> -16" diameter x 19" tall. Buried 12" deep. Located 80'0" from the north wall, 8'0" from east wall. | <b>Metal Door</b> -31" (east-west) x 34" (north-south). Located 76'0" from the north wall, 12" from the east wall.  |

Table 1. HAMMER GPR Test Bed Units and their respective features/items.

### Test Bed Sediments

Due to the fact the matrix that contains the archaeological deposit has a direct bearing on the GPR field procedures and subsequent results generated, a brief description of the two strata encountered in the HAMMER GPR Test Bed follows.

Strata 1: 0-19cm below surface (10YR \_ dry) Fine sand/silt, loose, friable; many fine roots, non-sticky, non-plastic, mildly effervescent; abrupt wavy boundary to...

Strata 2: 19cm below surface- below bottom of test bed (10YR 4/3 dry) Coarse sand, loose, very friable; common fine roots, non-sticky, non-plastic; mildly effervescent.

## **Conclusions**

The HAMMER GPR test bed was conceived as way of training individuals in the use of GPR and the interpretation of the data generated. Rather than training focused on unknown subsurface deposits, the test bed supplies instruction based on known deposits and features, created to simulate real historic and pre-historic materials. This method allows for examination of deposits and features from pre-burial, to the final GPR interpretation, without excavation. This is something GPR training focused on actual archaeological deposits could never achieve.