

**First Look Givat Sher GPR Study Results**

**Modi'in, Israel**

**Data Acquired 15 July, 29 July, 3 August, 2005**

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## **Background**

Givat Sher is a site located near modern Modi'in, Israel. Excavations at the site have been community oriented, bringing the children of Modi'in to the site as its prime excavators. Chief Archaeologists are Yuval Gadot and Yoav Farhee, who have stressed to the community that the worth of Givat Sher lies in the fact that it is the archaeology of their own town's history that is important. It is the archaeology that lies behind their back-door and connects them to the past.

The site includes agricultural areas and open spaces. As of yet, many walls have been found throughout the site, several cisterns, and the remains of a church lintel piece from the Byzantine period.

Ground Penetrating Radar (GPR) is a non-invasive sub-surface geophysical technique that among other applications, has been proven useful in Archaeology. The technology can work to make the archaeologist efficient in his or her planning by providing sub-surface information at a site pre-excavation to aid in efficient use of time and monetary resources.

On July 15, 29, and August 3, 2005, Jessie Pincus in collaboration with Mnemotrix Systems, Inc., began the long-range survey intended for the site. These results are the subject of this report. At the time of the writing of the report, the immediate need for quick post-processing and knowledge of where to dig for the August 15, 2005 excavation season influenced the type of figures created to help in pre-planning at the site. The GPR survey was exploratory in nature in order to gain as much sub-surface knowledge as possible before the season began. It is hoped that future research and surveying at the site will expand from this initial effort.

Equipment used was a GSSI SIR 2000 GPR system using a lower-resolution 200 MHz antenna in Area 1 and a high-resolution 400 MHz antenna in Areas 2 and 3. Standard field methods were used, acquiring data every meter in addition to standard post-processing methods. Datasets were linked and then studied in terms of visible reflections. Data modeling of this information in the form of useable figures was then completed, followed by the writing of this report.

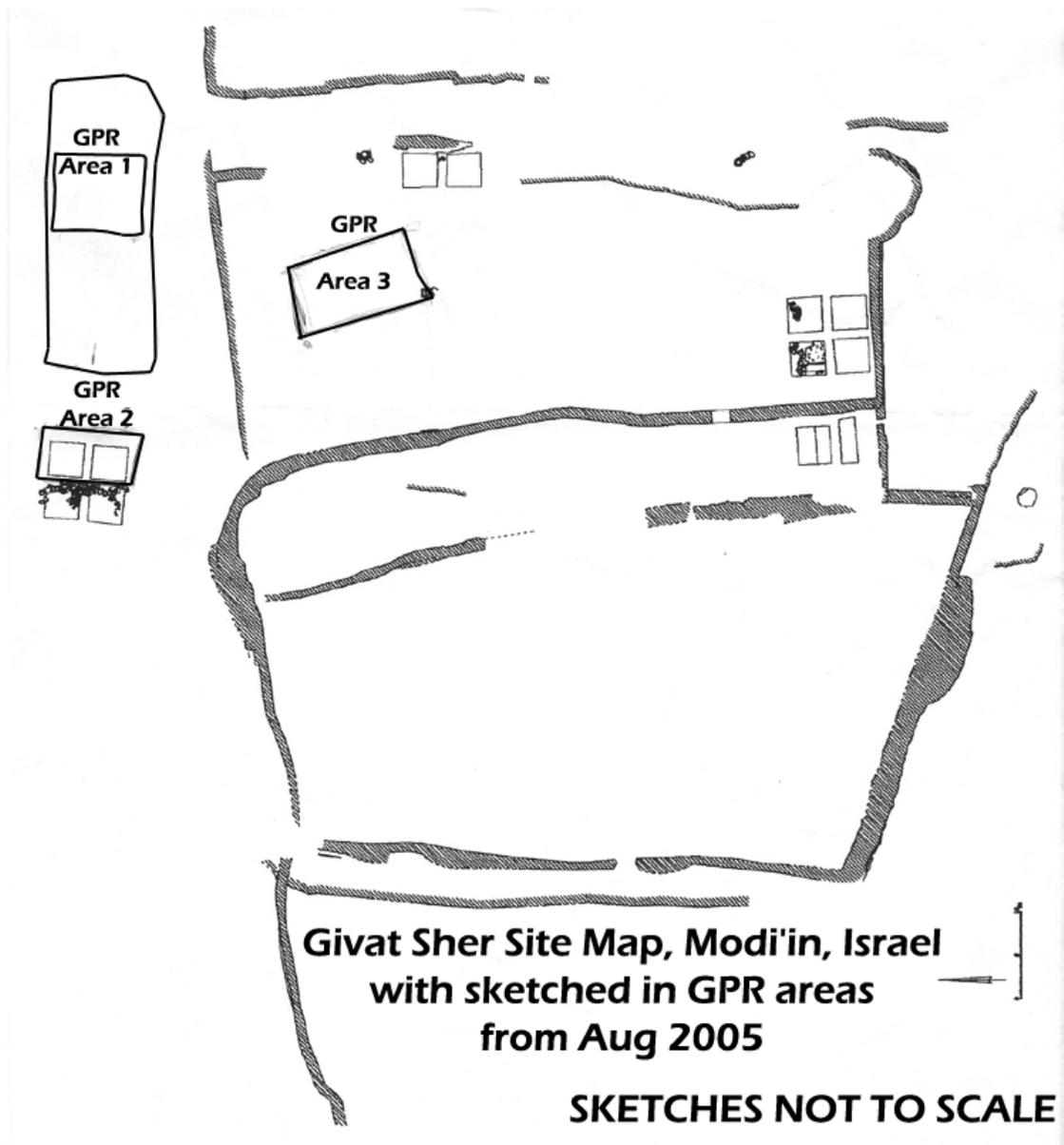


Figure 1: Archaeological map of Givat Sher with GPR Survey Areas labeled.

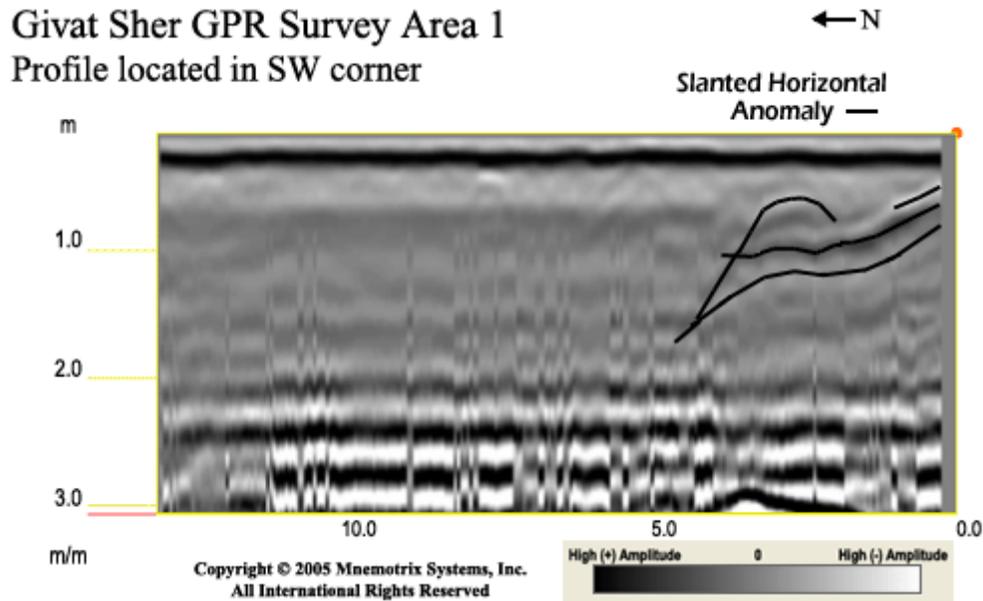


Figure 2: This side-view x-slice is part of GPR Area 1, located in the SW corner of the grid. A slanted horizontal anomaly has been traced (~35 – 45 degree angle), evidenced by the sloping lines and hyperbolic reflection. The anomaly extends about 4 meters N from the southern grid boundary and about 5.5 meters E of the western boundary. This anomaly can also be seen in Figure 3 below as an X.

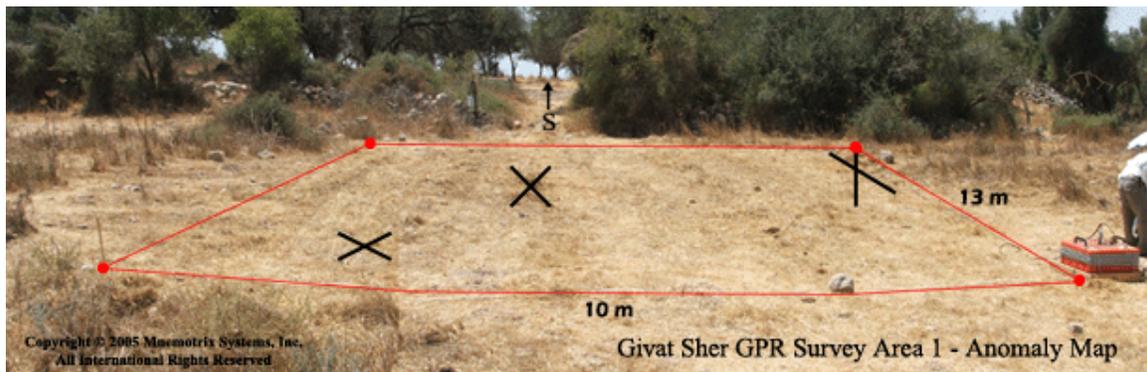


Figure 3: Anomaly map for GPR Survey Area 1. Three anomalies seen in the GPR data were studied and their locations have been marked by an X. The northernmost anomaly begins around 1.7 meter depth, becomes a large/round anomaly at 1.9 m, then stronger at 2.07 m. The feature is about 1 meter wide and stays consistently visible until 3 meter depth. The middle anomaly is similar in size and depth to the northernmost anomaly.

Givat Sher GPR Survey  
 Area 2  
 Depth = ~1.85

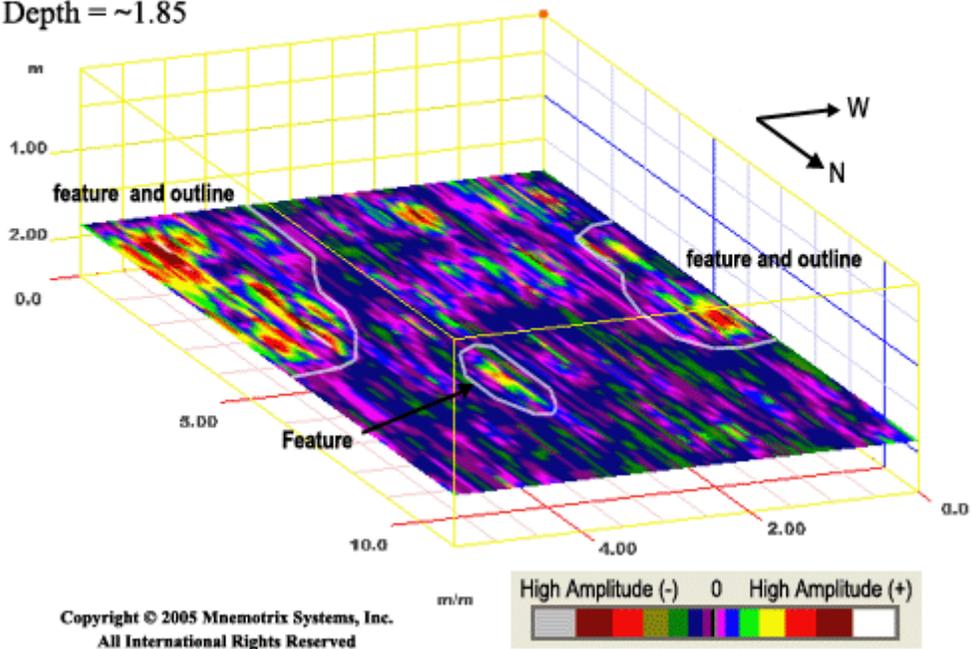


Figure 4: Three main anomalies were visible in the Area 2 GPR survey and are outlined above. The easternmost feature seems to be remnants seen in the sub-surface of the elevation change from excavated trench to ground level, and thus have not been marked in Figure 5 below.

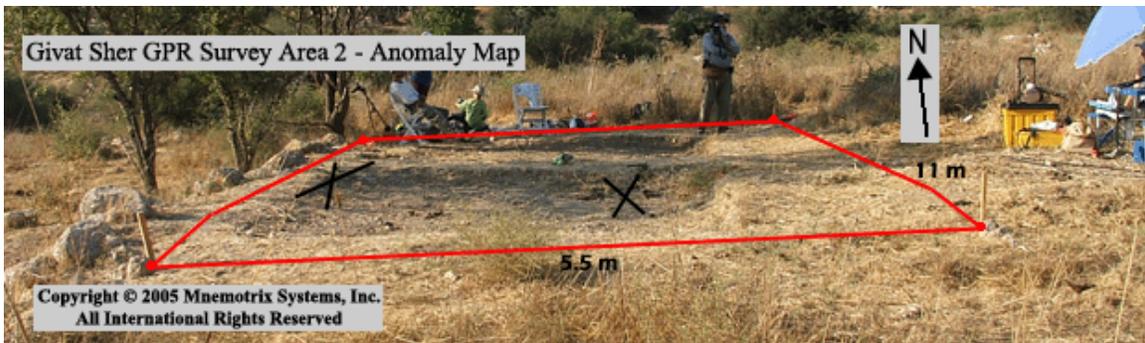


Figure 5: Anomaly map of GPR survey Area 3. As with Figure 3, anomalies have been mapped in this field picture to aid in location of anomalies. The westernmost anomaly is located closely to a remnant lintel, which is just over the terrace edge to the west.

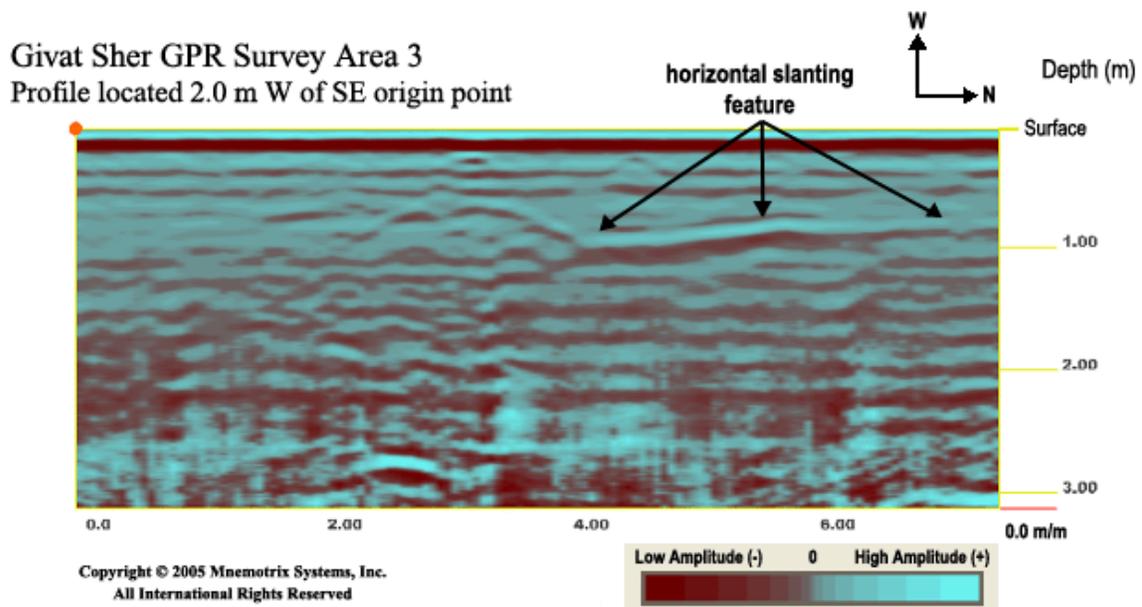


Figure 6: In this figure a horizontal slanting feature is clearly visible. It is seen here in profile view and from the top in Figure 7. This seems to be a most promising reflector due to its consistency and form. Ground-truth excavation of this feature will be particularly interesting to the authors.

Givat Sher GPR Survey  
 Area 3  
 Depth = ~0.9 m

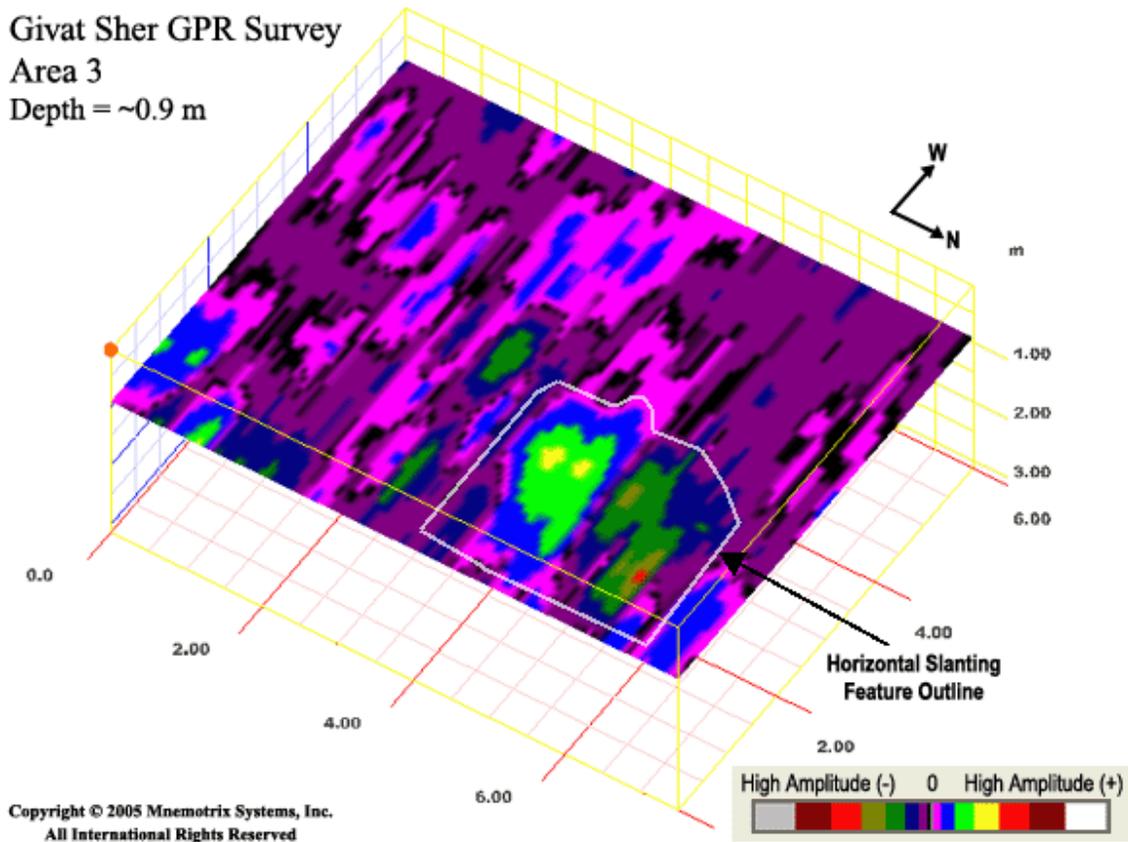


Figure 7: This is a top view of the same reflector from Figure 6 above. The anomaly seems to be quite wide, about 4 meters E/W and 3 meters N/S. In Figure 8, it can be seen that this is a place of depression. Past the southern end of the grid is a cistern, possibly built at a time when the soil height was shallower. It is possible that this anomaly is related to the mentioned cistern. Only ground-truth excavations can solve the true identity, located less than 1 meter below the surface.

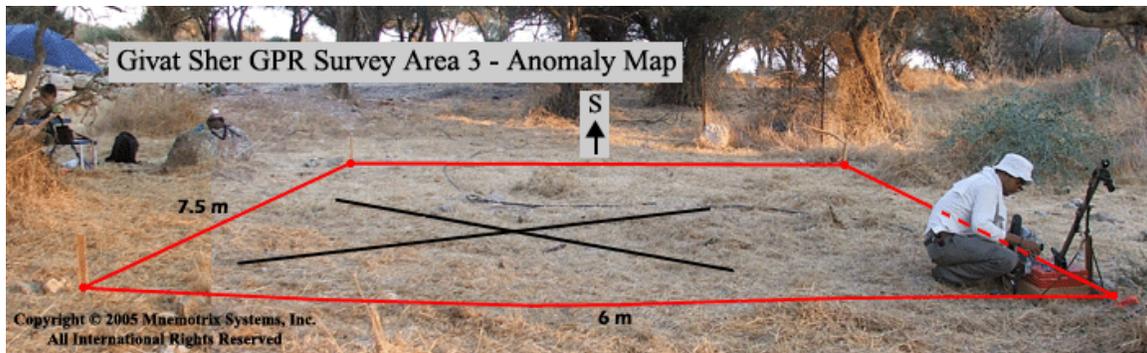


Figure 8: Anomaly map from GPR Survey Area 3. The anomaly discussed in Figure 7 is demarcated as a large X – marks-the-spot.

In the above figures we look for high amplitude reflections, as marked by different colors in respective color tables. When we encounter high amplitude reflections it is an indication that the GPR signal has just passed through a material that is significantly different than the previous one it was traveling through.

It is recommended that excavation begin in Area 3 to identify the flat horizontal reflection seen there. The anomaly seen in Figure 2 may be geologic in nature as the bedrock of the site. With time and more data acquisition a better understanding of the sub-surface features will be known, thus boosting efficiency at Givat Sher by directing the archaeologists and community members to a more full understanding of their home in history.

With the combination of more post-processing time in the lab, and results from ground-truth excavations, we will be able to more fully determine the usefulness of GPR in locating specific features in question. For the moment, this First Look report succeeds in directing excavations for the coming week of August 15, 2005. More comprehensive reports will be forthcoming as fieldwork and research increase at the site.