

Using Ground Penetrating Radar and Magnetic Gradiometry to Detect Archaeological Artifacts from the San Salvador Settlement in Colton, California, Buried During the Santa Ana River's Great Flood of 1862
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Background/Introduction:

In 1862, the Santa Ana River flooded the then largest settlement between New Mexico and Los Angeles, known as San Salvador. Adobe homes and the settlers' belongings were either washed away or buried. Historical archives demonstrate that a significant portion of San Salvador covered what is now a 200-acre, undeveloped lot known as Pellissier Ranch, in Colton, California. We use shallow subsurface geophysical techniques to detect any buried artifacts from this settlement.

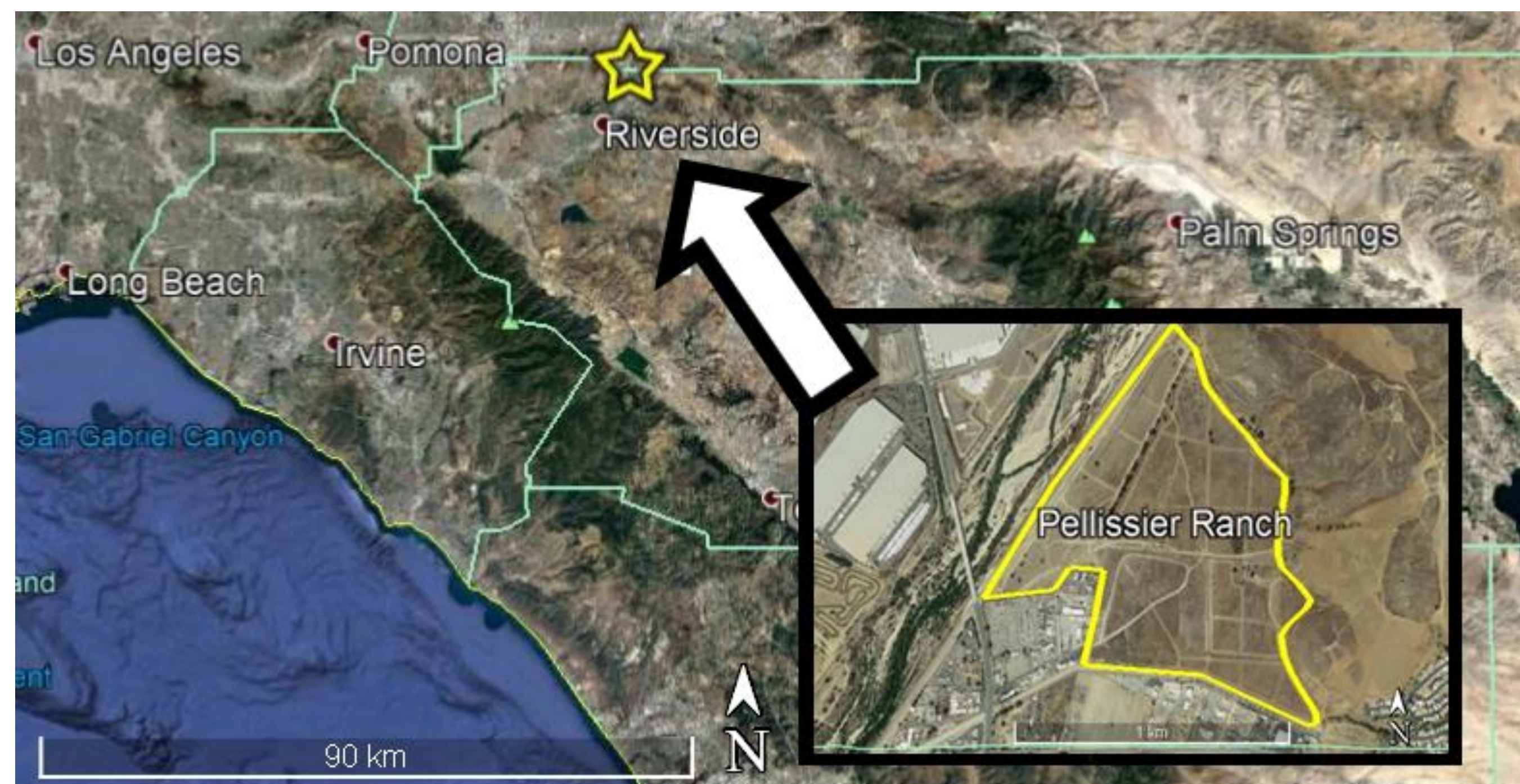


Figure 1: Map showing the location of Pellissier Ranch in the Southern California region. The site is alongside the southern border of San Bernardino County. The riverbed is clearly visible in the close-up inset image.

Pellissier Ranch is approximately 200-acres of flat terrain located on the border of Colton and Riverside, CA. The Spanish Town Heritage Foundation (STHF) inquired about the possibility of an archeological geophysics survey, in Pellissier Ranch, to image potential artifacts from the San Salvador settlement. No adobe structures were left standing after the flood that occurred in 1862. The land was full of rich soil but after the flood it was no longer soft and lacked nutrients to regrow crops for food. Eventually the settlers from San Salvador had to relocate to a different area in order to regrow their crops and build their homes. The question is what remains of the largest settlement between New Mexico and Los Angeles from the mid-1800's?



Figure 2: A model home representative of adobe homes in San Salvador. Note the large metallic objects and wooden furniture found in a settlers' living area.

The Great Flood of 1862 has left Pellissier Ranch a vacant lot. The City of Colton plans to build a warehouse development in this area. The president of the STHF, Nancy Melendez, as well as other members of the organization seek to stop the land from being developed by demonstrating its significance.



Figure 3 (left): Ground Penetrating Radar survey at the Pellissier Ranch site.



Figure 4 (right): Magnetic gradiometer survey at the Pellissier Ranch site.

Methods:

GPR has been shown to be an effective method to search for large wooden and metallic objects in similar conditions as those at our site. In search of San Salvador artifacts, we hope to find large objects such as farming equipment, metallic cookware, buried structures, or any other large objects left buried after the flooding event. GPR has been the primary equipment we have used in our search. We are equipped with a GSSI Utility Scan Pro with both a 400 MHz antenna and a 350 MHz HyperStacking antenna. We perform surveys over a marked area with parallel lines using 4 meters spacing. We expect to find remains of the settlement at around 1 to 4 meters depth.

Preliminary Results:

We have performed over 200 GPR survey lines across Pellissier Ranch. Many of these profiles show undisturbed horizontal layering. However, we have located several sites with clear anomalies.

Results from parallel GPR profiles measuring 30 meters each, extending from NW to SE, are shown in Figures 5-8. The antenna used in these surveys was a 350 MHz HyperStacking antenna. Highlighted large scale buried features are consistent across each profile spaced at 4 meters and may indicate buried channels or remnants of adobe structures. Figure 9 is a survey from the same area. Highlighted hyperbola indicate potential small-scale buried objects.



Figure 10: Map of the location of our last survey area. The green lines represent the lines shown in figures 5-8 with line 5 as the northmost green line. The blue line represents the survey line shown in figure 9. The yellow perimeter shows the edge of Pellissier Ranch.

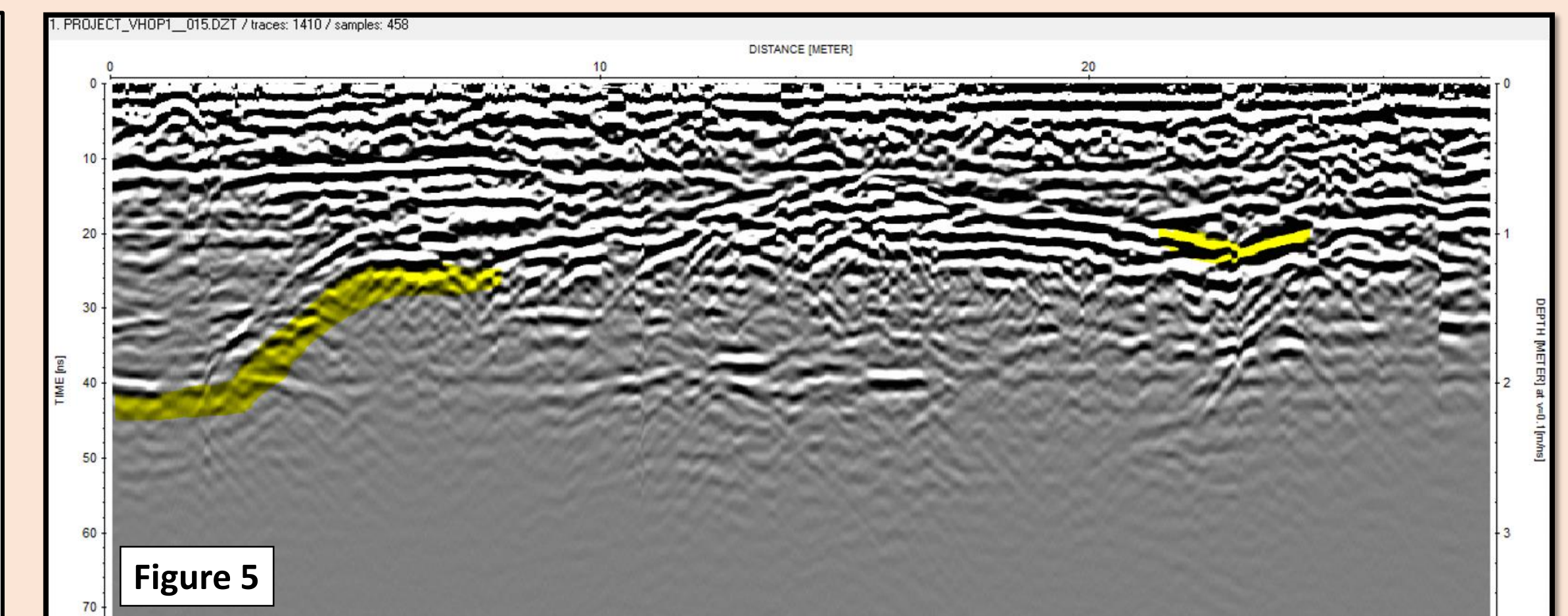


Figure 5

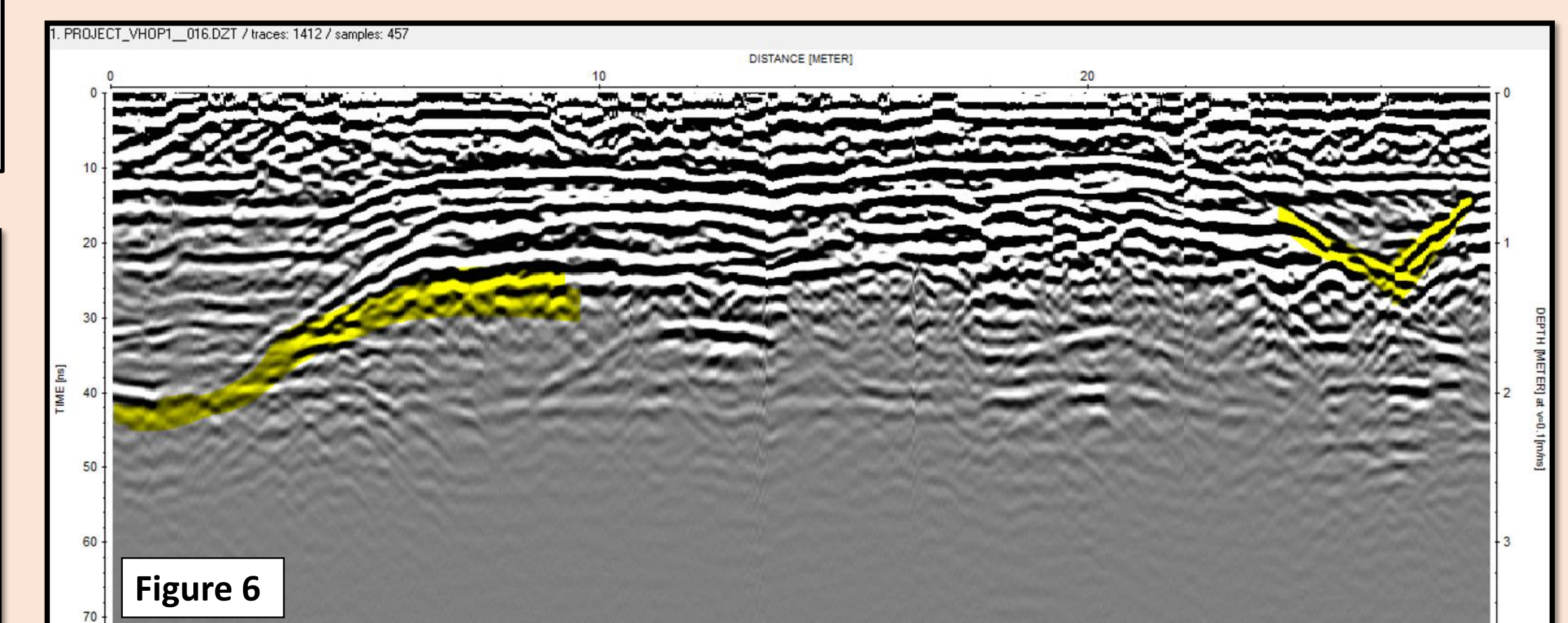


Figure 6

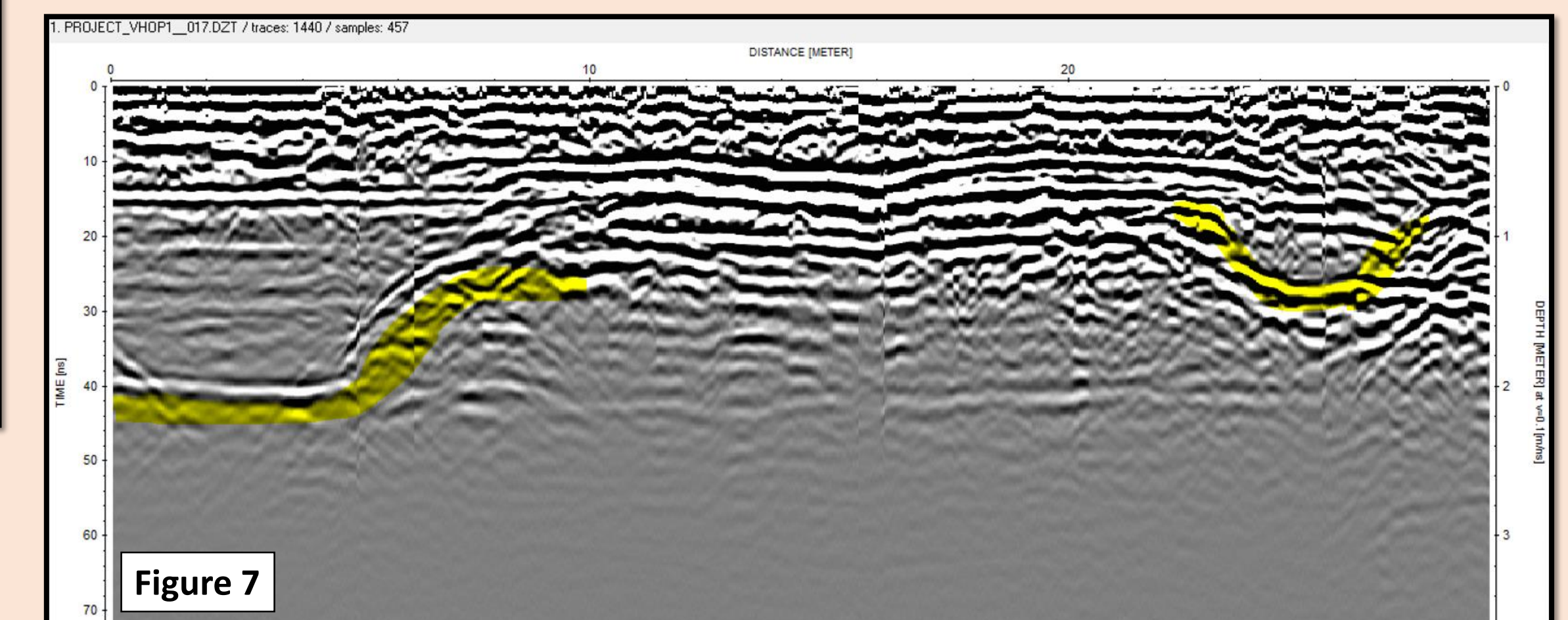


Figure 7

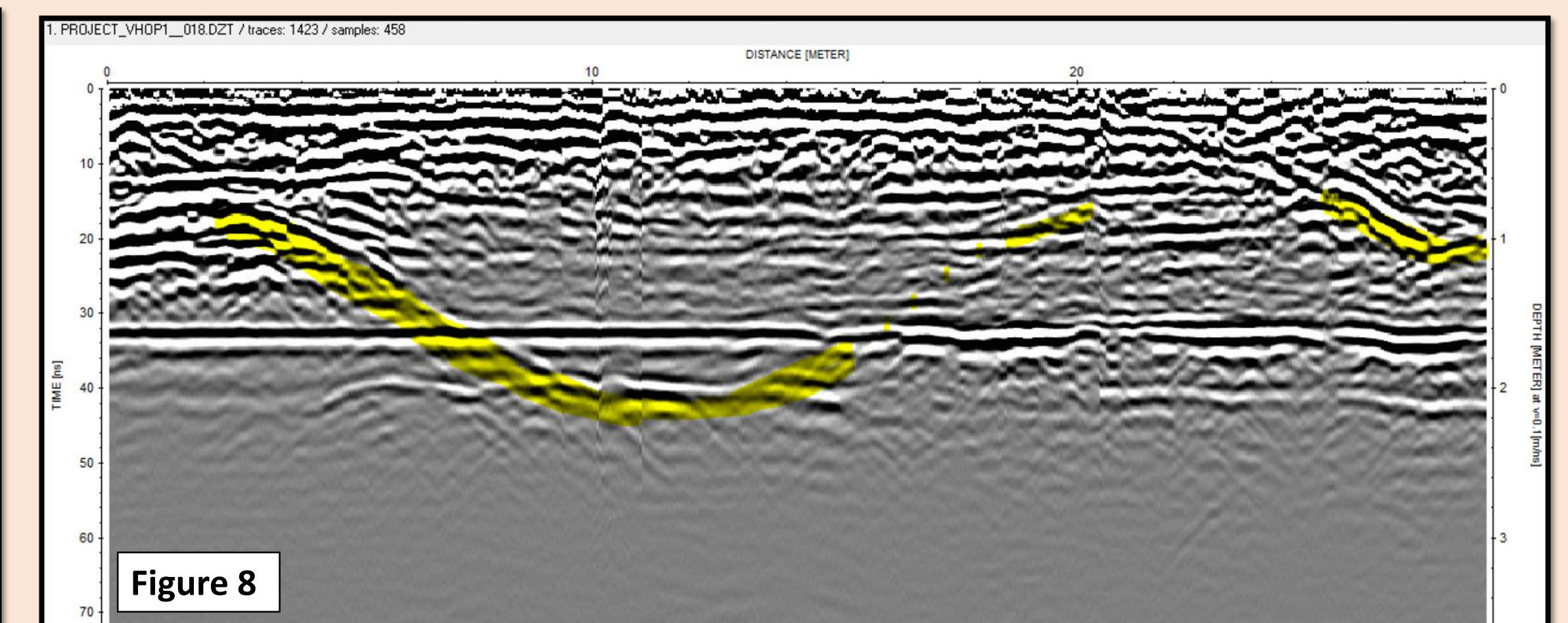


Figure 8

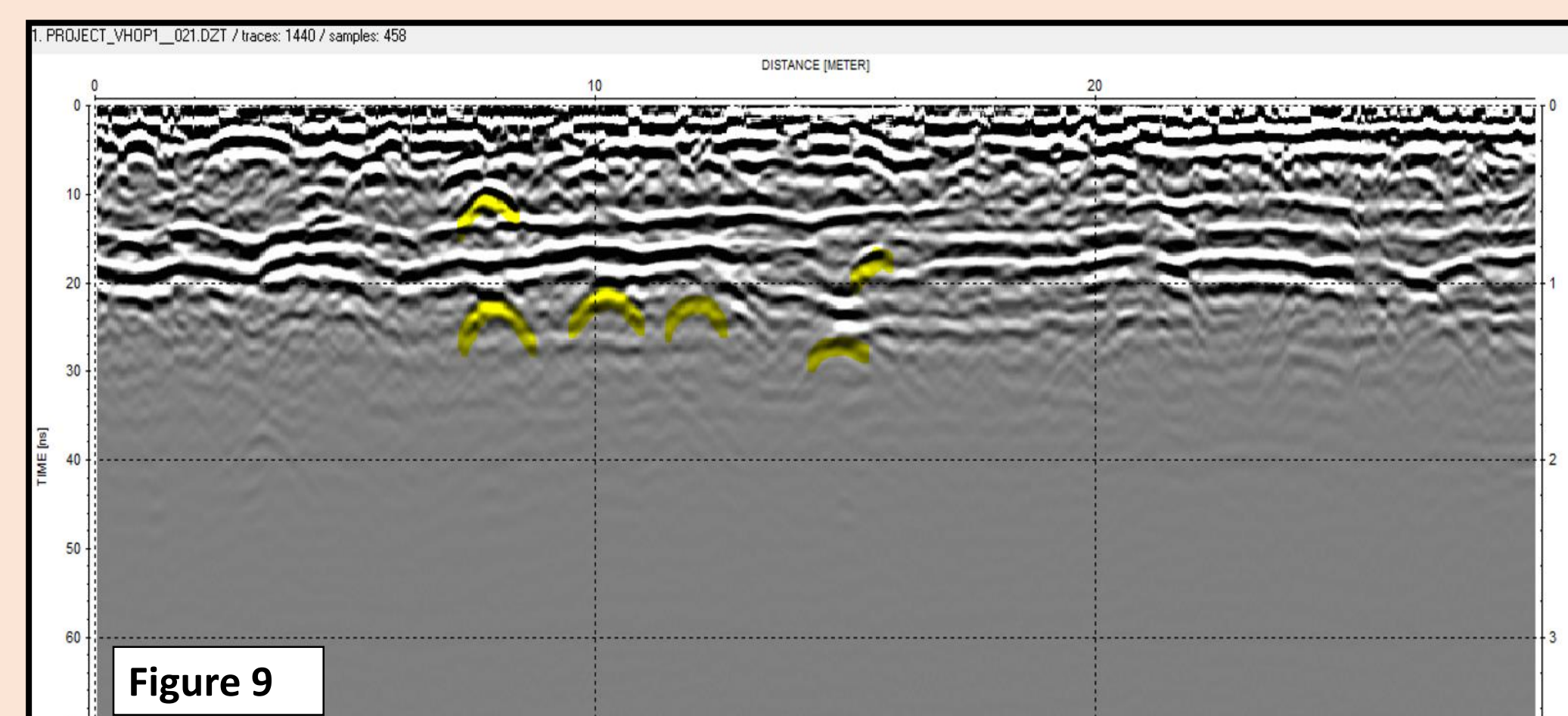


Figure 9

Additional Methods:

We hope to perform additional surveys in the same area using different subsurface geophysics techniques to correlate any anomalies and confirm the presence of potential artifacts. One additional surveying method we have started to implement is the use of magnetic gradiometry. A limitation is the tight spacing required in order to get measurements of shallow objects and the presence of metallic surface debris.

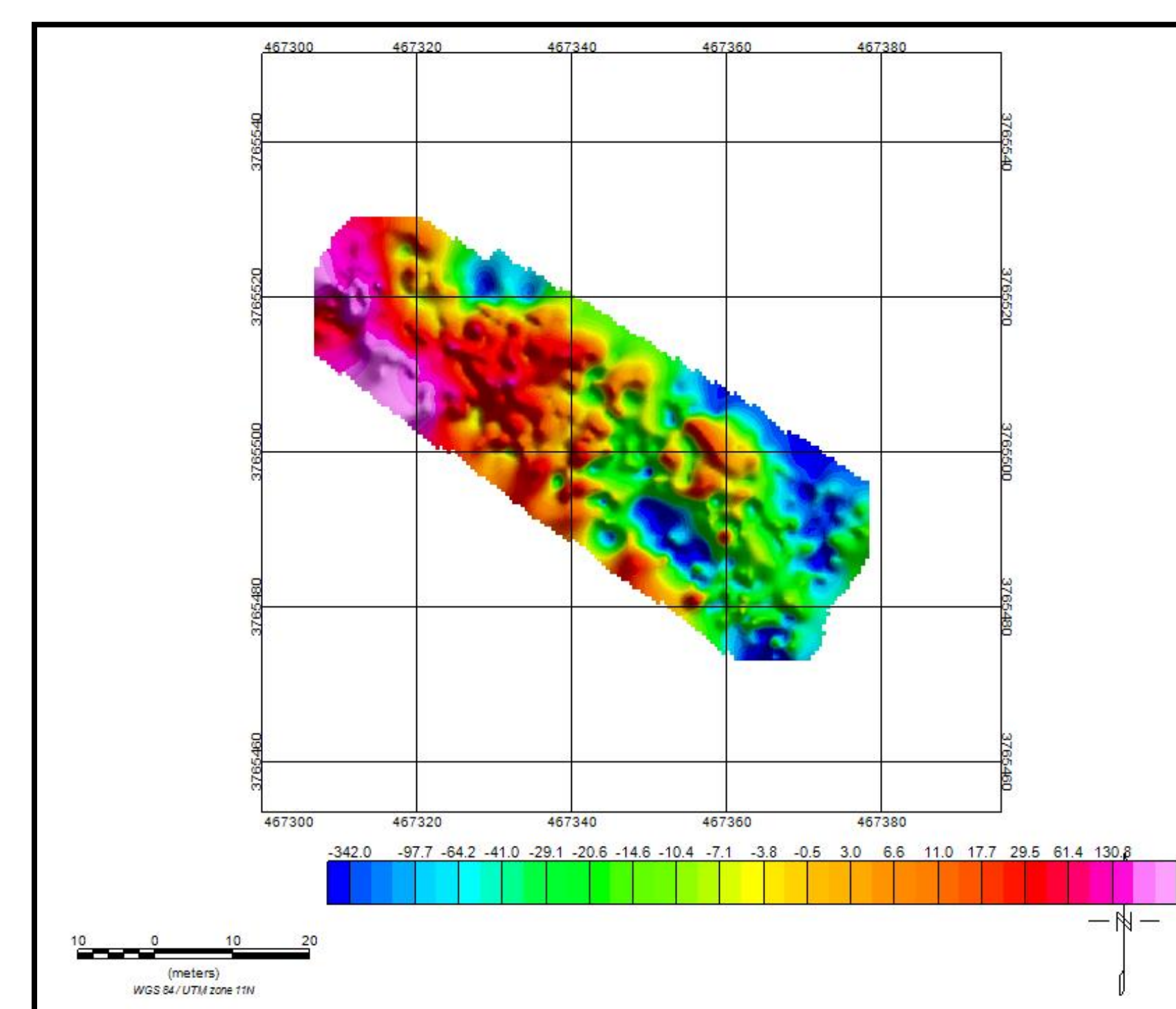


Figure 11: The image to the left is a processed map of the magnetic survey using Oasis Montaj of the vertical gradient measurement. The survey area is represented by the orange outline in figure 10.

Conclusion:

Our GPR survey at Pellissier Ranch has located several sites with consistent large and small scale subsurface anomalies, which may be produced by buried objects or structures. We plan to conduct additional GPR surveys to create 3D images of the subsurface and potentially carry out small scale digs at promising sites. We will also perform magnetic gradiometry surveys in the same area to correlate any anomalies and strengthen our interpretations.

Acknowledgements:

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