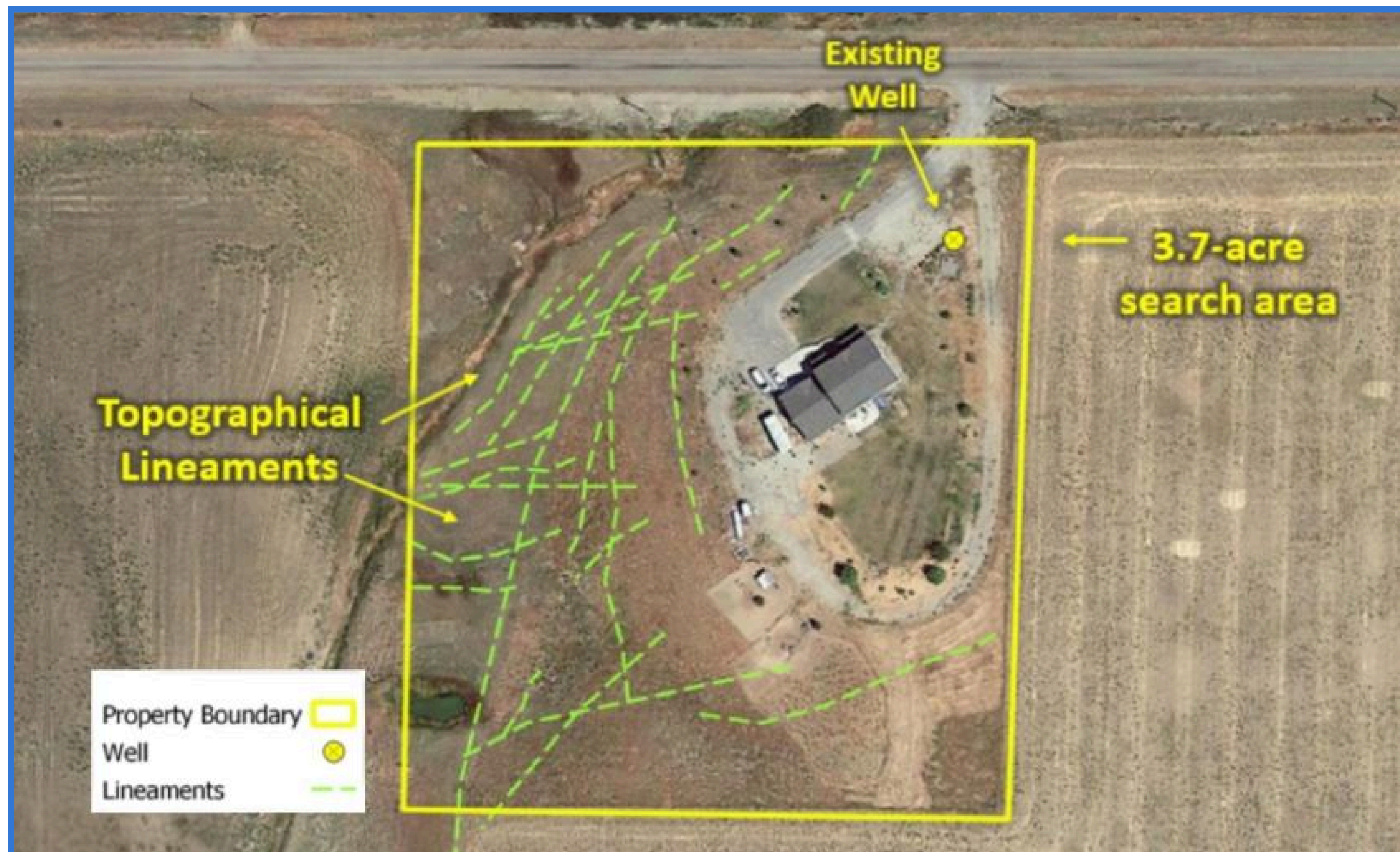


Geophysical Survey for Optimal Groundwater Targeting: Existing Well Outdone By New Well Target

Willowstick LLC



Site Location of Preston, Idaho

Introduction

This report details the geophysical investigation conducted for Nephi Carlisle to locate potential groundwater drill targets on a 3.7-acre property near Preston, Idaho. While geophysical tools cannot guarantee groundwater production, they are instrumental in identifying patterns and conditions where above-average flow rates are more likely. The objective is to provide targeted drilling guidance to mitigate, though not eliminate, drilling risks. The report outlines the investigative approach, methods used, and provides recommendations based on the data.

In the study, advanced geophysical tools to detect natural fracture networks or high-porosity zones in the subsurface, which can enhance well water production. Wells drilled into fractured bedrock often show significantly higher yields. For instance, a 2013 Utah study found that the highest yields came from wells in "highly fractured" volcanic rocks (Iron Springs Corporation, 2013). In valley drilling, high porosity zones are key, while in bedrock formations, open fractures are crucial. "Fracture Trace Mapping" and other methods are used to find these networks, and geophysical tools offer more detailed insights than surface mapping. Especially in mountainous areas, precision drilling targeting deeply-rooted fracture systems is essential. This investigation uses passive seismic techniques and radiometric gamma analysis to identify high-porosity and permeable zones, improving drill target accuracy.

SUMMARY

LOCATION

Preston, Idaho - USA

CHALLENGE

The existing well drillers in the area were skeptical to start, insisting that our technology wouldn't yield results. We put those doubts to rest as we pushed through and completed this study providing higher yield than ever before.

SOLUTION

The survey integrates MSR & Radiometric Gamma techniques to pinpoint optimal well sites accurately, enabling informed decision-making for efficient selection

BENEFIT

Allows for a more optimal step by step path to getting to available water, ultimately resulting in the ability to drill with peace of mind that you're in the right area.

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Investigative Approach

The investigative approach began with a comprehensive desktop study, integrating geological research, faulting analysis, and lineament mapping using imagery, LiDAR topography, and public-domain driller reports from the Idaho Department of Water Resources. Fieldwork was conducted on a 3.7-acre site, where extensive data collection utilized gamma and Micro Seismic Resonance (MSR) techniques. Gamma data was collected across 1.2 miles (1.9 km) of the area, totaling 415 data points, which were analyzed to detect geologic changes and guide placement of the MSR line.

MSR data collection spanned 9 lines, with shots processed to a depth of 1600 feet below ground surface. Each MSR shot was marked in the field with a pin flag labeled “L-S” for precise location tracking. The collected data, paired with GPS coordinates, was compiled into a GIS database, enabling detailed analysis and map generation. This process ensured accurate drill target selection by integrating 2D and 3D data.

Figure 1 presents the gamma survey results, with a color scale ranging from dark blue (low) to red (high). Gamma emissions ranged from 170 to 330 gamma counts per second (gCPS), typical for the area's silt, clay, sand, and gravel. Gamma trends reveal geologic factors such as rock type and subsurface structures, including faults and dikes. Although gamma readings do not directly indicate depth, they help focus MSR work in areas with higher potential for groundwater. Gamma patterns can suggest groundwater potential, but lower readings do not necessarily imply the presence of water, and interpretation requires expertise.

Figure 2 displays the MSR lines and results, with data collected at 5-meter intervals. The MSR technique, which detects micro-seismic energy from tidal movements, was used to locate stress relief zones and fracture networks.

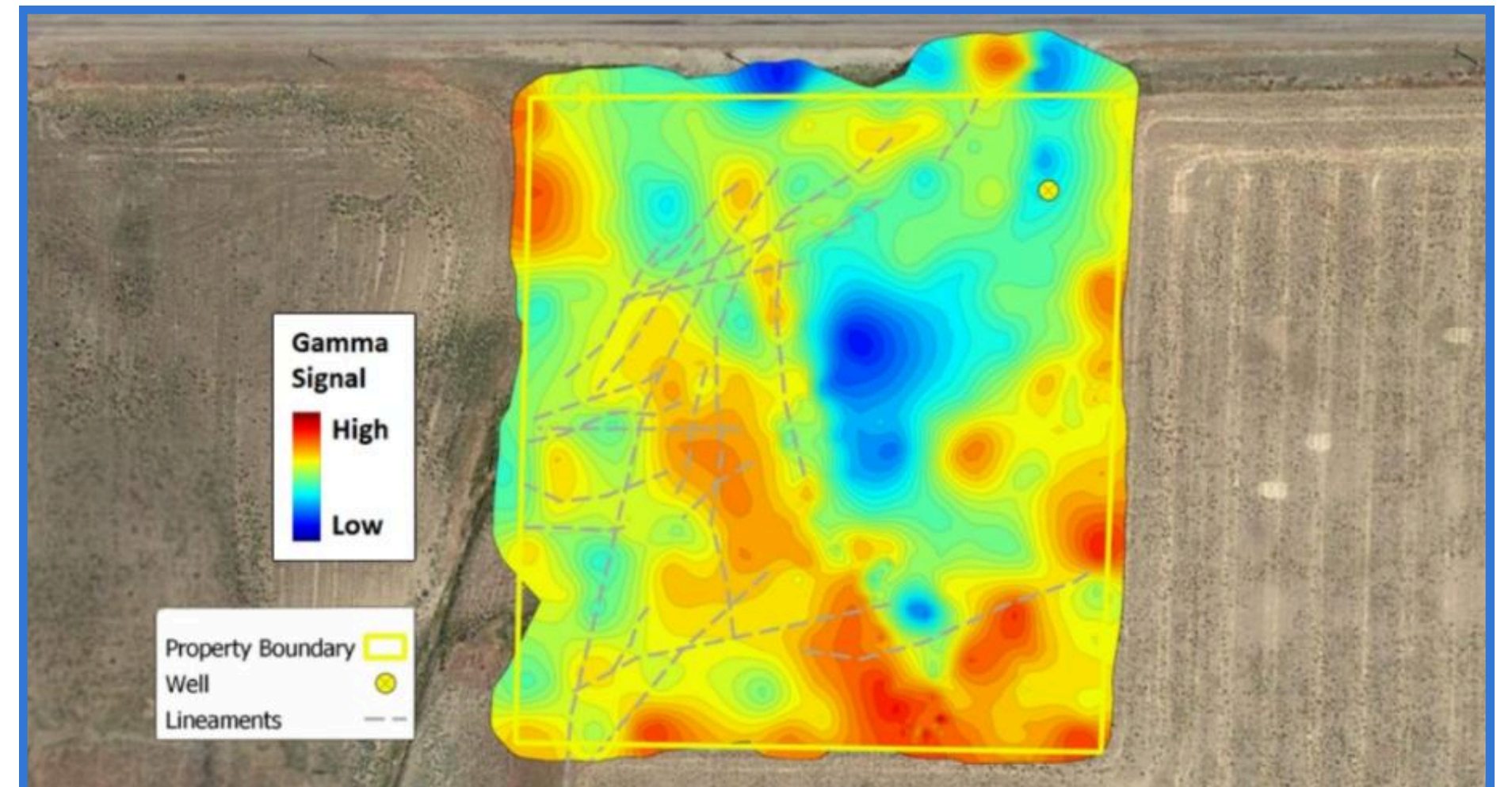


Fig. 1 - Gamma Results

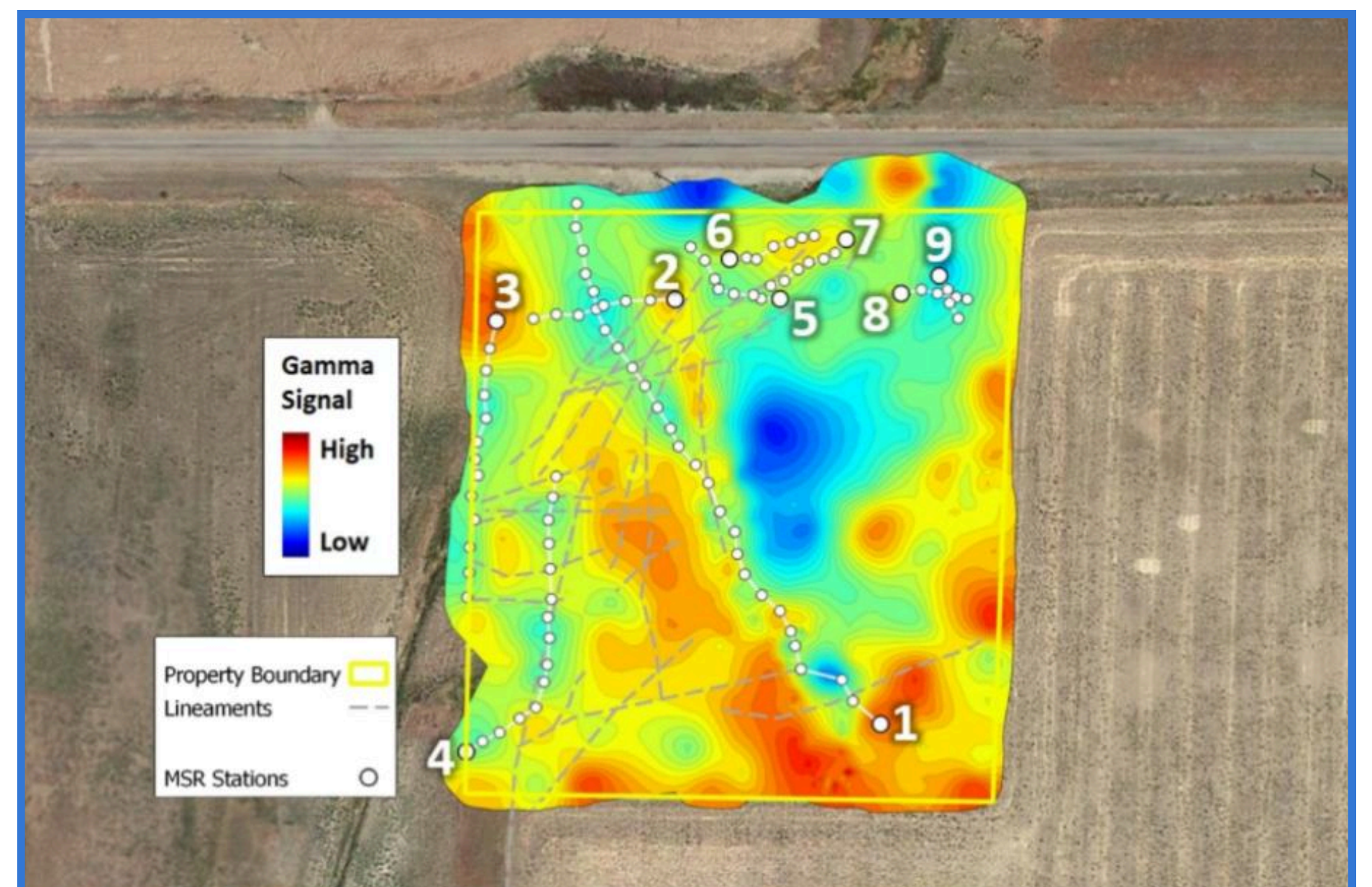


Fig. 2 - MSR Line Locations



After initial analysis, one primary target (T1) was identified, showing the highest resonance values and considered the most promising. Before the survey, we had been provided by local well drillers an “optimal” well target, Target Tw. It was close to the current well on-site and had initially good signals via our MSR tech. However, due to the lack of correlation between our Gamma data and the Tw site, we decided to pursue target T1, which indicated a potentially higher yield compared to the already dry well on-site.

The MSR results indicate that T1 is the optimal drill target, with an estimated drilling depth of 300 to 375 feet, although water may also be found at shallower depths. Figures 4 and 4.1 illustrate the MSR sections for Lines 4 and 6, highlighting the most prospective target (T1) and the less favorable target (Tw). The MSR sections, processed to 1600 feet deep but shown to 1200 feet, use a color scale from white to pink to represent resonance intensity. Higher resonance values suggest better potential for water yield, with deeper zones typically offering more reliable results. In general, deeper resonance zones are more likely to yield water and be less affected by drought conditions. As seen in the conclusion, our chosen targets aimed to address these concerns effectively.

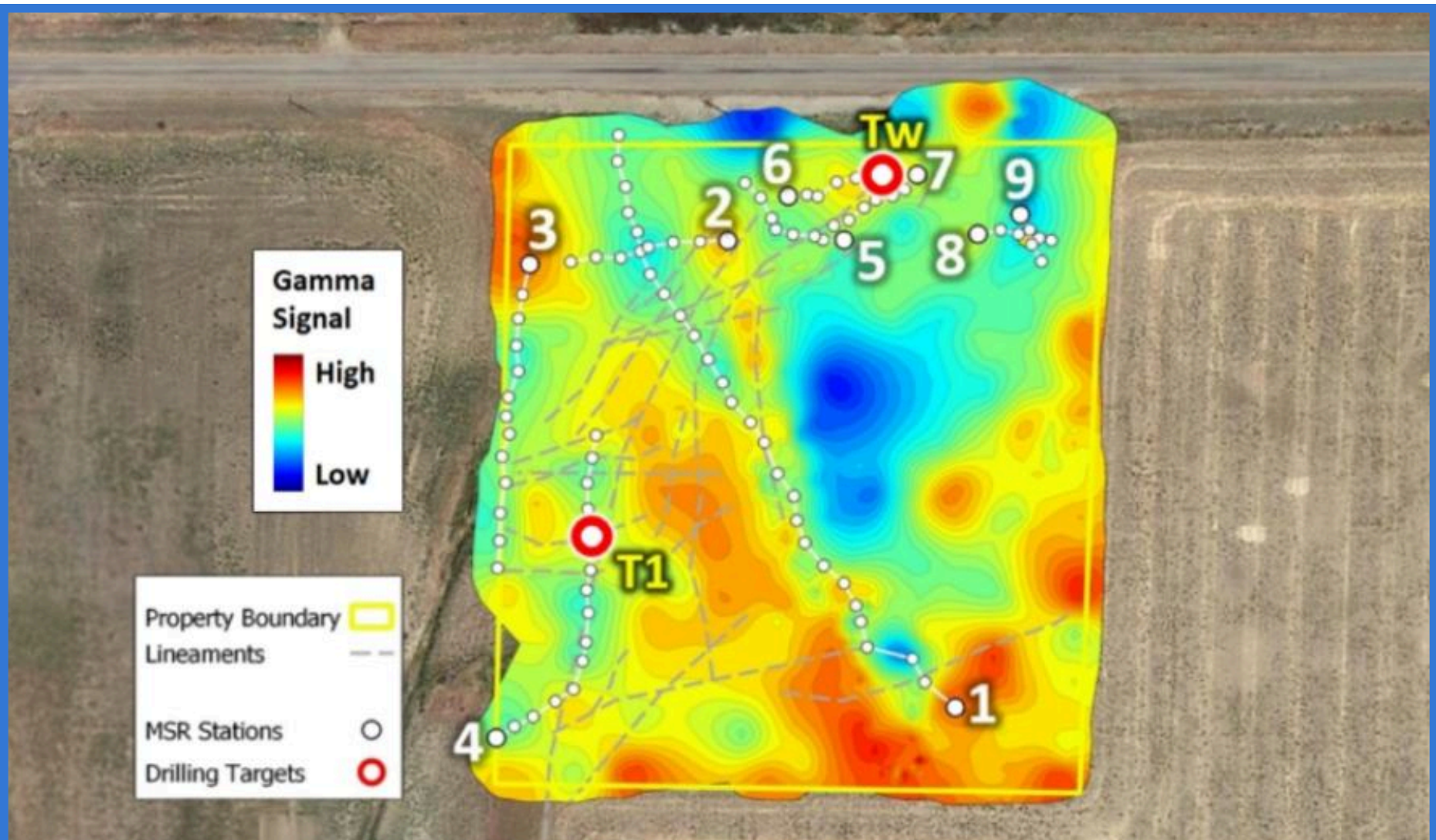


Fig. 3 - MSR on lines 4 and 6 with recommended drill targets

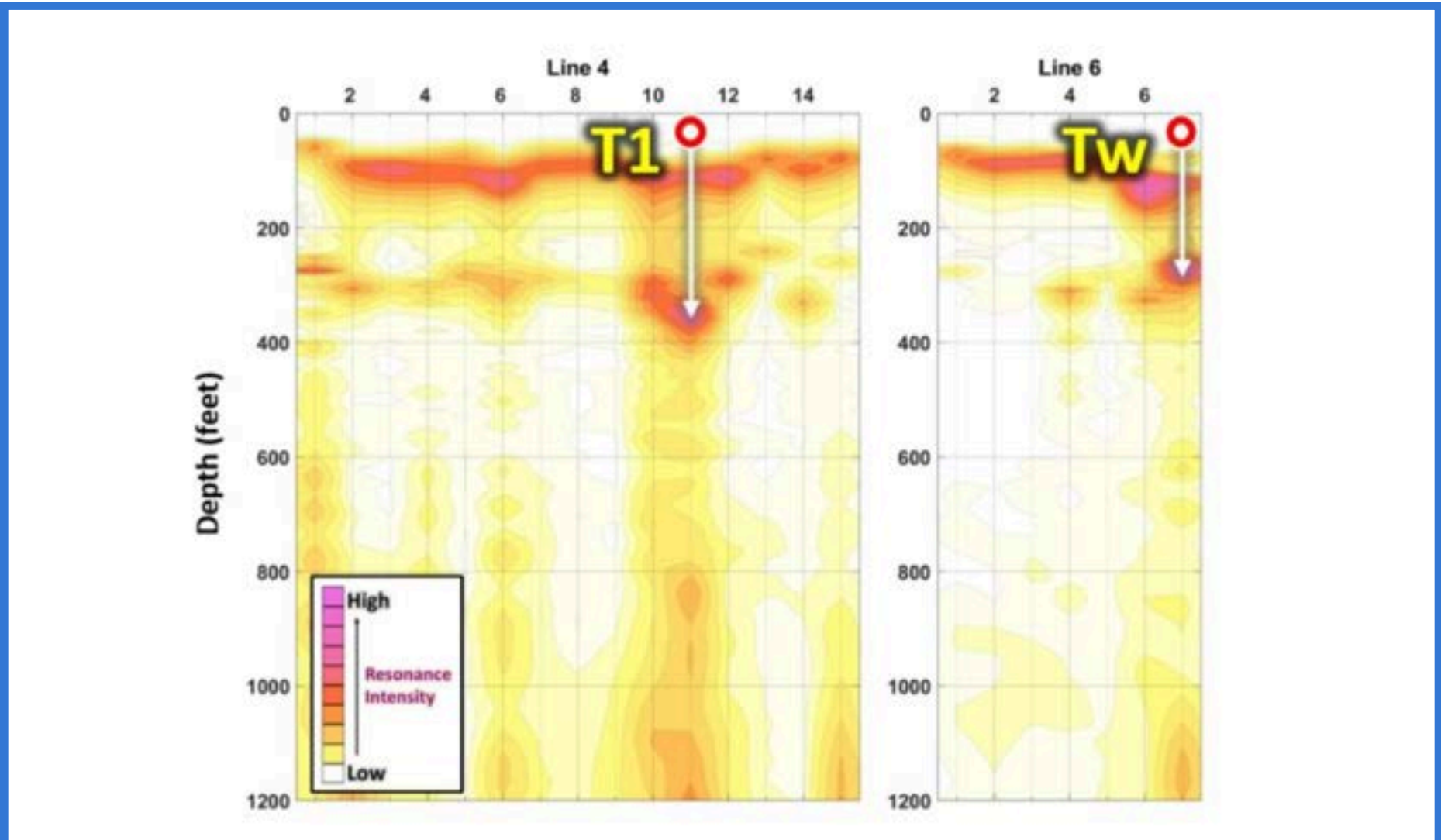


Fig. 3.1 - MSR profiles for line 4 and 6 comparing drill targets

Conclusion

This study integrated Micro Seismic Resonance (MSR) and Radiometric Gamma techniques with traditional geology and lineament analysis to identify precise drill targets within the 3.7-acre study area near Preston, Idaho. By focusing on MSR indicators of natural fracture networks and Gamma patterns, we aimed to pinpoint locations with potential for higher-than-average groundwater yields, especially in sub-vertical open fracture zones. The results suggest that targets showing the described MSR and Gamma patterns are likely to yield superior flow rates compared to average boreholes.

The study identified two main drill targets, labeled T1 and Tw. Target T1 meets all criteria for high potential, while Tw, located where a water dowser recommended, does not fully align with our criteria due to its less favorable Gamma pattern, despite a promising MSR signature.

Figures 4 and 5 display the recommended targets, with coordinates and depth ranges, and show the additional MSR lines collected on the north side of the property. These additional measurements indicate low permeability below the existing well, suggesting reduced production potential.



Fig. 4 - Recommended Drill Targets presented on property

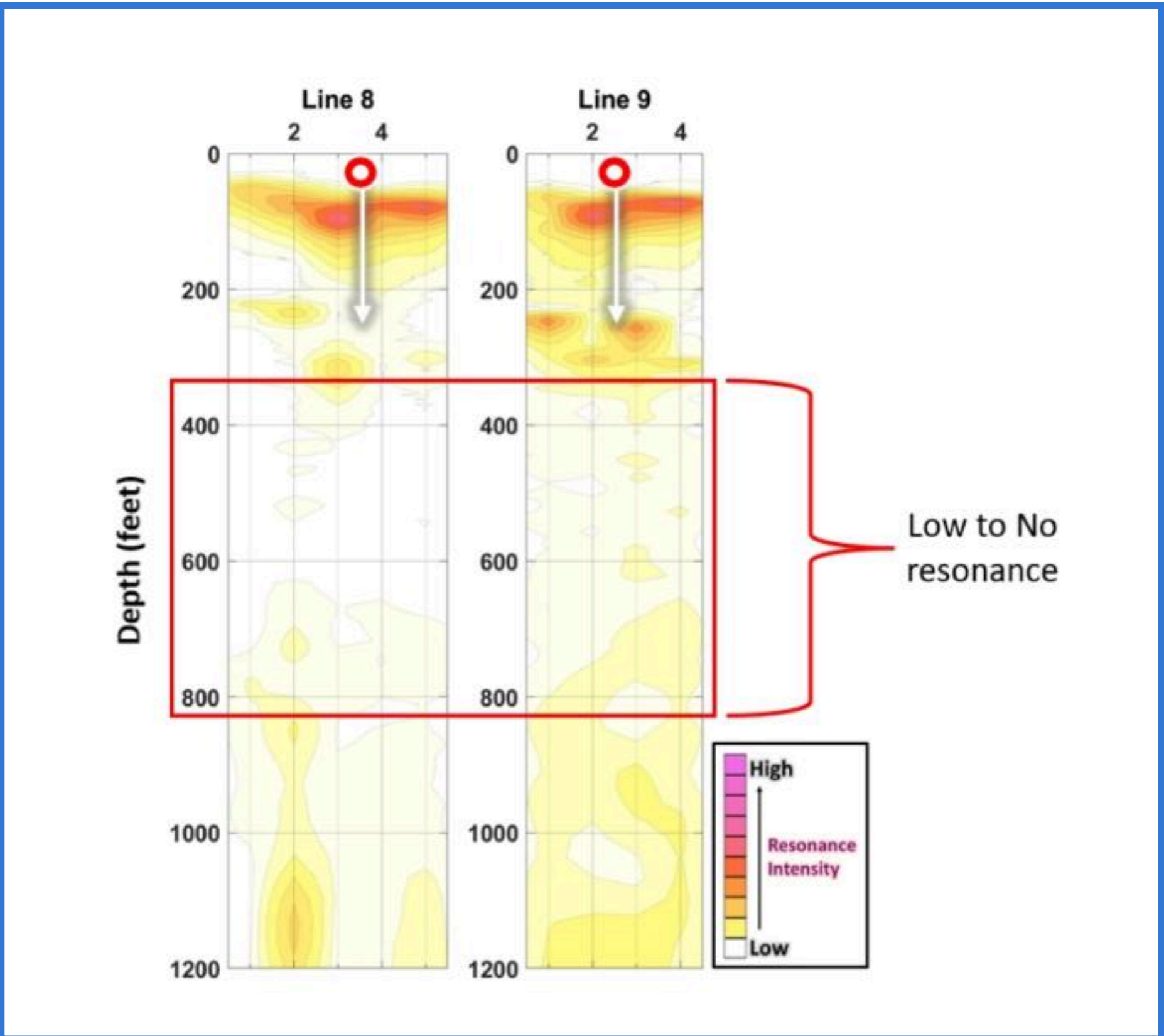


Fig. 5 - Existing Well Evaluation

Anecdote:

We completed our survey and delivery of the final report in May 2024. On July 1st, their existing well ran dry. Their only water was what was left in their cistern. July 8 the driller showed up onsite.

During the drilling, they hit some methane gas at about 40'. Once that cleared up they continued drilling. At about 200' they got a tiny bit of water and then choose to keep drilling to my estimated depth of 300+'. They hit huge water at 328 feet with artesian pressure. The water is super clean with no issues.

Testimonials:

"The driller informed me that we have gotten a little bit of water at about 200 feet and asked me what I would like to do, while also hiniting that we should stop drilling. I told the driller that the [geophysical] report says 300+ feet so please keep drilling. At 328 feet, exactly where you said to drill to, we hit a lot of water, and it was artesian."

"After hitting the artesian water at 328 feet, the driller was so amazed that they wanted to know everything about Willowstick. We have now had neighbors and other residents in the area stopping by our house to ask us who did the survey and who drilled the well.

The cost for the survey was 100% worth the result we obtained"

