PRIMARY WATER TECHNOLOGIES

Field Survey Report

CICWCD – Chekshani Cliffs Well
Kanarraville, UT
1-2 June 2020

Abstract

PWT/Mark Burr was contacted by Paul Monroe on behalf of the CICWCD to conduct geophysical surveys on a parcel adjacent to I-15 with the purpose of locating a production well for the nearby Chekshani Cliffs developments. The objective was to conduct gamma and passive seismic surveys to locate potential water-bearing structures for borehole drilling. The Utah geological map shows alluvial plain between the Hurricane Fault to the east and various hard rock formations to the west. A fault/fracture zone was revealed on the north field of the target zone running ESE – WNW. There is a prospective water-bearing zone at 150+ meters / 500+ feet depth with deep continuity well beyond 300 meters / 1000 feet. All of this was carried out in 1.5 days of surveys.

(1) Introduction

PWT conducted passive seismic and gamma surveys 1-2 June 2020 on the approximately 6-acre target zone adjacent to I-15 south of the rest stop on private property. A highly productive agricultural well was drilled and completed just north of the parcel.

Specific tasks:

(a) Collect gamma data to seek strong gradients related to groundwater
(b) Conduct passive seismic surveys to determine depth to potential water-bearing structures for culinary water well drilling

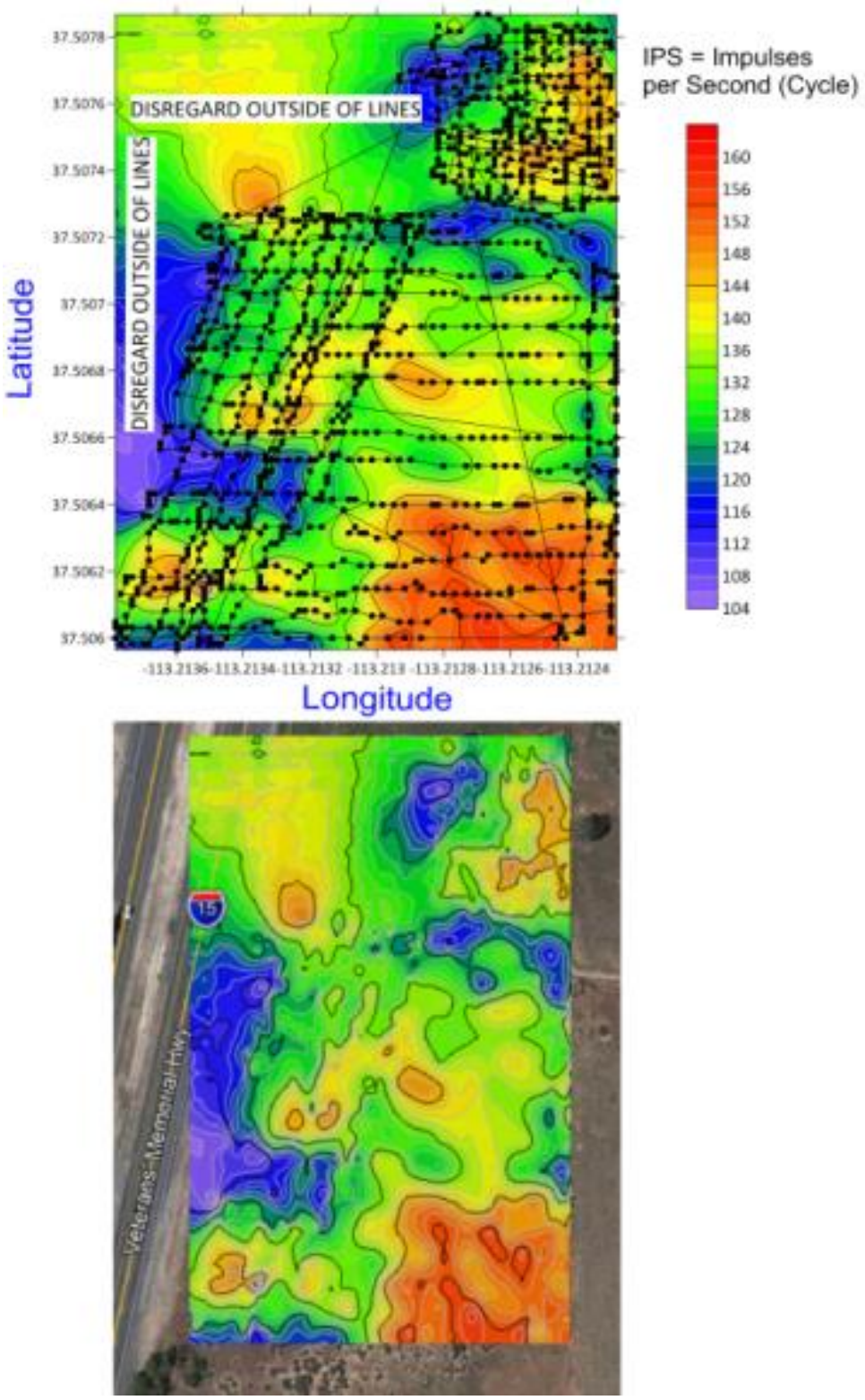
(2) Methodology

Two geophysical exploration systems were deployed: a gamma scintillation counter calibrated for groundwater exploration, and a passive seismic acoustic profiling system.

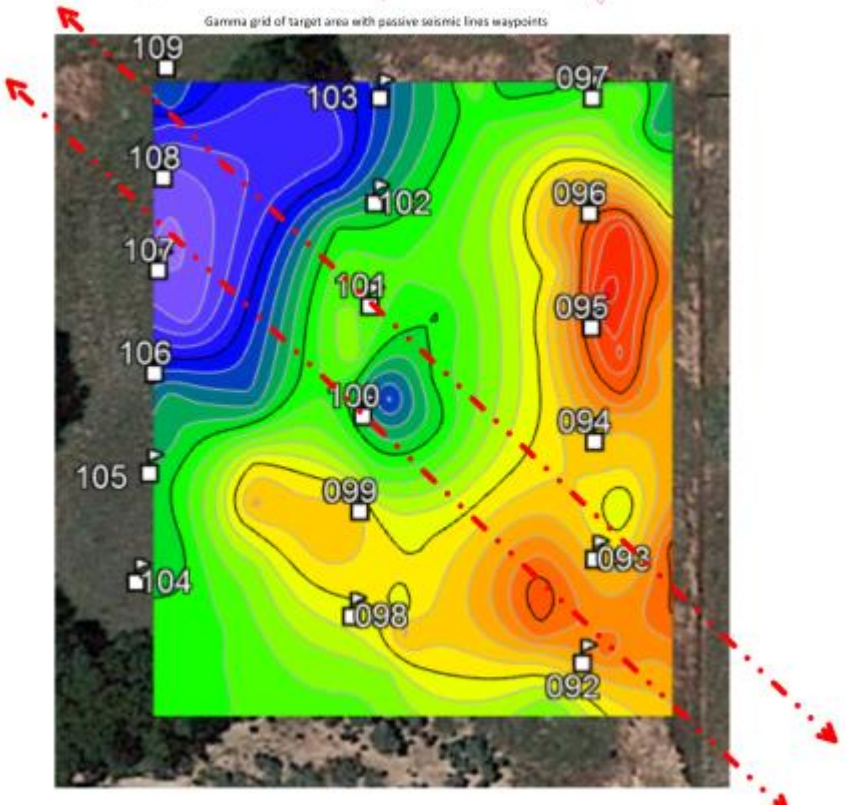
(3) Results of gamma exploration

Following is a horizontal profile of gamma data collected in various grids:

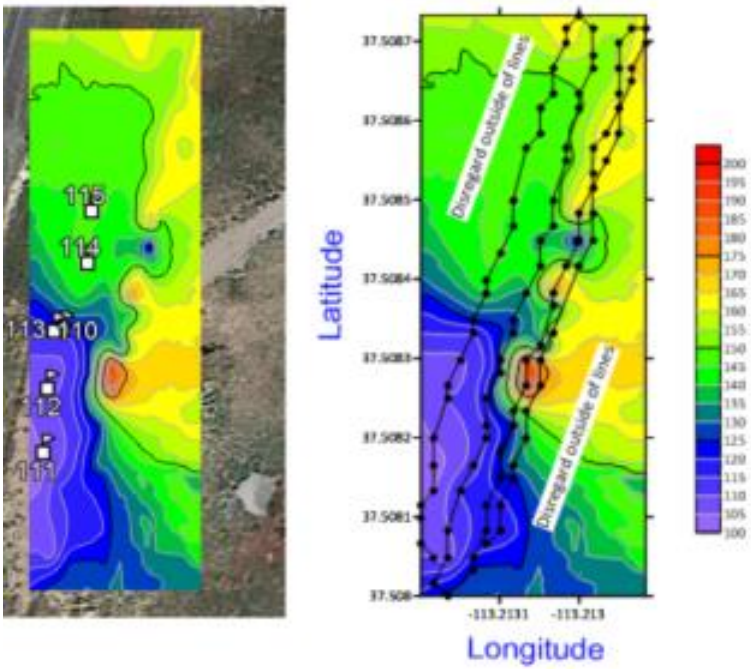
Gamma grid of the 6-acre project zone:



Gamma grid of the north field target zone (with red dashed lines showing fault/fracture zone revealed by the passive seismic data):



Gamma grid of the Holt well (waypoint #110) just north of the target zone:



(4) Interpretation and Analysis of gamma exploration

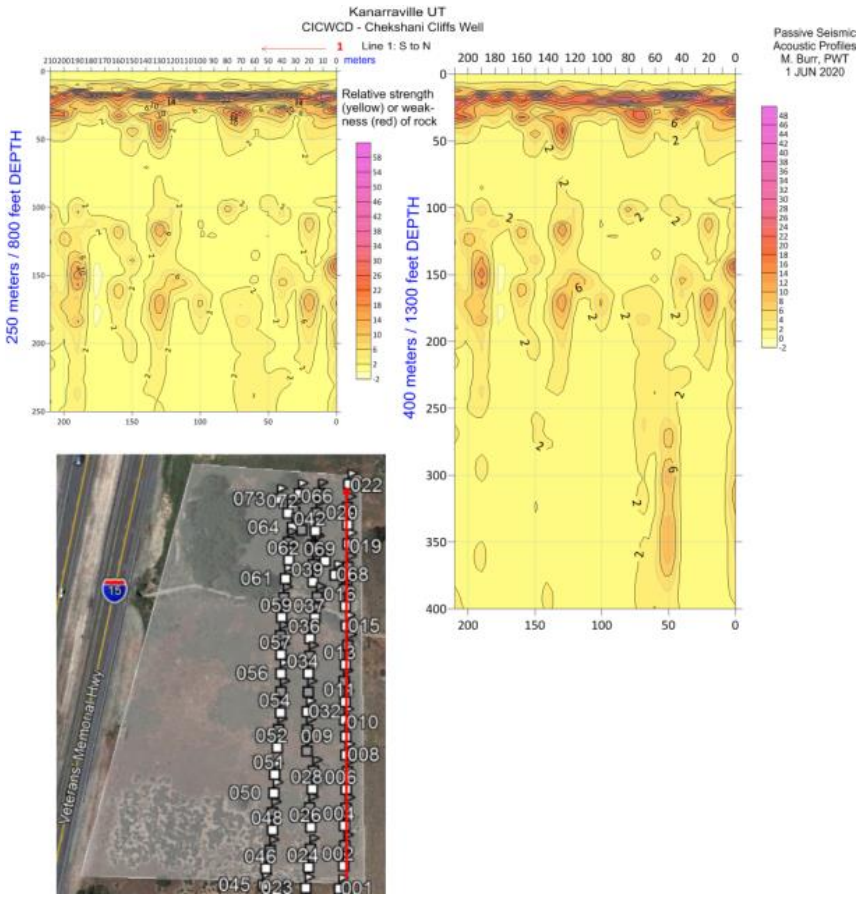
The gamma ray data was collected using a gamma scintillation counter calibrated for groundwater exploration. Groundwater dampens natural background radiation from within the planet so we are looking for low/blue versus high/red and sharp gradients in the prospect zone.

The heat map of the project zone shows lows to the west aligning with the Holt well, and also one or two E-W crosses of interest. The gamma grid of the north field target zone selected based on the passive seismic data (below) also revealed a strong gradient from east/low to west/high. The Holt well was drilled directly into a sharp gradient zone just north of the project zone.

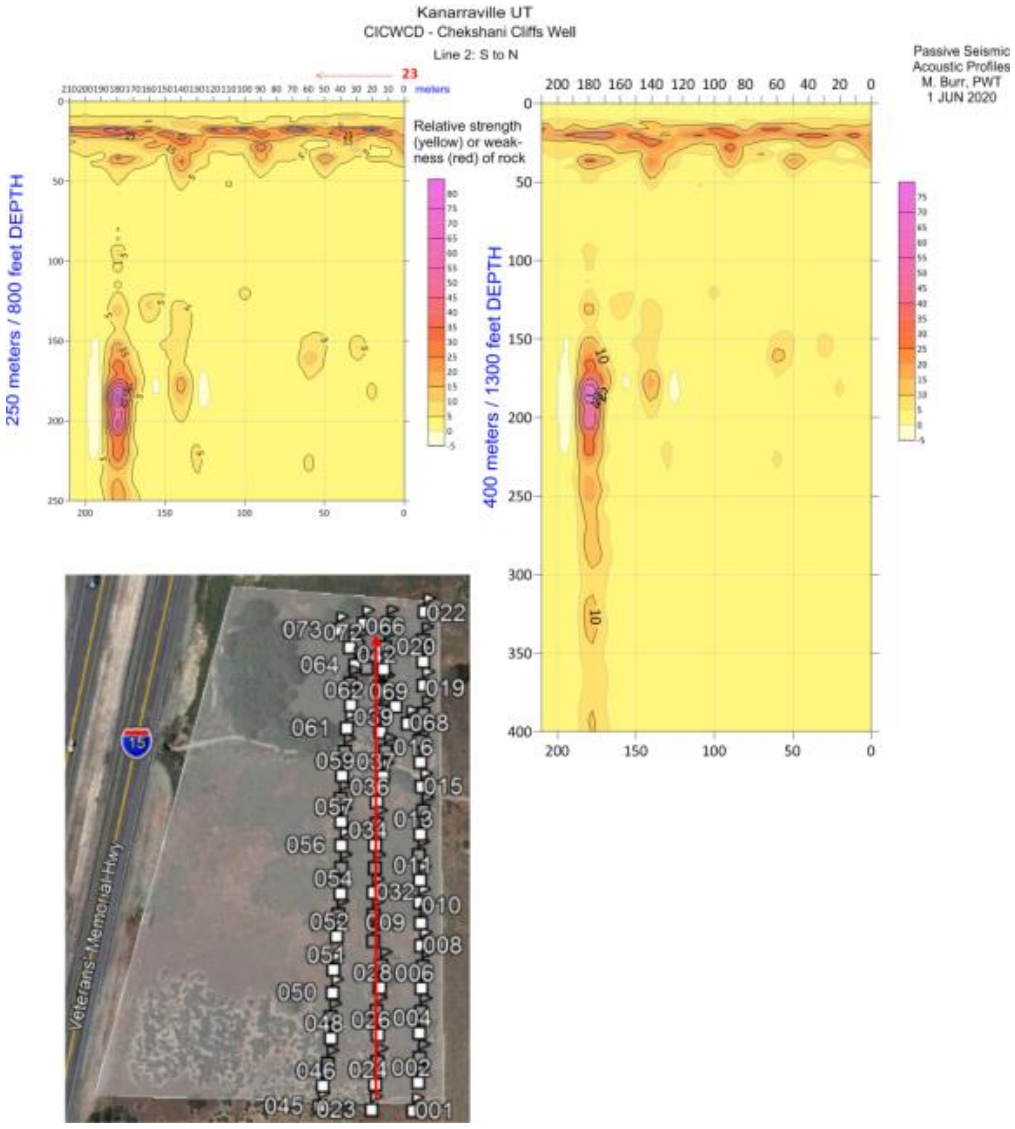
(5) Results of passive seismic exploration for water well drilling

Following are profiles of the three survey lines collected across the parcel using a 250-meter depth setting:

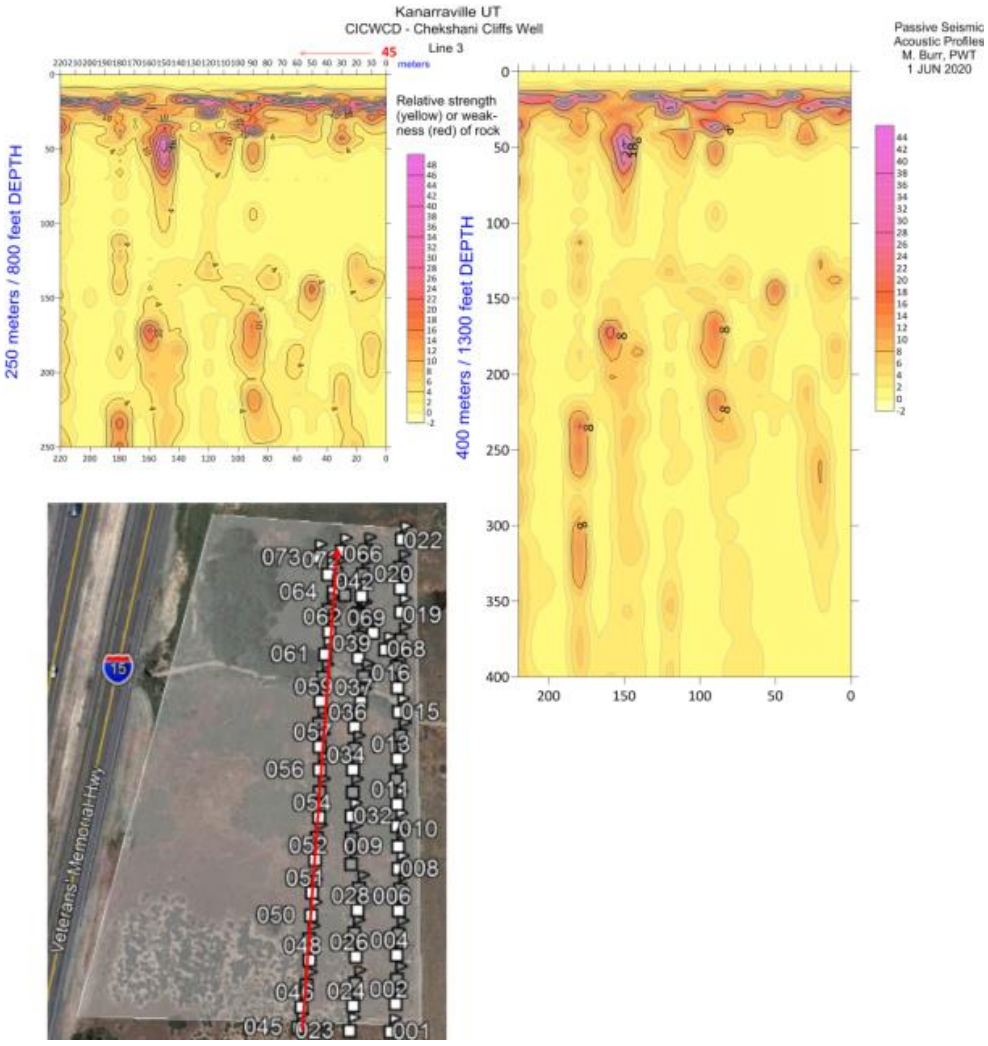
Line 1 (210 meters long at 10-meter spacing, 250-meter depth also processed 400 meters deep) S to N inside east fence:



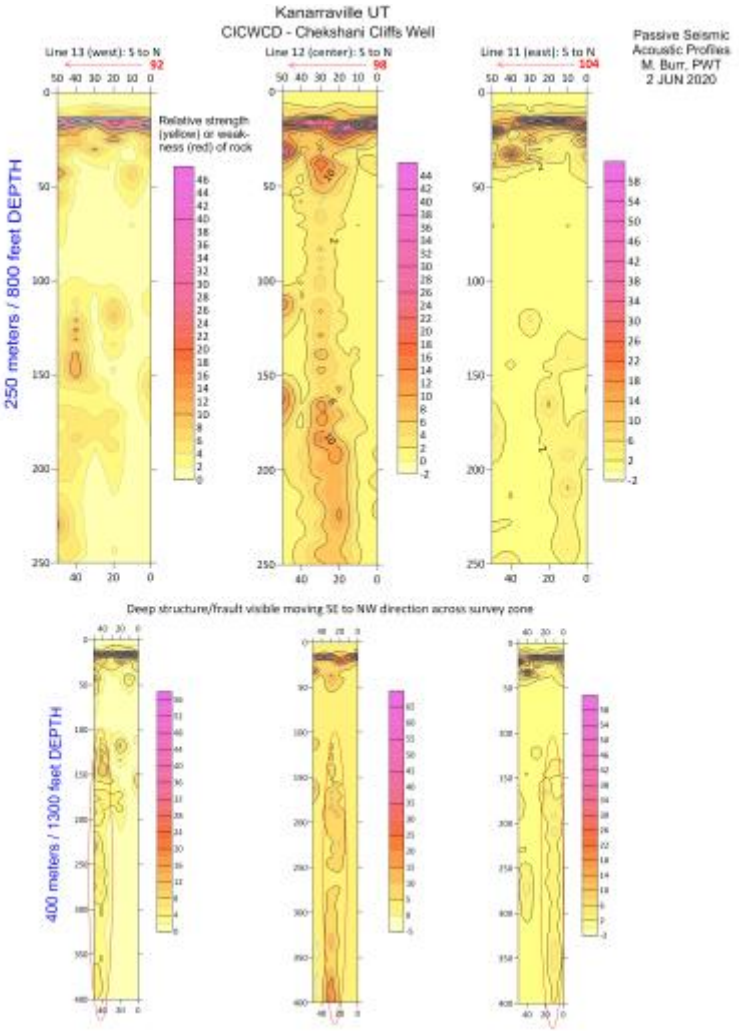
Line 2 (210 meters long at 10-meter spacing, 250-meter depth also processed 400 meters deep) S to N:



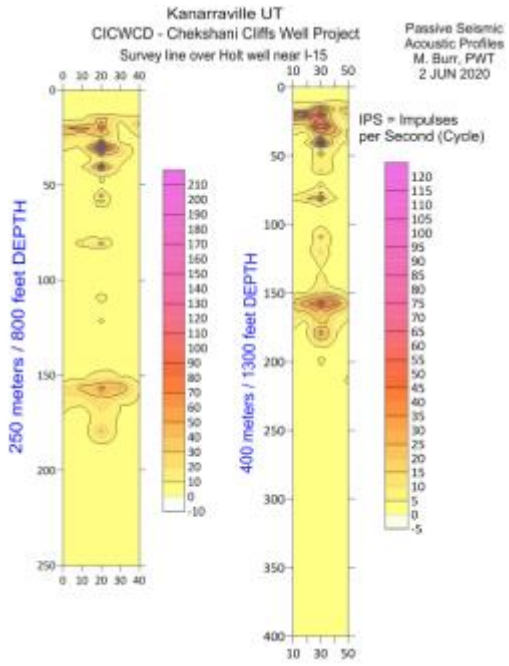
Line 3 (210 meters long at 10-meter spacing, 250-meter and also processed tp 400 meters deep) S to N, although it became difficult to maintain 20m spacing between lines:

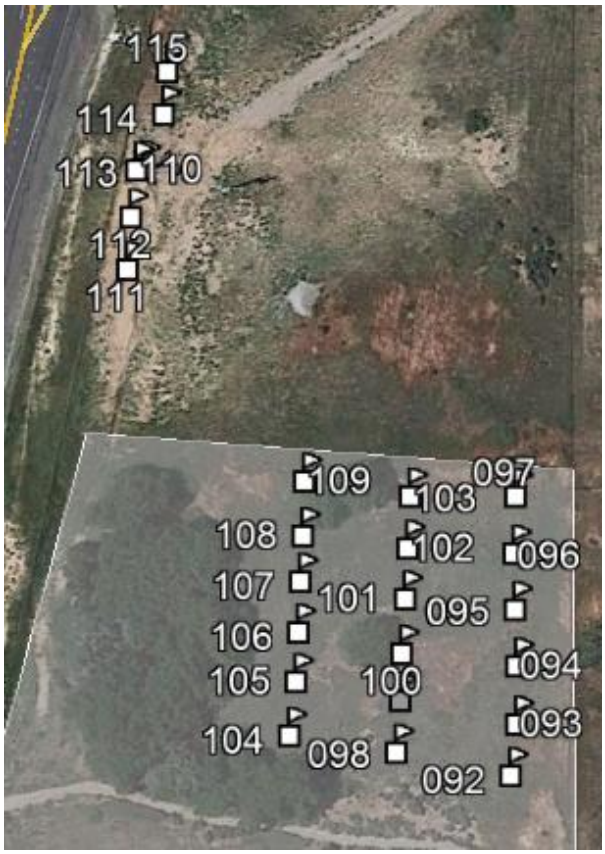


Lines 11 to 13 (50 meters at 10-meter spacing with 250-meter and 400-meter depth analysis) N to S over north field target zone and 20m between lines:



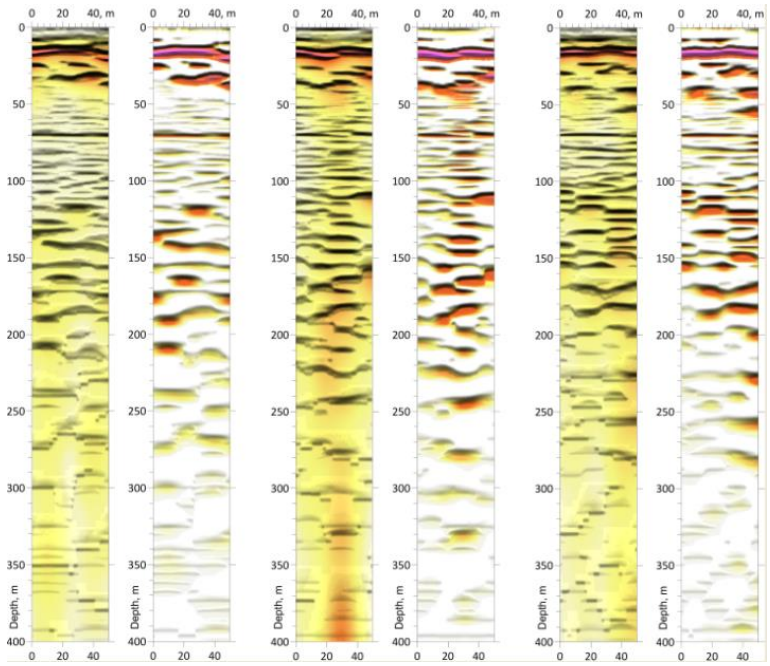
Line over Holt well (waypoint #110) just north of proposed area (40 meters at 250 meter depth also processed to 400 meters) waypoints 111-115 S to N:



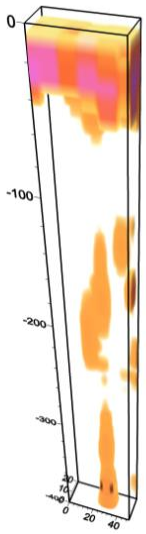


(6) Interpretation and Analysis of deep exploration

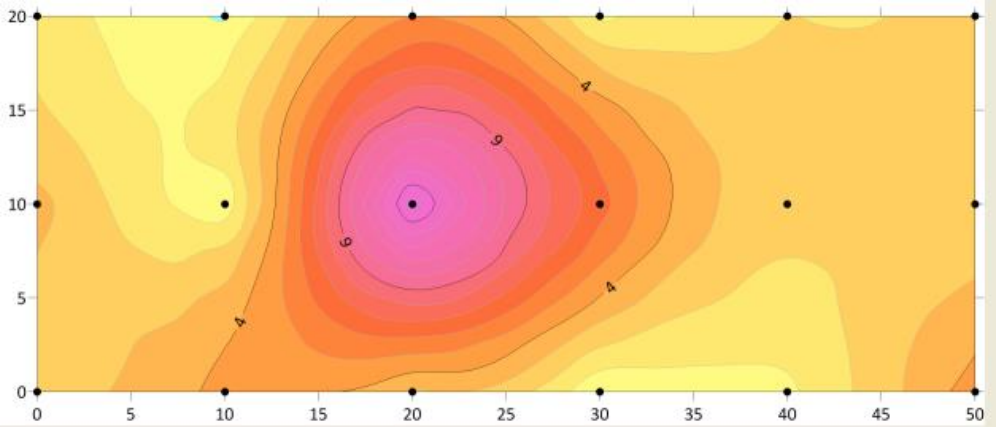
After locating the anomaly of interest on Line 2 and correlation with the north field gamma grid, it was decided to collect three parallel lines in that area. The three passive seismic survey lines (11-13) were then processed further through geophysical software to highlight anomalies prospective for groundwater drilling. All three lines show weakness from 100+ meters / 330+ feet to 200+ meters / 660+ feet with strongest and deepest structure in the center of the zone reaching past 400 meters / 1300 feet:



The data was combined into a 3D presentation of the potential connectivity between the various anomalies:



Below is a cross-section of the 3D profile at 190-meter / 600+ feet depth (north is to the left with Lines 11-13 coinciding with 0 and 10 and 20 of the left axis, respectively) showing the heart of the structure almost in the center of the north field target area survey zone:



(7) Summary and Conclusion

After gamma grids were collected and long passive seismic lines run south to north across the project area, it was determined the north field was prospective for water well drilling. It is interesting to note that the heart of the zone presented a large distressed area of dead grass, thistle and brush surrounded by tall, healthy grass on much of the rest of the property. This is a bio-indicator of a geophysically stressed zone (abnormal gravity, magnetics and radiometrics). A stake was placed at the recommended drill site:

Latitude:	37°30'27.19"N
Longitude:	113°12'45.14"W

(8) Drilling

It is highly recommended that the CICWCD and its engineering firm Ensign contract a Dual Rotary rig operator for this well. These are the Foremost (old Barber) rigs and there are at least two working out of SW Utah. Drilling into a fault/fracture zone is much more difficult than standard alluvial basin drilling. The advantage of a DR is that it can set casing while drilling the borehole and is capable of 100% air to great depth given the power of the onboard compressor. The DR will complete this project in a matter of days as opposed to less robust DTH / rotary - air hammer rigs or mud drillers who may be on site for months.

Foremost Dual Rotary Method: https://www.youtube.com/watch?v=Q_r3Q4q_5Vs

RESULTS AND PROJECT REFERENCE:

From: Justin Christensen <jchristensen@ensignutah.com>
Sent: Friday, October 30, 2020 8:05 PM
To: Mark Burr <ceo@primarywatertechnologies.com>
Cc: Paul Monroe <p.monroe@cicwcd.org>; Tracy Feltner <Tracy@cicwcd.org>
Subject: Re: Chekshani Cliffs Well

Good morning Mark,

Yes, with the low TDS levels (~450 ppm) we are very excited about this well. Thank you for your assistance in locating it!

We performed the 24-hr constant rate test at 500 gpm. The District will likely operate near the 200-300 gpm range. From what we observed, the well shouldn't have a large impact on the Agricultural well nearby or vice versa. We don't have a well log back from the driller as of yet.

Justin Christensen, EIT | Design Engineer
Main 435.865.1453
jchristensen@ensigneng.com | ensigneng.com

ENSIGN
THE STANDARD IN ENGINEERING