3. GEOCHEMISTRY IN VERNON FIELD, ISABELLA COUNTY, MICHIGAN

Go to Fourth Poster

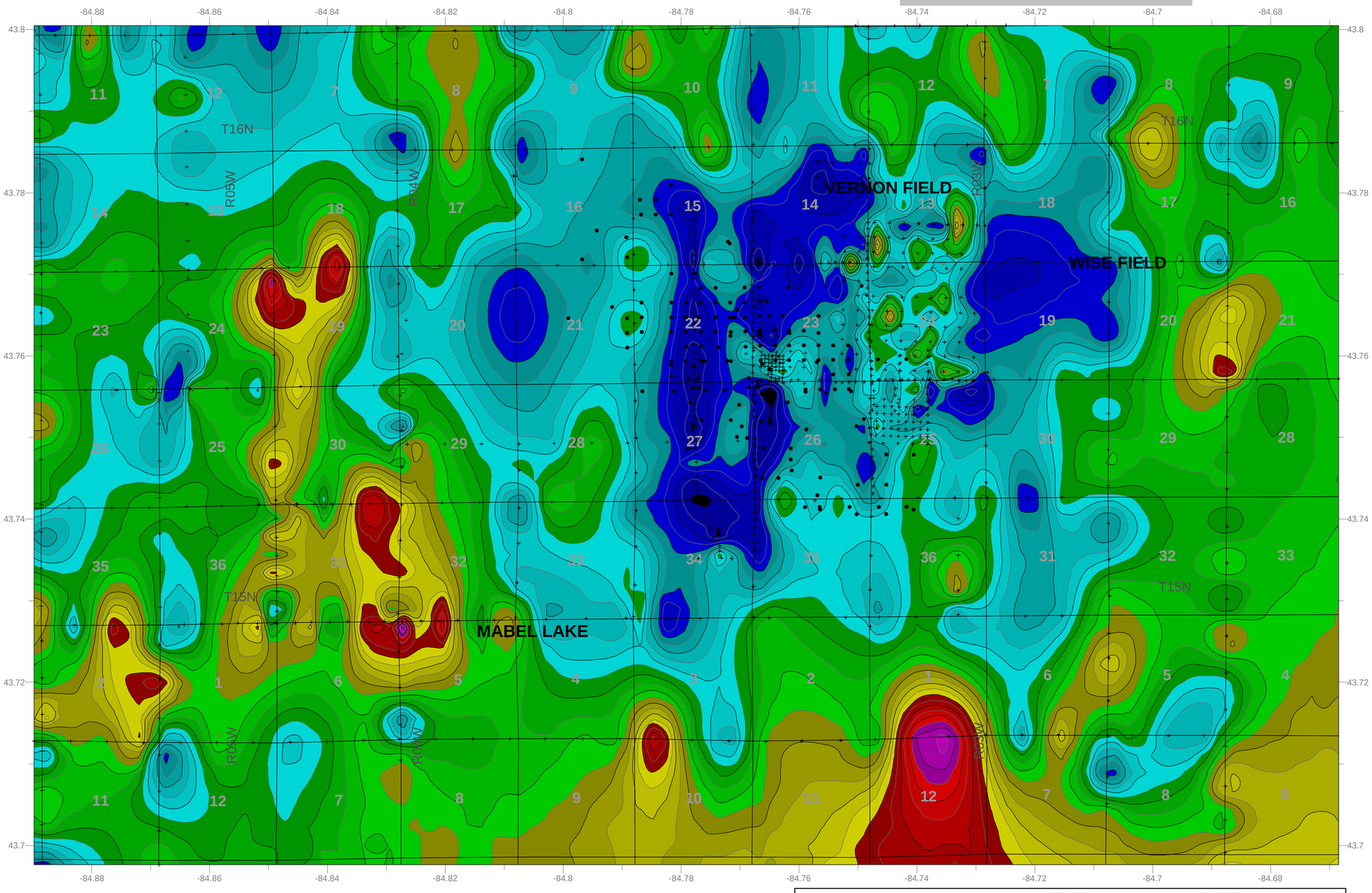

Table 1: MOST RANKING

MOST Value	RANKING	SAMPLES	PERCENT
0-30	POOR	402	36
30-60	MARGINAL	455	42
60-90	GOOD	199	18
> 90	EXCELLENT	46	4

Table of rankings for MOST samples. The rankings are based on numerous measurements collected by GeoMicrobial Inc. on fields worldwide and provide a rough guide to prospect quality. The samples listed in the table refer to Vernon Field (left) only. The bulk of the samples (78%) rated only “Poor” or “Marginal” and are located in the field itself indicating that Vernon Field is essentially exhausted as a resource. The better samples are for the most part located outside the field in what are presently interpreted to be over small, non-commercial gas pockets.

Vernon Area, Isabella County, Michigan
Microbial Contour Map

Location: [T15-16N,R3-4W]	+ Microbial Locations	C. Asiala
Gridding Algorithm: Kriging	● Gas/Oil Well Locations	MTU
Contour Interval: 5	Geographic Longitude/Latitude	6/15/2004

Microbial

Specific organisms are associated with hydrocarbon gases and there is an expected positive correlation with amount of microbes a nd occurrence of hydrocarbons at depth. The microbial technique is based on the premise that microbes living in the soil are unique depending on their energy source. Microbes that thrive on light hydrocarbon gases (C1 - C4) in particular are known to feed exclusively on these gases, even to th e extent that one microbe may consume only one gas (e.g., C3). The technique is based on culturing the microbes for a period of time on a special substrate and then counting the microbe population. Samples are collected below the “B” horizon, approximately 8 inches below ground surface and cu ltured within 48 hours of collection. The main assumption is that specific microbes will be present only if the appropriate gases are present and will be absent otherwise. Since C2 - C4 hydrocarbons are widely thought to originate only from gas and oil accumulations, the presence of microbes s pecialized to feed on these gases is taken as evidence of a migration of hydrocarbons from the reservoir to the surface. An anomaly should remain only as long as hydrocarbons of sufficient quantity exist in the subsurface to provide microseepage of gases to the surface. Thus, this technique can be used to detect bypassed oil in depleted reservoirs. In a typical case microbial data are log-normally distributed based on visual inspection and the KS statistical test. Microbial data show an apical anomaly over the center of the Vernon field. Results for the 2D microbial survey over the Vernon Field study area are shown above. The sampling locations are indicated by crosses. In general, the data show lows in Vernon Field typical of a deplet ed field. There is a high outside the field in the vicinity of Mable Lake. This was not drilled, but data from nearby wells suggest that it may be du e to shallow gas in the Pennsylvanian Stray Formation. Geologic data suggests that it is unlikely to be due to a Dundee source but this has not been def initively ruled out.

Nearly 1100 microbial samples were collected for the (MOST) analysis. The rankings for these samples are summarized in the table (above, right). The range for all 1100 samples was from 1 to 157. Out of all samples collected, including about 300 from outside the Vernon Fiel d itself, roughly 22% (245) ranked as "Good" or better. Using these criteria, our first demonstration well, the State Vernon & Smock #13-23, had micr obial values that lay in the ranges "Marginal" to "Good", while the second demonstration well, the Bowers 4-25, had microbial values that are mainly marg inal. Thus the geochemical survey condemned the prospect, but it was drilled anyway based on geologic criteria. This is good example of the abi lity of surface geochemistry to predict poor prospects.

Recommendations: The main lesson learned at Vernon Field was that the geochemical survey should be carried out over the entire field and a good background be established. It would also be advisable to obtain some “good” or “excellent“ readings in the vicinity to confirm t he expected range. For redevelopment of fields, we feel that it is important to get a whole field profile even if the data is widely spaced. Cost becom es a consideration, since the cost per sample for a survey can exceed $40-50, including sample collection and analysis. Thus a survey of a field such as V ernon will cost $40-50,000 and will impact the economics. Clearly what is needed is a low-cost technique that lowers the cost per point to less tha n, say, $5. In our opinion, the only way this can be achieved is to combine sampling and data acquisition into a single step carried out in the field, much like a field pH measurement. Technological innovation appears to be the key for widespread utilization of surface geochemistry.