

09/25/06

Mr. Ray Pugel
Milk Ranch, LLC.
P.O. Box 189
Pine, AZ 85544

**RE: Stepped Pumping Test Results and Recommendations for the Milk Ranch LLC
Well #55-210454 in Pine, AZ.**

Dear Mr. Pugel,

An evaluation of the well pumping test data collected during HWRC's September 9-10th stepped discharge testing of the new well #55-210454 has been concluded. The well was pumped at three variable rates of ~120gpm, ~165gpm, and ~210gpm with a maximum drawdown of 273 ft. from a pre-pumping water level of 514ft.. When one considers that no water was encountered until below 615ft. and that the well is 1045ft. deep, this is quite impressive. I am happy to report that the new well you have installed in Pine is a very capable well. It is notable that over the duration of testing more than 245,000 gallons of groundwater was produced and that the well recovered to 95% of the pre-pumping level within 30 minutes. The data indicates the well could yield far more than the 220gpm that it is currently equipped to produce. Historically, this is indeed a very significant well for the Pine area. In fact, your well reaffirms the State's recent approval of a 100 year water adequacy regarding another deep well in Pine installed for the Strawberry Hollow Domestic Water Improvement District. For your documentation and consideration, I wish to report the following observations and provide further recommendations:

- 1) Currently, the highest pumping rates that can be sustained, while at the same time minimizing sanding, are estimated to range between 120gpm and 180gpm.
- 2) As such, it is recommended that the 7-day constant rate pumping test rate not exceed 150gpm.
- 3) The fine sediment consisting of what visually appeared to be a fine sand and silt endured nearly throughout the higher end of the testing range. After 24hours of pumping and reducing the rate to 100-120gpm the sand production dropped off significantly and visibly clear water was consistently produced. I believe that if left alone following startup, relatively sediment free water can likely be produced at up to 180gpm, following some purge time. Please note the pictures on page 2 of this letter report.

Fine sand collected during testing rates of 220gpm to 120gpm

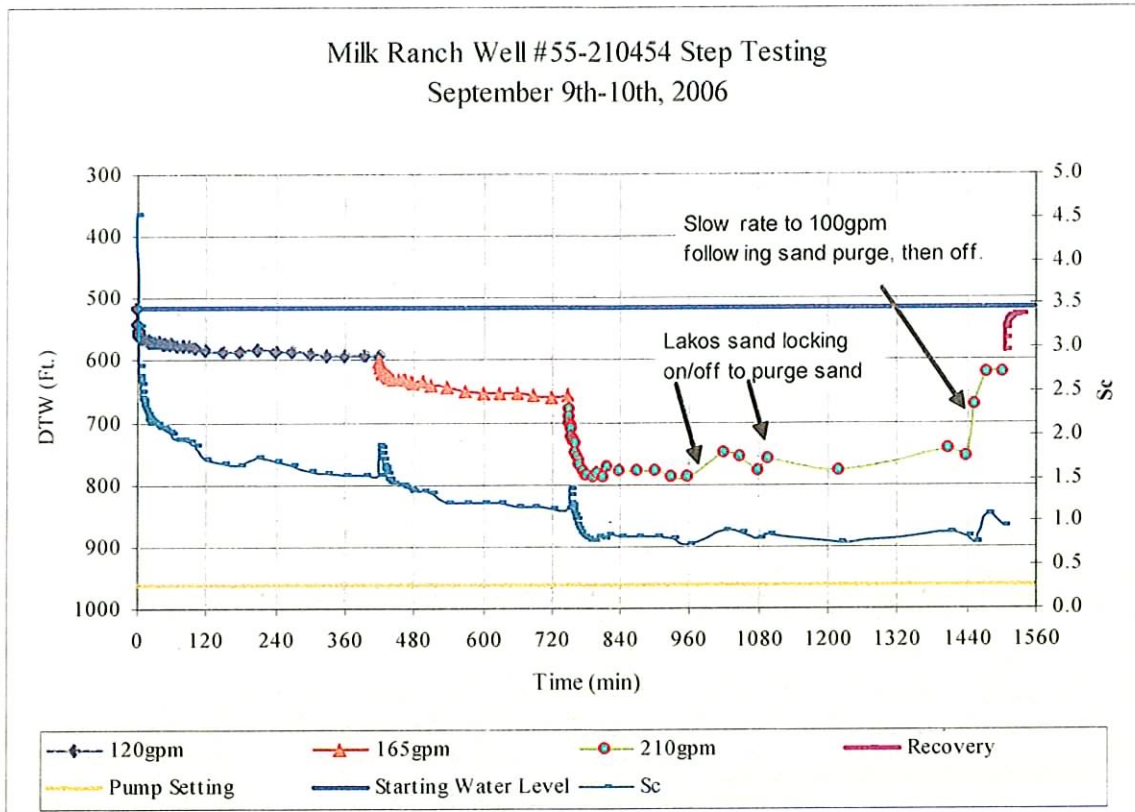


Only very fine sediment observed following stable pumping at 100gpm



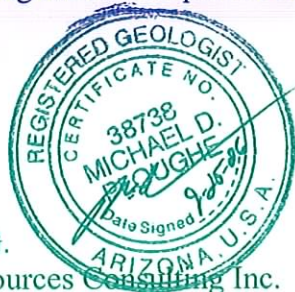
- 4) It is apparent from the data collected that the well can yield more than 300gpm.
- 5) Upon conducting a sieve analyses of the sediment and visually inspecting the sand grains under magnification I can report that the makeup of the sand is greater than 90% dolomite (issuing from the Martin Fm.) at a grainsize of $\sim .002''$ and finer. As such, the option to use acidification to aid in developing the well can be considered. The resulting increase in borehole size and fracture apertures following acidification will result in lower flow velocities and therefore less sand generation. This however requires specialized skill and expertise and therefore is recommended as an option to more traditional techniques if they do not prove satisfactory.
- 6) Because the Lakos sand separator could be separating out a larger size fraction which we cannot see at the surface, it is recommended that several sets of bailed samples of the sediment be collected when the well is next taken off line. It has been observed that during airlift development that the same size material as separated in the sieve was produced. However, by collecting actual samples in the well we can confirm the sediment size distribution has not changed under actual pumping conditions.
- 7) To pump the well at higher rates safely will require further well development via pumping at rates of 300-500gpm w/o a sand separator utilizing salvaged and/or used high capacity pumps as "sacrificial" pumps. In this way, sediment can readily be removed and sand production at pumping rates up to 300gpm can be minimized. This too will likely improve the well's overall performance by increasing the specific capacity significantly. Acidification may be considered in conjunction with this technique.
- 8) Following the aggressive well development techniques above the immediate installation of a well screen and filter pack would be the best means of stabilizing the formation while minimizing further sanding, should you elect to equip the well to pump at a higher rate than ~ 180 gpm in the future.

The graph below was produced utilizing the data collected during the step testing. Please note that the well pumping level approaches stabilization at all the pumping rates. However, the dolomite sand became a concern at pumping rates over 200gpm as the Lakos sand separator repeatedly sand locked. The well had to be turned off intermittently to prevent damage to the Lakos and the pump due to this issue.



Field measurements of ph (7.4), temperature (55°F), conductivity (290µs), taste (Excellent), and odor (none) all indicate that the water is of excellent quality. I anticipate the actual water quality results to be very similar to the other deep well installed in Pine's M-X aquifer, which passed ADEQ new source approval. Upon the completion of our 7-day testing I look forward to reporting to you further and in detail on the entire project. Please contact me at 928-970-9055 cell or 928-468-0252 should you have any questions. Thank you for allowing me to be a part of this success story.

Regards,



Michael Ploughe P.G.
Highland Water Resources Consulting Inc.