MEMORANDUM

BBA water consultants

BISHOP-BROGDEN ASSOCIATES, INC.

Summary of Ground Water Level Analysis and Findings
Gilpin County Justice Center Water Supply Wells

Background Information

BBA was asked by the County to review recent water level declines from the County's water supply wells and neighboring residential wells. We have monthly water-level data for the two County's wells since they were drilled in 1994 and 1995, and were provided limited water level data from one well (Duvall well) located close to the County's wells and three wells (Adsel, Brown and Peters wells) located approximately one mile from the County's wells. BBA completed an analysis of this data to determine if:

a) The pumping of the County's wells was causing a decline in the neighbors wells, and

b) If the data indicate any potential long-term problems with this aquifer

BBA helped the County with the design, construction and testing of the County's two wells, JC-1 and JC-2. We are familiar with the wells and the conditions in the local fractured rock aquifer. An extensive testing and water level monitoring program was completed when the wells were drilled. It was determined at the time that the pumping of the County's wells may have a limited impact on the water level in nearby wells, but the projected water level changes were expected to be limited to wells located closest to the County's wells and were not expected to limit these wells' ability to pump their permitted entitlements.

Summary of Local Geology and Hydrology

The bedrock geology beneath the area consists of metamorphic and igneous rocks of Precambrian age. The rocks are highly fractured, in some cases as a result of large-scale geologic faults. Ground water flows through fractures in these rocks, and successful water supply wells intercept these fractures to pump ground water. The ground water is recharged by precipitation and runoff events, as well as through streams and ponds and return flows from various uses of the water. Water levels fluctuate naturally as a result of variations in recharge and well pumping. In some areas, the bedrock formations are more fractured than others, resulting in variations in well yields and limiting the connection from one group of wells to another. The Dory Hill Fault trends north – south in the vicinity of the Justice Center. The fault very likely controls ground water flow in the vicinity of the fault.

Summary of Findings

- Water levels have fluctuated seasonally in the County's wells, which is an expected natural occurrence in this type of fractured rock aquifer.
- Data from the County's wells indicate that there is a trend of declining water levels since approximately 1995. Water level decline rates in the County's wells have been approximately 1.7 to 2.6 feet per year. Water level declines in the Peters, Adsel and Brown wells have ranged from 0.4 to 6.7 feet per year, depending on the year of the measurement. The greatest rates of decline have occurred since 2002.

- The limited data from the Adsel, Brown and Peters wells indicate that water levels have changed more in these wells than in the County's wells. Commonly accepted hydrologic principles state that water level changes in a nearby well can not be greater than the water level changes in the pumping well itself. Therefore, the water level changes in the Adsel, Brown and Peters wells resulted, at least in part, from factors other than the County's pumping.
- The region has experienced significant drought conditions in recent years. We have completed analyses of local streamflow data, which shows a significant decline in regional water supplies during this time. Because these aquifers are recharged by the same sources of supply (snow and rain), we can conclude that the drought conditions have contributed heavily to the water level declines in the area.
- The water level declines can also be influenced by many other factors, including: regional well pumping by local homeowners, businesses and other entities; pumping by the County's wells; and possibly other land use and hydrologic changes in the area.
- There is not enough evidence to suggest any long-term problems regarding the sustainability of this aquifer. As the drought conditions ease, we expect to see an increase in water supplies recharging this aquifer system and a corresponding rise is water levels.
- The Peters, Adsel and Brown wells are located at a significant distance from the County's wells and probably in fractured systems minimally connected to the County's wells. The distance and the separated fracture systems limit water level impacts to these wells resulting from the County's pumping.

Recommendations

Based on our findings, BBA recommends that the County continue to monitor its ground water levels on a monthly basis. We also recommend that other well owners in this fractured rock aquifer system also maintain regular (monthly or quarterly) records of water levels in their wells. Periodic review of these data should be sufficient to assess any potential long-term issues associated with the sustainability of this aquifer system. If homeowners have water level data that they could make available to us, we would welcome the opportunity to review the data as part of future analyses.