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Mr. Marc Wangsgard
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Subject: **Review and Opinion**
Specific Documents Related to Hydrogeology
Cedar Valley Area, Utah County, Utah
for Marc Wangsgard

As per your request, I reviewed reports and documents on groundwater conditions in the Cedar Valley by Feltis (1967), Hurlow (2004), and Epic Engineering (2004). The purpose of my review was to find out whether there are new data or analyses presented by Hurlow (2004) and/or Epic Engineering (2004), which contradict the estimates developed by Feltis (1967) for annual groundwater outflow from the Cedar Valley.

According to Feltis (1967), *"The estimated subsurface outflow of water from Cedar Valley along the east edge of the basin ranges from about 10,000 to 20,000 acre-feet per year."* The 10,000 acre-feet per year estimate was based on transmissivity values and hydraulic gradient data obtained for the basin fill deposits. This estimate does not include groundwater stored in or flowing through the Paleozoic bedrock aquifers because very little was known at the time about groundwater conditions in the bedrock. The 20,000-acre-feet-per-year estimate was calculated from estimated annual precipitation minus losses from evapotranspiration and discharges from springs and wells. Feltis (1967) concluded that *"the two figures are of the same order of magnitude and they are a good indication of the magnitude of the actual quantity of outflow."* It should be noted that if Feltis (1967) included bedrock in his flow calculations, the saturated thickness and estimated outflow would be greater than 10,000 acre feet; therefore, the 20,000-acre-foot estimate, may be more reliable.

Hurlow (2004) used information from geologic maps that have been published and wells that have been drilled since Feltis (1967) to develop an updated geologic framework for the Cedar Valley. This updated framework includes bedrock, specifically the Paleozoic aquifers. Hurlow (2004) also included some updated water level data for wells completed in the valley fill deposits. These data show that water levels in three wells near the center of the valley have risen 18 to 30 feet from the 1960s to 2003. The report by Hurlow (2004) does not present any new data or quantitative analyses of groundwater outflow from the Cedar Valley nor does it contradict the estimates presented by Feltis (1967).

According to Epic Engineering (2004), Eagle Mountain City Well No. 2 was *"...installed in 1999 and taps the fractured limestones of the Great Blue Limestone."* Epic Engineering (2004) (1) reports that the water level in the well dropped 8 feet from 1999 to 2004 and (2) observes that *"Whether the approximately eight feet of water level change reflects "mined" groundwater from the Great Blue Limestone groundwater compartment, or reflects an artifact of seasonal or barometric pressure changes, errors in measurement, or a combination of all factors remains problematic*

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until additional data are collected." I tend to agree with Epic Engineering (2004) and would not conclude that the existing water level data demonstrates groundwater mining. To support that conclusion, better data are needed, such as water levels measured at regular intervals using consistent methods and equipment over a longer monitoring time period. These data could then be used to distinguish water level changes caused by mining from water level changes that result from (1) extended periods of regional drought, such as the drought currently being experienced by the area, (2) natural seasonal water level fluctuations, (3) transient artifacts of pumping, and (4) other factors, such as barometric effects, which could affect the observed water level.

In summary, it is my professional opinion that although the information presented by both Hurlow (2004) and Epic Engineering (2004) contribute to the understanding of groundwater conditions in the area, neither present new quantitative estimates of groundwater outflow from Cedar Valley nor do they contradict the findings of Feltis (1967).

Kleinfelder is grateful for the opportunity to provide our opinion regarding this issue. If you have any further questions, please call me at (435) 649-2030 or on my cell phone at (435) 901-1334.

Very truly yours,

KLEINFELDER, INC.

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REFERENCES CITED

Epic Engineering, P.C., 2004, Eagle Mountain City Well No. 2 Water Level Data Analysis: correspondence from Korey C. Walker, P.E. and Todd Jarvis, P.G. of Epic Engineering, P.C. to Gerry Kinghorn, dated April 26, 2004.

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Hurlow, H., 2003, The Geology of Cedar Valley, Utah County, Utah, and its Relation to Ground-Water Conditions: Special Study 109, Utah Geological Survey, dated 2004.